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Re-thinking Europe's Skill Needs: Reflections following the European Year of Skills

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Europe's Skills Challenge

Līga Baltina and Terence Hogarth

1.1 Introduction

The recent past has proved challenging for Europe in all sorts of ways. From an economic perspective, lockdowns during the COVID-19 pandemic pounded the economy. Economic output dropped by 6 per cent in 2020 before rebounding rapidly between 2022 and 2023 pushing inflation to highs which had not been seen since the 1970s, with the war in Ukraine driving prices, especially for energy, even higher. The economic breaks were applied when the European Central Bank (ECB) and other central banks raised interest rates that dampened growth prospects. Several countries entered recession. But the labour market appeared to defy gravity. Unemployment remained relatively low, from a historical standpoint, and vacancy rates reached record highs. How this proved possible is explained in large part by the fall in real wages (European Commission / DG EMPL, 2023). There was an expectation that, with inflationary pressures moderating and labour shortages beginning to push up real wage growth, something close to the normal experienced before the pandemic would begin to reassert itself. Except that the world seems to have been irrevocably changed by COVID-19, the war in Ukraine, and the ongoing twin digital and green transitions. And even if it were possible to return to the pre-pandemic world, the European economy and labour market would still be facing a number of challenges. Not least of which is how to harness the manifold talents of the EU labour force to drive-up productivity and international competitiveness. Successive EU Skill Agendas have demonstrated the need for actions to create a virtuous circle where improved innovation and competitiveness are supported by human capital development, delivered in a fair and just manner, to bring about a high-skill equilibrium (European Commission, 2020, 2016, 2010). In other words, where the supply of, and the demand for skills which confer economic advantage are mutually reinforcing. This is seen to be all the more important in a world where the digital and green transitions have, as yet, uncertain outcomes for both employment and skills. In recognition of the importance of human capital, or, more prosaically, that of skills, as a source of the EU's future competitiveness, 2023 was declared the European Year of Skills (see panel).

The European Year of Skills

The European Year of Skills aims to address skills gaps in the European Union and boost the EU skills strategy, which will help reskill people with the focus on digital and green technology skills. This will require helping people get the right skills for quality jobs and helping companies, in particular small and medium enterprises by highlighting national efforts as well as existing and new EU initiatives and EU funding possibilities. It will support skills-related activities and events across Europe.

Source: European Year of Skills website - https://year-of-skills.europa.eu/about_en

1.2 The creation of European skills policy

The need to tackle skills policy at a pan-European level has a long history (Cedefop, 2018). Both the European Coal and Steel Community (ECSC), created in 1951, and the Treaty of Rome (1957), which established the European Economic Community (EEC), made reference to the need for concerted actions on skills. The ECSC, for example, was concerned about the potential for skill shortage induced wage-push inflation to impair productivity growth. This led to concerted action among member states, including the compilation and dissemination of documentation on vocational training, designed to improve skills supply (Meschi, 2004; Petrini, 2004). A space for vocational education can also be found in the Treaty of Rome (1957). Article 166 states: 'The Union shall implement a vocational training policy which shall support and supplement the action of the Member States, while fully respecting the responsibility of the Member States for the content and organisation of vocational training.' More generally, in relation to education as a whole, Article 165 states: 'The Union shall contribute to the development of [high] quality education by encouraging cooperation between Member States and, if necessary, by supporting and supplementing their action, while fully respecting the responsibility of the Member States for the content of teaching and the organisation of education systems and their cultural and linguistic diversity.' The Treaty of Lisbon, which entered into force in 2009 as the Treaty of the Functioning of the European Union (TEFU), retained Articles 165 and 166 and added Article 9: 'In defining and implementing its policies and activities, the Union shall take into account requirements linked to the promotion of a high level of employment, the guarantee of adequate social protection, the fight against social exclusion, and a high level of education, training and protection of human health'. The Treaty of Lisbon also gave legal

effect to the Charter of Fundamental Rights of the European Union which also came into force in 2009. Article 14 of the Charter states: 'Everyone has the right to education and to have access to vocational and continuing training.' In the same vein, the European Pillar of Social Rights (2017), which reaffirms the exiting rights in the Treaties, stipulates that: 'Everyone has the right to [high] quality and inclusive education, training and life-long learning in order to maintain and acquire skills that enable them to participate fully in society and manage successfully transitions in the labour market.'

Petrini (2004) documents the difficulties the EC faced in progressing a vocational education and training agenda within the EEC during the 1960s. In part, this seems to have stemmed disputes about the respective legal competences of the Commission and the member states. Jumping forward to the start of the 21st century, EU level skills policy gained momentum. The Copenhagen Declaration (2002) can be regarded as a landmark moment in the history of EU policy making on skills and vocational education and training (VET). In one fell swoop, it obtained agreement between member states to further develop a European education and training area that would, in effect, bring about partnership working across the EU to improve the information available to guide careers, provide a basis for greater transparency, comparability, transferability and recognition of qualifications, and improve quality assurance in national VET systems. It provided, in many respects, the springboard for VET policy making in the EU, which a succession of communiqués reporting on progress towards the ambition set out in the Copenhagen Declaration were able to build upon: Maastricht (2004), Helsinki (2006), Bordeaux (2008), Bruges (2010) and the Riga Conclusions (2015). More recently, the Osnabrück Declaration (2020), which set the medium-term goals for EU VET policy in the 2021 to 2025 period, set out the need to:

- improve the resilience of VET by exchanging information on innovative reforms of VET and develop centre of vocational excellence as innovative hubs;
- establish a new lifelong learning culture by, for example, improving skills anticipation, developing an inventory of actions and strategies in relation to upskilling attached to the green and digital transitions, introducing a Pact for Skills;
- further develop the green link in VET through, for example, promoting the exchange of practices of VET teachers and trainers with regard to the green economy;
- address the European education and training area and the international dimension of VET and the need, amongst other things, to explore structured transnational exchanges between VET stakeholders, VET teachers and trainers, and social partner representatives.

Looking back at developments since the Copenhagen Declaration, it is possible to identify a number of recurrent themes:

- the further development of a VET infrastructure at the EU level, including, amongst many other things: EQAVET, which assists member states to improve their VET systems; EUROPASS, designed to assist mobility in the EU by making an individual's skills and qualifications be readily understood; the Digital Platform for Skills, and the European Qualifications Framework;
- target setting to stimulate the demand for, and supply of, skills across the EU;
- legal recommendations designed to stimulate participation in training and lifelong earning across the EU, including those on Individual Learning Accounts (2022), Vocational Education and Training (2020), Key Competences for Lifelong Learning (2018), and the Upskilling Pathway (2016);
- engagement activities such as the Pact for Skills;
- information sharing and technical assistance especially in relation to skills anticipation to improve skills matching in an increasingly uncertain environment given substantial changes in the labour market resulting from the green, digital, and demographic transitions;
- the need to tackle basic skill deficits, support vulnerable groups, and ensure fair and just outcomes.

Why the EU should engage in these types of activity has its roots in the centrality of skills to so many of its ambitions, such as the priorities of the European Growth Model (i.e., the objectives the EU and its Member States have committed to with respect to the green and digital transition and to strengthening social and economic resilience), or the completion of the single European market with its free movement of workers. Even the defence of Europe is seen to have a skills dimension, given the specific skills required by producers of defence hardware and software. There is also recognition that the challenges posed by the green, digital, and demographic transitions are common across the EU.

The policy imperative to act has been expressed in a series of EU Skill Agendas: New Skills for New Jobs (2010); the New Skills Agenda (2016); the European Skills Agenda for Sustainable Competitiveness, Social Fairness and Resilience (2020). These have tended to emphasise:

- the role of skills in increasing productivity and competitiveness;
- the need to develop skills for the green and digital transitions;
- improving intra-EU mobility;

- the need to improve the matching of skill supply to demand, stressing the importance of having demand-led VET systems;
- ensuring that VET systems are responsive to the needs of the labour market and flexible with respect to provision (e.g. the use of micro-credentials in VET);
- making VET a first choice for people making the transition between education and work by improving its attractiveness (e.g. by increasing apprenticeship provision);
- promoting upskilling and reskilling of workers over their life-course to avoid the increased risk of skills obsolescence that the digital and green transitions potentially pose;
- improving the acquisition of key, basic competences (increasingly digital ones), especially amongst low skilled individuals and vulnerable groups;
- enhancing access to VET and bringing about increased levels of social inclusion and, in doing so, contribute to fair and just digital and green transitions.

Initially, European initiatives seemed to focus on creating a European VET infrastructure or space related to qualification systems and quality assurance. Successive Skill Agendas have tended to emphasise the labour market aspect insofar as they are concerned with ensuring that Europe possesses skills which are not only matched in sufficient volume to meet current labour market demands, but confer upon European citizens (and businesses) the capabilities to drive up productivity and competitiveness and achieve their own aspirations.

1.3 The skills challenge

The skills challenge facing the EU – and other regions of the world for that matter – is formidable. First of all, there are the various drivers of change which affect the types of skills which will be in demand in the future, including climate change and the sustainability agenda, technological change – especially that which incorporates artificial intelligence –, globalisation / de-globalisation, and demographic change. These drivers will create demands for new types of skills, while making some of the existing ones obsolete. Secondly, there is a need to address existing skill deficits, so that future change is not a catalyst for increasing existing inequalities and disadvantage.

Two Cedefop studies – *The changing nature and role of vocational education and training in Europe* and *The Future of Vocational education and Training in Europe* – highlighted many of the drivers which are likely to shape the demand for skills over the medium-term and how these are likely to affect the demand for VET (Cedefop, 2018;

2022a). Both studies underlined the diverse ways in which VET is able to respond to changes in the external environment which affect the demand for skills. While VET is adaptable, it needs clear signals about the future direction of change to deter skill mismatches arising. Results in the recent EURES report on skills shortages and surpluses (ELA, 2023), and Cedefop's second European Skills and Jobs Survey (Cedefop, 2022b), both indicate that while skills shortages are far from being endemic across the EU, they nevertheless impose substantial costs on particular sectors and, in aggregate, on society and the economy as a whole. It remains the case that a not insignificant share of the EU population lacks basic skills. In many respects, however, the principal skills mismatch that the EU faces is that of skill surpluses rather than shortages, which suggests that a substantial share of overall investments in skills are misplaced. From a system level perspective, concerns remain that national education and training systems are not sufficiently demand-led, resulting in persistent skill mismatches.

The essays collected in this volume cannot address all the skill challenges facing the EU over the medium-term, but are able to address selected key challenges, namely:

- the degree of labour and skill imbalances across the EU;
- identification of the specific skills which will be increasingly in demand; and
- how to effectively supply skills including how to achieve fair outcomes.

Some of the chapters focus on diagnosing how change is affecting the demand for skills, others address how skill challenges can be addressed, and one provides an illustration of unintended outcomes. As will be seen, the role of EU initiatives of one kind or another help inform both the diagnoses and the solutions presented in many of the chapters.

1.4 Tight Labour Markets, Labour Shortages and Skill Imbalances

The number of people of working age (15 to 64 years) in Europe has been in decline. Over the period 2012 to 2022, the EU-27's working age population contracted by 2.7 per cent. Eurostat projections suggest that the working age population (15–64-year-olds) is expected to continue to contract by 2.2 per cent over the period between 2022 and 2032. This means that there will be around 6.3 million fewer people potentially available for work in 2032 compared with 10 years earlier, and 14.0 million compared with 20 years earlier. In total, 17 countries in the EU are projected to show a population decrease over the period. In some, the projected scale of population is likely to decrease

substantially, such as in Latvia, where it is expected to decrease by 11 per cent, and in Greece by 9 per cent. This has major implications for both labour and skills supply. The chapter by McGrath and his colleagues examines the factors which affect the incidence of labour and skill shortages across Europe. Their analysis suggests that the tight labour market conditions which have prevailed over recent years are likely to alleviate, but that factors such as population decline mean that labour shortages, and skill shortages, are likely to persist. Davern's chapter builds on this theme by looking at the role of public employment services (PES) in meeting future labour and skill needs and the various initiatives which have sought to improve the process of matching jobseekers to jobs across the EU. In their chapter, McGuiness and his colleagues review what is meant by a skill shortage and examine the determinants of under-skilling drawing on sources such as the European Skills and Jobs Survey. Looking to the future, and reflecting on the levels of replacement demand which are likely to arise as workers retire and the working age population shrinks, Livanos's chapter provides an indication of those jobs which are likely to be affected by skill shortages in the future.

1.5 A Focus on Specific Skill Needs

There are evident concerns about the scale of labour shortages facing the European labour market and the skills that will be needed to fill many of the jobs which are likely to materialise over the near future. In particular, there is an interest in understanding the impact of the digital and green transitions on the demand for skills. Addressing the green transition, Hogarth and Baltina show how there has been a shift away from identifying green jobs to identifying the green skills which may be evident in non-green jobs (however defined). Their evidence suggests that defining green skills remains a work in progress, but there is an increasing understanding of the types of skills required to support the green transition. Research increasingly points to the impact of technological change, including artificial intelligence, affecting the tasks individuals undertake in their jobs rather than resulting wholesale job loss (Autor, 2022). Evidence from the first European Skills and Jobs Survey suggested that technological change is most likely to result in job loss in relatively low skill jobs, where their incumbents do not have access to training (Pouliakas, 2018). Drawing on evidence from the second European Jobs Survey, the chapter from Pouliakas in this volume presents evidence of how workers' jobs tasks are affected by new technologies. His analysis shows that that it is mostly lower educated workers and men employed in larger-sized, public organisations who face a greater chance of seeing some of their job tasks being replaced by new digital technologies. Arendt and his colleagues identify the demand for specific AI skills derived from online job adverts. Detailed results are presented

for Poland, with comparative data provided for selected other EU countries. In thinking about how AI-related skill demand might be satisfied, Fornaci and her colleagues show how T-shaped skills provide a means of equipping people for a world of work in which people will increasingly work with AI. Finally in this section, Baltina addresses entrepreneurial skills. The economy of the EU is dependent upon innovation to drive productivity growth. Turning innovation into growth is dependent upon entrepreneurship, which is a skill. How national VET systems might deliver this skill is addressed.

1.6 Skills Delivery and Fair Outcomes

It is not enough to be aware of the scale of the problem, or know the details about Europe's specific demands. Consideration also needs to be given to how skills can be effectively delivered to individuals and employers. As noted in the introduction to this chapter, a considerable part of skills policy making at the European level has been given over to developing the infrastructure to both identify skill needs and suggest mechanisms for their effective delivery. The development of skills ecosystems is often seen as critical to being able to increase the demand for skills and ensure that skills supply is in place to create a high-skill equilibrium (Finegold, 1991). The chapter by Diego demonstrates how an ecosystem approach has been developed in a region of Spain to deliver entrepreneurial skills to students in secondary schools. In doing so, the chapter reveals the substantial efforts required to make ecosystems work effectively. In essence, the creation of skill ecosystems can provide substantial skill dividends, but these take time to develop. Developing upskilling pathways was identified by the European Commission in the 2010 Skills Agenda as being central to ensuring that adults, especially those with low levels of skill development, have access to tailored training to avoid skills obsolescence. Drawing on evidence from France, Chatagnon and Sgarzi show how existing employment and skills systems – in this case, that of France – can be configured to promote upskilling and reskilling. As already mentioned, creating a skills system which is demand-led is a recurring theme in the policy documents on VET in the EU. Drawing on evidence from England's apprenticeship system, Dickerson and Hogarth show how reforms to make the delivery of this form of training more demand-led resulted in changes which might not have been intended. Their chapter shows how the characteristics of apprentices have changed since the introduction of an apprenticeship levy. It is not simply about creating more skills with increasing levels of economic value in the labour market. There is a need to consider outcomes from a social justice perspective. In her chapter, De Micheli provides evidence about the development of programmes to improve gender equality in employment and skill programmes.

1.7 Conclusions

As indicated in the introductory parts of this chapter, skills policy at the European level has been subject to substantial development over the past 20 years or so. Initially the focus would appear to have been on developing an infrastructure which would contribute both to the completion of the European single market (e.g., mutual recognition of qualifications and the EQF), and improving the quality of provision. Over time, arguably, the focus has shifted to one which has more of a labour market focus, with more concerted efforts to improve skills anticipation and ensure that skills systems are attuned to the needs of the labour market. In many respects, these go hand in hand. The recent past has seen Europe subject to a number of crises and challenges: the financial crisis, the climate change crisis, COVID-19, the challenge posed by AI, and the war in Ukraine, with its resultant impact on prices and supply-chain stability. From a strategic perspective there is a need to be able to anticipate emerging skill needs, perhaps faster than previously, and have in place the mechanisms that can respond in short order to develop the skills required. This is all taking place against a backdrop of increased fluidity in the labour market. People may well be increasingly required to move between jobs and employers in the future, and it may well be the case that in some instances there is no employer, such as in the case of platform workers. This poses further challenges for skill systems, insofar as employers may be less inclined to invest in the training of their workers if they are unable to appropriate the returns where the employee leaves for another job or has a tenuous link to an employing organisation. If Europe is about to experience a period of permacrisis against a backdrop of a more fluid labour market, then this is likely to pose a number of challenges to policy makers. The evidence presented in this volume provides examples of how emerging skill needs and skill imbalances can be better anticipated, alongside information on how to define specific skill needs and effectively deliver them.

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CHAPTER 2

Tightening Labour Markets in Europe: An exploration of the extent, causes and implications of labour shortages in Europe with special reference to the role of skills

John McGrath, Costanza Pagnini, Greta Scarpato and Terence Hogarth

2.1 Introduction

Despite relatively weak economic growth across Europe, labour markets have remained buoyant. Employment rates are high by historical comparison and unemployment rates are low by the same token. Added to this, there have been widespread reports of labour shortages and the problems they pose to employers and, in aggregate, the economy as a whole across Europe. The European Labour Authority (ELA) has documented the scale of labour shortages on an annual basis and explored their underlying causes (ELA, 2024). At face value the explanation seems simple enough. Europe's economy has continued to grow but the working age population has shrunk. This has been exacerbated by the sharp increase in demand following COVID-19 induced economic lockdowns, but it is also true that some labour shortages have persisted even as economic growth has slowed.

How policy makers should respond to labour shortages depends, in large measure, upon their causes. If it is simply a need to replace those workers exiting the labour market because of retirement, then the solution lies in finding new sources of labour supply. This might be achieved through stimulating labour market participation rates, though this might be difficult in those countries where rates are already high. Or, it might be achieved through migration within and from outside Europe, though the latter remains something of a sensitive issue for politicians. Attempts can also be made to reduce the scale of labour market exit by raising retirement or pension entitlement ages, though this is likely to do little to reduce voluntary exits which may reflect lifestyle choices. Other causes point to increases in long-term sickness levels which

have resulted from COVID-19, leading to worklessness. There is, for instance, some evidence of this taking place in the UK (IES, 2024). Attention has also focused on the extent to which skills supply might be part of the problem. In particular, technological change, especially that related to artificial intelligence and machine learning, is seen to have the capacity to change the demand for skills (Acemoglu and Restrepo, 2020. Autor, 2022). If those skill requirements fail to be met quickly enough, then they will manifest themselves as labour shortages.

Based on the evidence on the extent, causes and implications of labour shortages collated by the ELA in its reporting on the current state of labour shortages in Europe as well as other evidence, this chapter explores the reasons underlying the labour shortages across Europe. In particular, it addresses whether labour shortages are a problem or something which is likely to solve itself as, for example, employers look to automation as a substitute for labour or labour demand weakens. Some shortages are characterised by persistency suggesting non-cyclical causes such as deficient skills supply. Accordingly, the chapter addresses the structural factors which account for persistent labour shortages associated with certain jobs and sectors.

The chapter is structured as follows. Section 2 provides, by way of context, a description of economic and labour market trends over the recent past, to determine the extent to which they are exceptional, given the policy discourse about labour shortages in Europe. In Section 3, the evidence on the extent and characteristics of labour shortages across Europe is provided. This is followed in section 4 by an examination of the causes of shortages. Section 5 then looks into the extent to which labour shortages are skills-related. Finally, Section 6 points to the policy implications which flow from the evidence provided in the main body of the chapter.

2.2 The Economic and Labour Market Context

COVID-19 imposed a huge shock on economies across Europe. Typically, following an economic shock the size of the one brought about by the COVID-19 lockdowns, one would expect to see a stark rise in unemployment levels. The European Union economy shrank by 10 per cent over the first two quarters of 2021. But, because countries acted quickly to put employment protection measures in place, the feared increase in unemployment levels failed to materialise (see Table 2.1). Maintaining individuals' incomes – in full or in part – allowed some individuals and households to increase their savings resulting in a pent-up demand for goods and services, which was duly unleashed once lockdowns were lifted. The result was a rapid return to growth, with the EU economy growing by 3.4 per cent during 2022.

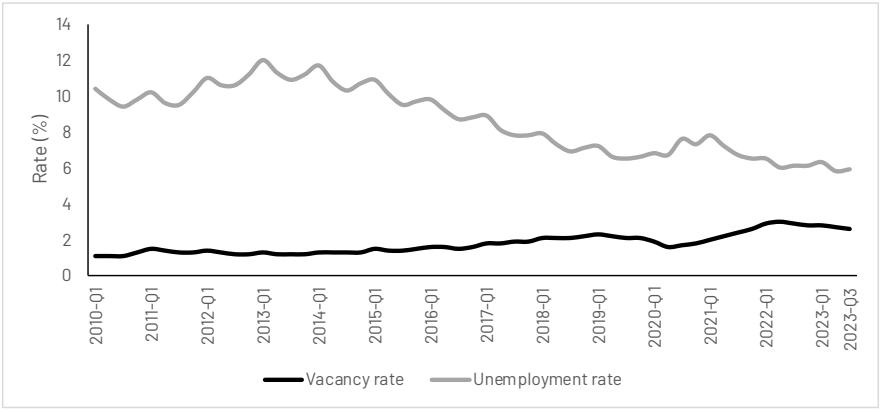
Table 2.1: Economic growth, employment and unemployment before, during, and after the COVID-19 lockdowns, EU-27

	Economic Growth (%)	Employment Growth (%)	Unemployment Level (%)
Before (2019)	1.8	1.1	6.7
During (2020-2021)	0.4	0.4	7.0
After (2022)	3.4	2.2	6.0

Source: Eurostat [nama_10_gdp, nama_10_pc]; [lfsi_emp_a]; [une_rt_a]

The return to growth was accompanied by an increase in the vacancy rate. The combination of increasing levels of vacancies and historically low levels of unemployment has over time led to a tightening of the labour market in Europe. While the gap between unemployment and vacancy rates had been narrowing in the pre-pandemic period, the gap closed substantially as the economic recovery gathered pace during 2022 (see Figure 2.1). It needs, however, to be borne in mind that there is variation by country (see Figure 2.2). Countries such as Spain and Greece in particular have labour markets which are far from tight, given their relatively high unemployment rates and low vacancy ones.

Figure 2.1: Unemployment and vacancy rates 2010 to 2023, EU-27



Source: Eurostat job vacancy statistics [jvs_q]; unemployment statistics [lfsq_urgan]

FIGURE 2.2: UNEMPLOYMENT AND VACANCY RATES ACROSS THE EUROPEAN UNION, 2022

Source: Eurostat [jvs_a_rate_r2 and lfsa_urgan]

Whatever the causes of labour shortages, one might expect to see some reduction in their volume as employers adapt to changed conditions in the labour market. The problem is that this might not occur quickly enough for policy makers (Bosworth, 1993). Before looking in detail at the cause of labour shortages, an indication of their scale and characteristics is provided in the next section.

2.3 The Extent and Characteristics of Labour Shortages in Europe

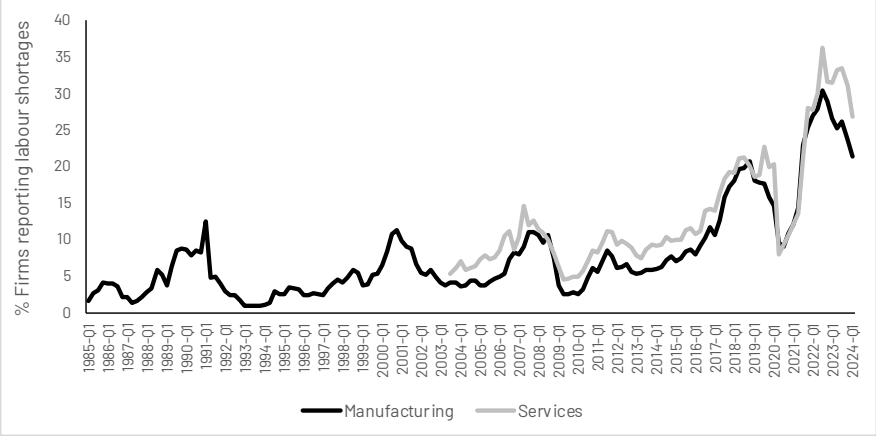
Obtaining a quantitative estimate of labour shortages proves difficult. At the European level there are two data sets, both qualitative, which provide information on labour shortages:

- the European Commission's Business and Consumer Surveys (BCS), which asks a representative sample of manufacturing businesses "What main factors are currently limiting your production?" where one of the answers is "shortage of labour force";
- EURES survey of National Coordination Offices in Public Employer Services.

These sources give an indication of, respectively, (i) the scale of labour shortages and (ii) their characteristics. Figure 2.3 provides an indication of the scale of labour shor-

tages as reported by employers. The evidence points to labour shortages over much of the 1980s, 1980s, and 2000s being at relatively low levels. During the 2010s labour shortages began to increase as the European economy recovered from the financial crisis, before collapsing as COVID-19 affected the demand for labour. With the end of economic lockdowns, the percentage of manufacturers and service sector businesses reporting labour shortages increased substantially, though it showed some signs of decrease at the end of 2023, which most likely reflects weakening demand conditions in the labour market. That said, at 21 per cent in manufacturing and 27 per cent in services in 2024 Q1, labour shortages were still at a relative high level.

Figure 2.3: Manufacturing and service sector reports that labour shortages are a constrain on production, 1985-2024



Source: European Commission Business and Consumer Surveys (Industry and Services, not seasonally adjusted)

The annual EURES report on labour shortages and surpluses provides a comprehensive assessment of the types of vacancies that employers experience difficulty in filling (ELA, 2024). The data are based on information provided by the EURES National Coordination Offices (NCOs) across 29 countries in Europe.

In 2024, more than 85 per cent of all available occupations were reported as experiencing labour shortages by at least one country, indicating that this imbalance is a widespread phenomenon across jobs with different tasks and qualification levels.

There was significant variation in the number of labour shortages identified by each country with about half of the 1,700 or so shortage occupations reported in only six countries: the Netherlands, Norway, Belgium, Romania, Slovenia, and France. While some of these countries, particularly the Netherlands, experienced high job vacancy rates and low unemployment rates (see Figure 2.2), overall the report does not find a consistent statistical correlation between vacancy rates and the number of labour shortage occupations reported across countries. This suggests that other factors contribute to defining such imbalances, such as skills mismatches and the specificities of the production and services sectors. Importantly, differences in national data collection systems and criteria used to define 'shortage occupations' are also likely to have contributed to the observed variance.

At a broad level of aggregation, the study revealed NCOs were most likely to report that jobs classified as professional or craft and related trade worker were experiencing labour shortages (see Table 2.2). Many labour shortage jobs were ones in the middle of the occupational hierarchy. In other words, occupations where, according to the theory of routine biased technological change, their incumbents are most likely to be substituted by new technologies of one kind or another (Autor et al., 2003). Rather than skills surpluses arising, as this theory would suggest, shortages are being reported instead.

TABLE 2.2: SHARE OF SHORTAGE OCCUPATIONS BY BROAD OCCUPATION GROUP AND SEVERITY (ROW PERCENTAGES)

Occupation	Percentage of occupations with			Number of occupations
	High severity	Medium severity	Low severity	
Professionals	48%	41%	12%	355
Craft and related trade workers	45%	40%	15%	289
Technicians and associate professionals	31%	56%	13%	172
Services and sales workers	41%	43%	15%	123
Plant and machine operators, and assemblers	46%	40%	14%	114
Elementary occupations	47%	38%	16%	77

Clerical support workers	44%	40%	16%	45
Managers	22%	44%	33%	45
Skilled agricultural, forestry and fishery workers	53%	33%	13%	19
All occupations	**43%**	**43%**	**15%**	100%
Number of occupations	**531**	**528**	**180**	1,239

Source: Based on ELA (2024) Table 3, p.21

EURES defined a widespread shortage as one identified by at least 11 NCOs (i.e., reported in just under 40 per cent of the 29 countries taking part in the study). According to the 2023 report, the most widespread shortage occupations were for welders, plumbers, pipefitters, heavy truck drivers, and specialist doctors, all identified by at least 18 NCOs. Many of the widespread labour shortages were predominantly sector-specific and belonged to the construction (e.g., roofers, concrete placers, concrete finishers and related workers), software (e.g., systems analysts, software developers, and applications programmers), and healthcare sectors (e.g., specialist medical practitioners, nursing professionals, generalist medical practitioners).

The report also explored the severity of the shortages to identify 'critical' shortage occupations, i.e., those shortages which were reported by NCOs to be widespread and severe necessitating immediate attention and action. The report found that jobs undertaken by certain healthcare professionals, including specialist doctors, general practitioners, and professional nurses, exhibited critical levels of shortage. The COVID-19 pandemic is likely to have exacerbated existing shortages in these occupations, resulting from demographic change and the increasing demand for health care from an ageing population. Additional critical shortage occupations included heavy truck drivers, floor layers, tile setters, roofers, and construction labourers. The inclusion of labourers indicates that skill does not always explain why shortages exist.

2023 marked the sixth consecutive EURES report on labour shortages in Europe. Because the methodology has remained broadly unchanged over time, it is possible to observe changes in the list of occupations reported to be in shortage. It is notable that many of the occupations identified in the 2023 report as being in shortage were also ones identified in previous editions – for example, welders, plumbers and pipefitters, and heavy truck drivers are persistently reported as being in shortage over time. There

is also evidence of convergence across countries, suggesting that structural factors affecting the entire European economy (e.g., the age structure and gender composition of the workforce), rather than short-term shocks, play a role in defining labour market imbalances.

When examining the socioeconomic composition of workers in the shortage occupations in 2023, the disparity in gender representation is notable. Women accounted for 27 per cent of those employed in shortage occupations, even though they represented 46 per cent of those in employment. Furthermore, the analysis revealed that the highest level of educational attainment of most individuals employed in shortage occupations was at a medium level (ISCED 3-4), typically corresponding with qualifications obtained through programmes such as apprenticeship. Finally, workers with relatively low levels of educational attainment (i.e., at ISCED 0-2) were over-represented in shortage occupations. These occupations employed a relatively high share of migrant workers, thus aligning with the numerous schemes across European countries to attract foreign workers to compensate for hard-to-fill vacancies.

An important feature of the EURES reports is its exploration of occupational labour surpluses. Although fewer surplus occupations have been identified by NCOs, some shortage occupations were matched with surplus ones. At face value, this suggests that there is some potential within Europe to alleviate labour shortages by promoting labour mobility between countries. Upon closer inspection, the data revealed that for at least 11 countries experiencing a labour shortage, there was only one with a corresponding occupational surplus. This suggests that labour mobility offers at best a limited and partial solution to Europe's labour shortages.

2.4 The Causes of Labour Shortages in Europe

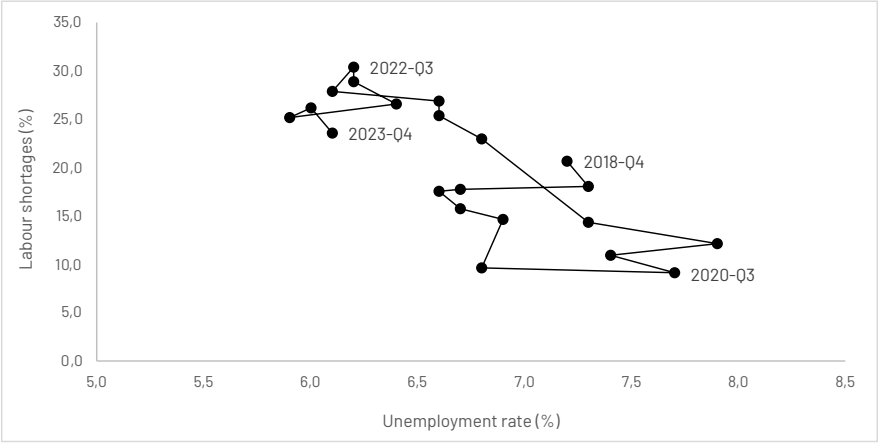
The factors which might account for labour shortages can be divided between supply- and demand-side ones. Supply-side ones include activity rates and population changes, whereas demand-side ones refer to changes which have some bearing on the quantity and types of labour required. This will reflect structural changes in demand, resulting from, amongst other things, growth in the economy, technological change and the green transition to a low carbon economy (ELA, 2023). These types of change can result in the demand for skills changing. There is a tendency to sometimes conflate the respective concepts of labour and skill shortages. Consideration is given in the commentary below about the extent to which labour shortages might be the result of skills supply insufficiently meeting the demand for skills.

As shown in Table 2.1, there was strong employment growth in the immediate post-lockdown period, though, since then, employment demand has weakened as the European economy has slowed (European Commission, 2023a). A variety of factors have sought to explain the increased incidence of labour shortages over the period since COVID-19. These include a fall in real wages, which may have resulted from the withdrawal of income / employment support schemes designed to limit the impact of COVID-19 on employment. The invasion of Ukraine in 2022 and the inflationary shock contributed, to some degree, to a fall in real wage levels. In effect, events in the post-2022 period made the price of labour cheaper, which fuelled demand for labour. It is tempting to consider the impact which this may have on firms' decisions to invest in automation and, ultimately, productivity.

A further feature of the tightening labour market conditions across Europe was labour hoarding, whereby employers seek to avoid laying off workers because of fears about the difficulties and costs of rehiring labour at a later date (European Commission, 2023b). The evidence suggests that labour hoarding has been most prevalent in those countries with high levels of vacancies and low levels of unemployment. Labour hoarding reduces job separation rates at a time when the demand for new recruits has been increasing thereby exacerbating labour shortages. The labour hoarding indicator reveals a highly cyclical pattern, so it is reasonable to expect that the incidence of hoarding may well ease if the demand for labour reduces.

The above commentary suggests that cyclical factors explain much about the causes of labour shortages. This is supported by the data in Figure 2.4, which shows that as the economy weakened during 2023, labour shortages fell and unemployment levels increased. This is consistent with the view that, as real wages responded to shortages, the economy slowed, and company profits came under pressure, the demand for labour weakened (European Commission, 2023a). Figure 2.4 also suggests that the capacity of the labour market to match people to jobs has not deteriorated over the relatively recent past.

Figure 2.4: Beveridge Curve 2018 to 2023, EU-27



Source: Eurostat Job Vacancy Statistics [jvs_q_nace2] Eurostat Unemployment Rates [lfsq_urgan]

While there is, indubitably, a large cyclical element associated with labour shortages, there are also structural factors at play. Population and demographic change is one such factor. In short, Europe's working-age population (and the population as a whole) is shrinking and ageing. With participation rates at relatively high levels, there seems relatively little scope for activation policies to increase the supply of labour. In the UK and the USA, labour supply has been adversely affected by people deciding to exit early from the labour force following the COVID-19 pandemic, either because of lifestyle choices or long-term sickness. This has been dubbed the Great Resignation (Duval et al., 2022). In the UK, it is estimated that in 2023 there were around 700,000 fewer economically active people in the labour market than before COVID-19. This is in a country experiencing population increase. In contrast, there is little evidence to suggest that the EU-27 and its largest countries have experienced the Great Resignation. Nevertheless, given the age structure of the EU-27's population and the expected number of retirements which are likely to take place over the next ten years or so, there will be a need to replace many workers as well as find additional workers to meet increases in the projected level of employment (see Table 2.3). Cedefop's labour market forecasts suggest that over the period 2022 to 2035 there will be a need to replace around 122 million workers who will exit the labour market, in addition to an extra 7 million people required to fill the new jobs created over the same period.

TABLE 2.3: WORKING AGE POPULATION CHANGE IN THE EU27, 2003 TO 2035 (000S)

	Historical data		Projections		Absolute change		
	2003	2023	2030	2035	2023-2003	2023-2030	2023-2035
Population	290,501	286,312	281,784	274,976	-4,188	-4,528	-11,336

Source Eurostat [demo_pjanbroad and proj_23np]

It is not just the scale of demand which is changing. There are also changes in the types of labour required not least with reference to the twin digital/technological and green transitions. In relation to technological change, especially that related to digitalisation and artificial intelligence (AI), the discussion has focused on three inter-related concepts:

- automation – where machines take over some or all of the tasks undertaken in a job;
- augmentation – where the same machines complement the tasks undertaken by workers such that their productivity increases; and
- task reinstatement – where new tasks or new jobs emerge as a consequence of new technologies being introduced.

Some of the initial evidence on the impact of new technologies on employment revealed the way in which they were able to automate those tasks which followed an explicit set of rules (Autor, 2022). Those tasks might be relatively complex, but because they followed a set of rules, they could be replicated by computer programs. Evidence from the USA indicated that those jobs at risk of being automated tended to be in the middle of the occupational hierarchy. In contrast, the tasks undertaken in relatively high-skill jobs that required abstract thinking and interpersonal skills, such as those found in managerial and professional occupations, proved more difficult to automate. The tasks they undertook were of a kind which could not be reduced to an explicit set of rules that could be replicated by computers and robots. Less skilled jobs were seen to be immune to automation, with the evidence revealing little or no substitution or augmentation by machines and robots. In Europe, by way of contrast, automation would appear to have had most impact on the jobs of relatively low skilled workers without access to training (Pouliakas, 2018).

Over the last decade so, it has also been apparent that new technologies could create new tasks in existing jobs (augmentation) as well as creating new types of job (reinstatement), (Acemoglu and Restrepo, 2018). So long as the reinstatement effect is bigger than the automation one, then labour demand will increase. There is plenty of eviden-

ce of new jobs being created. Autor et al. (2021) estimate that around 60 per cent of employment in the USA in 2018 was found in jobs that had titles which did not exist in 1940. Furthermore, data from the European Skills and Jobs Survey conducted in 2021 revealed plenty of evidence of augmentation taking place (Cedefop, 2022). There is, however, a feeling that digitalisation and AI may have a different impact on employment compared with previous waves of technological change. It is nowhere near as dependent upon being able to find explicit rules to automate a task. As a result, the tasks which were previously considered to be out of the reach of computers or robots are now within their grasp as a result of AI. High-skill jobs – where their incumbents undertake abstract reasoning – are potentially within AI's scope to automate some or all of the tasks their incumbents carry out. Time will tell.

It is likely that digitalisation will result in some jobs being destroyed, but the evidence for now suggests that the major effect is that of augmentation whereby AI creates new tasks within jobs which, over time, might result in the content of those jobs being changed in their entirety. This is noticeable from the evidence collected on the impact of digital technologies on jobs from the second European Skills and Jobs Survey (Cedefop, 2022). Digitalisation and AI, it would seem, are unlikely, at least over the short-term, to provide a means of relaxing labour market tightness.

The evidence in relation to the greening of the economy is that its impact on overall levels of employment is small. In other words, the net employment gains or losses which are likely to result from the implementation of policies designed to reduce Europe's carbon footprint or move to more sustainable means of production such as a shift to a more circular economy, are minor (Cedefop, 2021; European Commission, 2023a). It is more likely that the green transition will have more of an impact on skills demand than overall employment levels.

2.5 Evidence of Skill Shortages

Are skill shortages the root of labour shortages in Europe? There is a need to acknowledge at the outset that skills shortages prove difficult to define in practice (McGuinness et al., 2018). A distinction can be made between external and internal skill shortages. The former refers to the difficulties employers face when there is an insufficient number of applicants with the skills, qualifications or experience they are looking for when recruiting someone, whereas the latter refers to the skills held by the existing workforce and the extent to which these are sufficient to undertake their jobs. There is also a perspective dimension. With reference to internal skill shorta-

ges or gaps, employers and employees may well have different views about the extent to which skills held are sufficient to undertake the tasks required in a particular job. There are also a range of issues about the extent to which people possess skills, qualifications or knowledge – at varying levels – which are not considered relevant to their job. Then, there are a range of more objective measures which tend to rely upon either qualification or occupation as proxy measures of skill. One might expect wage levels to respond to scarcity such that measures of differential occupational wage growth should provide an indication of the extent to which some skills are in relatively high or low demand. Comparisons of educational attainment compared with the typical level of attainment required in a specific job can also provide an indication of the extent to which there is an over- or under-supply of skills. These are all flawed measures. In the first case, wages may not respond quickly to changes in the demand for skills; in the second, people may work initially in a job which is mismatched to their skills as part of the process of making the transition from education to work. Over time, they are able to find work which is commensurate with their skill or qualification levels.

From an employer perspective, evidence from Europe suggests that a sizable swathe of employers have faced difficulties recruiting people with the skills they require. The European Company Survey 2019 reported that 26 per cent of establishments found it very difficult to recruit people with the skills they needed and 51 per cent fairly difficult. In other words, just over three quarters of employers in the EU experienced difficulties recruiting people with the skills they required, while only 2 per cent reported no difficulty at all (Eurofound / Cedefop, 2020). The same survey revealed that 16 per cent of employers thought their existing workers were over-skilled and 13 per cent under-skilled. In short, in 2019 when the survey was conducted 31 million people were considered under-skilled by their employers, and 26 million over-skilled. On balance, the problem, insofar as there is one, suggests that it is one of over-skilling rather than under-skilling.

Data from the UK provides a time series of external and internal skill shortages (see Table2.4). In general, the data reveal that there has been a relatively sharp increase in the incidence of skills shortages over the period since 2019, compared with the period 2011 to 2019. This is also observed in relation to skill gaps (i.e., the extent to which employees are under-skilled) which, following a period of decline, picked up again after 2019, perhaps reflecting that employers – in a relatively tight labour market were taking on recruits whose skills were lower than those required to do the job for which they were hired. It is evident from Table 4 that skill shortages, expressed as a percentage of employment – reported in the column with the heading 'Skill-shortage related vacancies - % employment' – have been at relatively modest levels. Whether labour

shortages at a level consistently below 1 per cent is a problem meriting interventions of one kind or another is a moot point.

TABLE 2.4: SKILL SHORTAGES AND SKILL GAPS IN ENGLAND

	Vacancies - % employers with vacancies	Vacancies - % employment	Skill-shortage related vacancies - % establishments	Skill-shortage related vacancies - % employment	Skill-gaps - % establishments	Skill-gaps - % employees
2011	14.1	2.2	3.5	0.2	16.8	5.6
2013	14.9	2.5	4.1	0.3	15.0	5.1
2015	19.7	3.4	5.7	0.4	14.2	5.0
2017	20.0	3.6	5.9	0.4	13.0	4.3
2019	17.1	3.2	5.5	0.4	13.3	4.6
2022	23.2	5.0	9.8	0.7	15.3	5.9
Change 2011 to 2019	*3.0*	*1.0*	*2.0*	*0.1*	*-3.5*	*-1.0*
Change 2019-2022	*6.2*	*1.8*	*4.3*	*0.3*	*1.9*	*1.3*

Source: Employers Skills Survey England – data from https://explore-education-statistics.service.gov.uk/find-statistics/employer-skills-survey/2022

The data provided above reports on the employer's view. There is also a need to take into workers' perspectives on the skills they report. Cedefop's European Skills and Jobs Survey provides comprehensive information about the extent of skill shortages across 29 countries in Europe from the employee's perspective (Cedefop, 2022). It revealed that around 40 per cent of workers across Europe in 2021 had skills which are not matched to the needs of their current jobs – 28 per cent of workers said they were over-qualified and 12 per cent said that they were under-qualified. This equates with around 55 million workers in the EU-27 who reported that they were over-qualified and around 24 million who were under-qualified to carry out their current job. The message would appear to be consistent with that provided by employers – on balance the problem is more one of how to deal with skill-surpluses rather than skill shortages. But even at 12 per cent, the number of people who reported that they were under-skilled might be considered sizable.

The evidence on the extent to which labour shortages can be attributed to a shortage of skills is mixed. There is prima facie evidence that employers, especially in the aftermath of the COVID-19 lockdowns, have increasingly faced difficulties finding the skills they require. On the other hand, there is evidence from the workers' side that they often possess skills which are in excess of those required in their jobs. Analysis which has been able to separate the shortage of skills in the external labour market from other factors, such as offering relatively poor working conditions, suggests that between 60 and 80 per cent of reports of skill shortage from employers may well derive from non-skill related features of employment in the workplace (Cedefop, 2015). In other words, there is something inherent to certain jobs, other than the skills which they require from applicants, that proves unattractive to jobseekers. Bearing this in mind, there remains, in absolute terms, a sizable number of vacancies which prove hard-to-fill because of a shortage of skills available in the external labour market. And even if one were to apply a degree of scepticism about reports of the extent to which employers report internal skill gaps (i.e., where workers are said to be under-skilled to do their current job, the degree of under-skilling is likely to be modest at most otherwise they would not be working in that job), it is still the case that there are a sizable number of people who require upskilling or reskilling. That the level of over-skilling or over-qualification are more to the fore, should not distract from the demand for upskilling and reskilling that a sizable share of the Europe's labour force will require as a consequence of the green and digital transitions.

2.6 Conclusions

The evidence suggests that in the immediate post-COVID-19 period the European economy rebounded quickly from the substantial contraction in output that the economic lockdowns brought about. Overall employment demand also increased, as evidenced by the sharp rise in the vacancy rate during the rebound phase. That employers then experienced difficulties recruiting the labour they required, given these circumstances, is hardly surprising. On balance, the evidence suggests that, as real wages increased and labour demand weakened, labour shortages began to attenuate and return to something nearer their pre-COVID-19 levels. This narrative sees the rise in labour shortages as having a strong cyclical determinant that was exacerbated by the impacts of COVID-19 and the inflationary spike resulting from the war in Ukraine. As the effects of these eased labour shortages reduced. But the evidence also suggests that labour market may well continue to be tight, at least over the slightly longer term, because of the combined impacts of a shrinking working age population and the changes in the demand for skills likely to arise from the twin digital and green transitions.

The projected changes in population size – and the accompanying ageing of the population – will place pressures on labour supply unless migration and / or productivity gains are able to offset the impact of this eventuality. It is also apparent that the labour force will need to acquire new skills to navigate the green and digital transitions. The evidence suggests that access to upskilling and reskilling is unequal across the workforce. This may well continue to have some impact on the persistence of labour shortages across Europe over the medium term.

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CHAPTER 3

PES as agents for delivery of skills policy - opportunities and challenges

Eamonn Davern

3.1 Introduction

Technological change is transforming the world of work, creating both opportunities as new occupations emerge, and challenges as other skills become redundant. Stakeholder collaboration is essential to support citizens in dealing with changes driven by automation and digitalisation. Employers, NGOs, Vocational Education and Training (VET) providers, Private Employment (PrEAs) and especially Public Employment (PES) services, are key partners in the vital agenda to ensure that citizens are suitably skilled to meet future labour market needs.

This chapter discusses the context within which wider EU skills policy is being developed to meet the challenges of technological change. It provides examples from Europe and beyond of how support services are being implemented by PES and other agencies, operationalising policy to address skills deficits. The role of Labour Market Information (LMI) is summarised with reflections on the importance and challenges of applying skills-based client profiling. Some examples of effective stakeholder partnerships to support skills development are described, including specific practices which have been developed to assist employers to adapt to labour market transitions and promote equality of outcome including for the most vulnerable jobseekers.

European Union (EU) PES have agreed various approaches to promote mutual peer learning in order to optimise their shared objectives to successfully operationalise EU skills development policies. The ***EU PES Network Strategy for 2020 and beyond*** described the transformation in the external operating environment in which PES operate (PES Network, 2018). Challenges in integrating suitably skilled jobseekers to the labour market were identified from "rapid technological enhancements, changing working life with new forms of employment, demographic change (with ageing popu-

lations), increased migration, different career patterns, new social attitudes of (younger) jobseekers, and continuing low participation rates amongst vulnerable groups".

Several European policy instruments laid the foundation for an operational framework for PES and other stakeholders to assist their clients in developing skills to deal with rapid transitions. Member States (MS) were called to provide structured assistance to combat skills deficits through several Council Recommendations. The Recommendation on ***Upskilling Pathways*** is a response to the urgent need for upskilling adults who do not possess a functional level of basic skills necessary for participation in modern society.[1] Eurostat reported that only 54 per cent of Europeans possessed sufficient literacy and digital skills in 2021. PES have been pivotal in the delivery of the objectives of this initiative to provide an integrated pathway consisting of three steps: (i) skills assessment to identify the existing skills of adults and any gaps in their skill sets that need to be filled; (ii) provision of tailored and flexible learning opportunities providing a learning offer which fills the specific skills gaps identified through the assessment; (iii) and validation and recognition assessing and certifying the skills acquired and encouraging their certification towards a formal qualification.

The ***Youth Guarantee*** was established in 2013 to prevent young people from falling into inactivity due to a lack of suitable skills for the labour market.[2] It was set up to ensure that, within four months of becoming unemployed or leaving formal education, all young people under the age of 25 receive a good quality offer of: employment, continuing education, apprenticeship or traineeship. PES have provided core gateways to youth training/upskilling programmes.

The **reinforced Youth Guarantee** introduced in 2020 aims to better support youth employment across the EU through national schemes consisting of measures that provide young people with a path toward stable labour market integration. [3] It reaffirms member state (MS) commitment to national schemes, extends the age limit for targeted young people from 25 to 29 years, and provides a specific focus on young people from vulnerable groups, including: people with disabilities; young women; and NEETs (young people not in employment, education, or training). The role of PES has been in-

1 Council Recommendation of 19th December 2016 on Upskilling Pathways, New Opportunities for Adults (2016/C484/01)

2 Council Recommendation of 23rd April 2013 on establishing a Youth Guarantee (2013c 120/01)

3 Council Recommendation of 30th October 2020 on a Bridge to Jobs – Reenforcing the Youth Guarantee and replacing the Council Recommendation of 22nd April 2013 on establishing a Youth Guarantee (OJ C 372. 4 11 2020. Pp 1-9)

creased through requirements to: map provision; plan outreach, especially to NEETs; improve programme preparation through profiling to better match skills needs and responses; and build on links with employers to offer employment incentives, quality and equity, and post placement support. Many PES have an important convening role as cross-cutting enablers to: mobilise partnerships; improve data collection and monitoring; and optimise utilisation of funding.

The Recommendation on the ***integration of the long – term unemployed*** (LTU) into the labour market defined a personalised, customer focused support system bringing together PES and other stakeholders to promote the integration of persons farthest from the labour market.[4] It described how MS, especially through PES, can provide focal points to identify integration, including skills development and a gateway to skills development support.

Most PES are not direct providers of training programmes, and in some cases have historically had a limited role in providing careers guidance and advice, a distinct and separate function from employment support. Job matching and career orientation services have often been delivered by separate agencies, with PES tending to concentrate on the former. PES, however, have long been a primary provider of the interface between government and unemployed persons seeking integration and employability support services. This has given them a crucial role in client orientation directing their customers to other providers of Active Labour Market (ALMP) and skills development programmes.

PES are increasingly involved in providing careers advice, as changes in the nature of work are reducing the number of jobs for life. A 2022 survey of the 32 PES members of the EU PES Network described all but four PES as having some involvement in provision of skills advice (Jakubowska et al., 2024). Over half, 18 PES, reported being direct providers of a full range of careers advice services, and 10 offered partial careers advice as part of a system including other agencies. In addition to expanding their remit, PES are enhancing their stakeholder engagement as technological advances are generating potential for more personalised services to be delivered by a range of actors forming part of a wider Employment Services ecosystem.

Peer learning has been an increasing feature of EU PES engagement for the last 20 years. ***PES Mutual Learning*** exchanges are increasingly focused on the operational

4 *Council Recommendation of 15th February 2016 on the integration of the long term unemployed into the labour market 92016/C 67/01*

delivery implications of operationalising delivery of European Employment, including Skills Development, policy to meet the skills challenge. Though labour and skills development policies fall within the purview of different ministries in many countries, and as mentioned above, advice on career orientation and skills acquisition may be a shared responsibility with different agencies, PES are a common feature of Careers Support in most EU countries, providing a key link in the service delivery chain. In this regard, PES provide an essential role in identifying skills deficits, bringing citizens into contact with skills development support. They provide transversal connections between differing parts of the employment and skills administrations to facilitate effective case management and integration support for citizens.

The ***PES Mutual Learning*** programme continues to provide a vital platform for the exchange of intelligence and good practice on how to improve the operationalisation of skills policy. This chapter therefore concludes with reflections on how peer learning has, and can continue to, support the delivery of the EU skills agenda.

3.2 Delivering skills policy in the changing world of work 4th Industrial Revolution

PES have a key role as labour market mediators. This function is being delivered in the context of what has been described as the ***4th Industrial Revolution*** following the earlier the impacts of steam and water power driving mechanisation, the effects of electrification, and the initial impact of information technology. This fourth epochal technological change has been characterised by several trends driving the operational development of PES seeking to respond to meet new labour market requirements. The COVID-19 pandemic galvanised citizens' demands for more digital public services, encouraging an increasing blended experience between physical and virtual delivery. The importance of person-centric services has grown, driven by datafication with greater use of Artificial Intelligence (AI) enhancing capacity to make decisions, act and learn. This has necessitated an increasing need for online security in an increasingly connected digital world as technologies grow to support the building of hyperlocal networks.

Through improved harvesting of richer available data on jobseeker clients' skills needs and employers' requirements, automating services, and applying new technology**, *PES*** have the opportunity to offer ***more effective matching*** services. The historic "one off job match" is being superseded by more granular analysis of labour market skills needs, and holistic personalised assessment of individuals capabilities, attitudes, preferences, and motivations. It is essential that PES optimise the advantages

available from improved technology to assist their clients in navigating rapid labour market transitions, and so that they can develop service strategies informed by the future direction of skills demand.

A number of influential studies have considered the potential impact and implications of technological change on the labour market. Brynjolfsson and McAfee(2014) have described "automation as powering a second machine age equivalent to the first industrial revolution, one that will further exacerbate inequality". Frey and Osborne (2013) suggested that half of the jobs listed by the US Bureau of Labor were vulnerable to automation, with a particular impact upon blue collar jobs. Susskind and Susskind (2015) predicted a similarly dramatic impact upon professional occupations including law, accountancy, and health care. Ford (2016) confirmed the analysis of these technological shifts but was more optimistic on the societal impact, provided that policy decisions could be implemented to resolve structural unemployment. Notwithstanding different conclusions in regard to the scale and impact of change, an overview of the literature has contributed to a narrative of a "great displacement" with unemployment unevenly distributed within and between countries (Oxford Economics, 2019). This clearly has significant geopolitical implications, of particular relevance to the future development of skills development policies.

3.3 European Skills Policy Framework

The COVID-19 pandemic exposed vulnerabilities in the European labour market and a need for policy interventions to combat labour and skill shortages and reduce the risks of long-term unemployment for the most vulnerable jobseekers. The European Commission launched the ***Skills Agenda*** for Europe in July 2020. This highlighted the importance of investment in skills for inclusive and sustainable growth in the context of the ***twin transitions*** towards a ***green and digital economy***. This five-year plan was intended to help individuals and businesses develop more and better skills by strengthening sustainable competitiveness as described in the ***European Green Deal***. The plan was designed to ensure social fairness through putting into practice the first principle of the ***European Pillar of Social Rights***, which calls for access to education, training, life-long learning and building resilience to react to crises***. The European Pillar of Social Rights Action Plan*** set a new target by 2030 of 60 per cent of adults participating in annual training, which was endorsed by EU leaders at the May 2021 Porto Social Summit.[5]

5 *Communication from the Commission to the European Parliament, the Council, the European*

Skill shortages compromise countries' abilities to take advantage of opportunities in the green economy and from digital development. The ***Skills Agenda*** was therefore linked to the ***European Digital Strategy***[6] , the ***Industrial and Small and Medium Enterprise Strategy***[7] , and increased ***Support for Youth Employment***[8]***.***

In recent years the EU has provided unprecedented levels of funding for skills investment as part of the ***Next Generation EU*** and ***Multi-Annual Financial Framework***. All Member States National Recovery and Resilience Plans endorsed by the Commission have included measures for adult upskilling and reskilling. One third of European Social Fund Plus (ESF+) funding between 2021 and 2027 should be invested in education and skills development.

3.4 Operationalising European Skills Development

The ***European Skills Agenda*** detailed a number of ***flagship actions*** intended to provide practical tools for the delivery of European Skills policy. More than 500 organisations have signed up for the ***Pact for Skills*** by 2024. Partnerships have been established in five sectors (automotive, microelectronics, aerospace and defence, offshore renewable energy, shipbuilding and marine technology) and have pledged to reskill or upskill more than 1.5 million workers. The ***European Alliance for Apprenticeships*** had received 366 pledges by 2024 offering more than 1 million apprenticeships. To ***Strengthen Skills Intelligence***, Cedefop launched an expanded Skills-OVATE site to offer detailed information on the jobs and skills employers demand, based on online job advertisements in 28 European countries.

The ***EU Commission supports strategic national upskilling action*** through assisting Member States to develop national skills strategies. As of March 2023, 13 EU Member

Economic and Social Committee and the Committee of the Regions – The European Pillar of Social Rights Action Plan (SWD -2021-46 final) Brussels 4.3.2021 COM (2021) final

6 European Commission Digital Strategy – A digitally transformed and user -focussed and data driven Commission – Brussels 21.11.2018C (2018) 7118 final.

7 Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions – Updating the 2020 Industrial Strategy, Building a stronger Single Market for Europe's recovery (SWD 2021 351 final) – (SWD 2021 352 final)(SWD 2021 353 final)

8 Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions, Youth Unemployment Support: A bridge to Jobs for the Next Generation Brussels 1.7.2020 COM (2020) 276 final.

States were developing, and six were implementing ***National Skills Strategies*** with the OECD. A programme of mutual learning on upskilling took place during 2022 through a ***Working Group of Adult Learning***, followed in November 2023 by a series of initiatives in a ***Skills and Talent Mobility*** **package**[9] to attract talent from outside of the EU. These included a new **EU Talent Pool** to match employers in the EU with jobseekers in third countries, and measures to promote the recognition of qualifications and learners' mobility.

To ***Future-proof vocational education and training (VET)*** MS have agreed to modernise VET and make it more attractive to people of all ages by adopting a ***Council Recommendation on VET in November 2020***[10]. And, to promote ***Skills to support the Green and Digital Transitions***, the EU Commission launched a self-assessment tool that allows citizens to test their digital skills and access training opportunities appropriate for their needs. This has been accompanied by a ***Digital Competence Framework*** supporting common understanding of digital skills, including digital upskilling, assessment, and framing of policy. A proposal for a ***Council Recommendation on improving the provision of digital skills in education and training*** was presented in 2022 and a taxonomy of green skills published including both, occupational and sector specific green skills shared across economic sectors, and more transversal skills.[11]

The importance of developing ***Skills for Life*** has been acknowledged in the ***New European Agenda for Adult Learning*** adopted in November 2021 which sets out priorities for making holistic and inclusive adult learning available for all, including seniors and those most in need of learning. An Initiative on ***Individual Learning Accounts*** was adopted by the European Commission in December 2021. People can spend these personal accounts with training entitlements throughout their careers on labour market -relevant quality assured training. Opportunities for career guidance and validation of previously acquired skills, a public national registry of training opportunities, a single national digital portal, and paid training leave are intended to make it easier for people to take up training.

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9 See EU Commission press release 15 November 2023, https://ec.europa.eu/commission/presscorner/detail/en/IP_23_5740

10 Council Recommendation of 24th November 2020 on vocational education and training (VET) for sustainable competitiveness, social fairness and resilience, (2020/C 417/01)

11 Council Recommendation on improving the provision of digital skills and competencies in education and training Brussels 23 November 2023 (OR.en) 15740/23

In December 2021 the EU Commission presented a proposal to establish a common ***EU approach to micro- credentials*** intended to ensure that they are relevant and transparent, so that they are valuable aids in personal career development. The maintenance of small learning records to build credentials should therefore systematically develop knowledge, skills, and competences. Furthermore, a new ***Europass platform*** introduced in 2020 has enabled people to record their skills acquisition and career development in a secure personal online space, providing them with a framework to promote their skills and qualifications to potential employers across the European Union. The launch of ***European Digital Credentials for Learning*** means that people can use digital methods to display their learning achievements when applying for training.

3.5 Improving Labour Market Information

Enhanced digital connectivity is enabling a more ***effective use of LMI and PES client data*** to improve skills matching through upgrading services to provide improved responses to skills and labour shortages. This is especially important in countries where demographic pressures from an ageing workforce are expected to contribute to increasing shortages. Studies have noted that the traditional model of a single job and employer for life is becoming increasingly uncommon (Scoppetta, 2019). She found that classical transitions – i.e., education to work to retirement – are being replaced by non-linear transitions, which are necessary to facilitate the life-long learning required to maintain labour market attachment. The increased number of job changes which jobseekers can expect to experience during their working lives is placing a greater premium on efficient PES services to support smooth career transitions. Rapid evolution in the nature of work and occupational structures mean that the accessibility of good LMI is an important enabler for both jobseekers and employers to deal with the implications of an increasingly volatile and unpredictable macro-economic climate.

Asymmetry in LMI contributes to skill and labour shortages. Jobseekers require access to good quality LMI and especially advice on sectoral trends and available skills training to equip them to compete for jobs in growing areas of the labour market. Employment service providers are increasingly utilising emerging technologies, from ***artificial intelligence to apply behavioural analytics***, which can provide more granular data on individual jobseekers' search activity, skills, and motivations. Systems to assess individuals' skills gaps are especially relevant to support jobseekers in adapting to rapidly changing labour market conditions. Traditional "static" systems for collating and applying skills requirements for particular sectors are inadequate tools to provide the rapid responses necessary to meet employers' needs in ever more volatile and dy-

namic labour markets. Employment services are therefore exploring the potential to implement systems enabling close to real time responses to changing labour market conditions. ***Workforce Australia***, for example**,** has been introducing systems to match and shortlist people to meet the most recently identified employer needs. [12]

In 2022 the ***PES in Japan*** expanded its ***online employer portal***, enabling employers to create their own pages to post and amend vacancy information, accept applications, and allow employers to contact suitably skilled people to request that they apply for vacancies. In the ***United Kingdom***, the ***LMI for All*** initiative allows large volumes of data collected by the government to be accessed through a portal and made available to any guidance services who wish to develop their own customised applications.[13]

Improved IT allows for considerable increases in the speed and volume of data exchange between stakeholders. PES and other employment service providers are therefore better able to identify skills gaps and orientate jobseekers towards appropriate training and support programmes, jobseekers can consequently take advantage of emerging opportunities and update their skills to meet labour market developments. Since 2021, the ***PES in Denmark has used a skills identification tool*** which applies textual analysis of posted vacancies to identify skills most in demand by employers. PES counsellors use this information to advise their clients on how best to target their job search and direct them towards programmes providing training to equip people to compete for jobs in growing sectors.[14] Governments are increasingly focussing on ensuring that information on skills demand can be as accessible as possible. The ***Austria Ministry of Labour*** introduced a "***look up" platform*** in January 2022, providing information to advise jobseekers and policy makers of skills imbalances.

12 See Australian Government, Department of Employment and Workplace Relations, Job Seeker Assessment Framework https://www.dewr.gov.au/job-seeker-assessment-framework

13 See https://www.lmiforall.org.uk/

*14 h*ttps://www.oecd.org/els/emp/PES-Digital-OCT2021-Denmark.pdf

3.6 Predicting future skills demand

To effectively support skills development, PES require effective forecasting tools to provide the guidance which their customers need. Research by the World Bank (2019) has identified less skilled and less adaptable people as more vulnerable to unemployment risk through displacement or falling into lower-skilled employment due to automation. This re-emphasises the increasing importance of PES at the core of activities to assist people dealing with technological change and redressing market failure. To deliver this support, they need to ensure that their services are up to date, especially in the fields of prevention and skills anticipation.

In anticipating future skills needs, PES and other stakeholders previously depended upon traditional prediction methods and did not design or apply specific data collection programmes. Relying on extrapolating past trends is no longer seen as a robust skills prediction methodology, as the emergence of new occupations from developing technology means that analysis of past changes can often provide only very limited insight into future skills requirements. The backward facing nature of administrative data, and the frequent time lag in updating classifications, present obstacles to prioritisation by PES and others of measures to meet future skills demand. In a volatile labour market, it is ever more important for workers to anticipate the skills and competencies which will be of most use to them when seeking to access future employment opportunities. Consequently, data collection methods are being enhanced and better use is being made of administrative data to improve skills forecasting.

Improvements in skills identification have enabled more granular data analysis to identify the skills mix required in emerging occupations. Using big data samples can greatly enhance the predictive capacity previously available from previous approaches dependent upon study of aggregate level information, but challenges remain in ensuring that data samples are sufficiently representative to reflect changing occupational structures. Further analysis of skills mismatches is needed, particularly identification of the extent and characteristics of mismatches to assist in prioritisation. A mix of skills forecasting, analysis of big data, and investigation of econometric evidence can provide a sound basis for considering future skills demand. For example, the ***United States O-NET system***[15] provides highly disaggregated information on the skill content of occupations; the **EU ESCO**[16] system has similar potential. Dierdoff et al. (2009) reported success from applying O-NET to identify Green Jobs which do not feature in the standard ***USA US-SOC*** [17]classification system.

15 *O-NET* https://ec.europa.eu/esco

16 *ESCO* https://ec.europa.eu/esco

17 *US-SOC* https://www.bls.gov/soc

3.7 Challenges in matching, Skills - based Profiling

The labour market is changing at an unprecedented rate, as developments in technology drive increasing automation and AI and Machine Learning are transforming or removing job roles. The replacement of the notion of a "job for life" by a concept of career management means that workers must successfully navigate a number of transitions during their working lives to maintain labour market attachment to secure their inclusion. This presents significant challenges for PES seeking to identify skills needs and refer clients to the most appropriate opportunities and training programmes.

It is important that citizens participate in life-long learning to both upgrade existing skills and acquire new ones, thus ensuring labour market attachment. Blazquez (2014) found that labour market changes require skills matching tools which can identify non-certified and informally acquired skills. He found that matching tools which only draw upon previous employment experience and qualifications produce incomplete skills profiles which are insufficient to provide a comprehensive assessment of jobseekers' skills needs. Holistic skills-based profiling can improve the quality of both vacancy descriptions and jobseeker profiles. Outputs from such skills assessments can increase jobseekers' awareness of their strengths and weaknesses and form the basis of Individual Action Plans (IAPs) detailing steps which they should take to develop skills and enhance their employability.

Larsen et al. (2012) reported employer dissatisfaction with the standard of PES matching and criticisms that candidates referred for vacancies often lacked the skills and competencies to meet job specifications and requirements. Consequently, when implementing profiling tools, many PES have prioritised improving labour market outcomes through enhanced skills-based matching to reduce vacancy duration and turnover, thereby increasing employment sustainability. The introduction, however, of enhanced skills-based profiling systems continues to be accompanied by debate as to the accuracy of particular tools.

A particular challenge for PES counsellors has been seeking to effectively match and refer jobseekers to vacancies without holding sufficient information on clients' technical and especially generic skills. This data deficit can be addressed through introducing systems which can utilise richer granular personalised information to support better skills-based matching. Such service improvement can increase employer confidence with employment services and encourage them to place more vacancies with them. Employment services are investing in increasing their ICT capability to enable more intensive exploitation of data to design and monitor personalised, bespoke,

client focussed career and skills development trajectories. The ***Belgium (Flanders) PES*** has introduced processes to ***analyse job search data*** including from clients' click behaviours to allow individualised re-integration and skills development strategies to be developed.

Ideally, the client information obtained through the application of skills-based profiling tools captures information on individuals' transferable skills. Where both generic skills and personal attributes can be identified, an improved "fit" can be achieved between referred candidates and employer requirements with a reduction in mismatches. Where skills needs are identified, ALMPs can be better targeted, improving the outcomes from training programmes. Skills-based profiling can reduce employment service delivery costs, and reduce spells of unemployment. For lower skilled jobseekers, improved skills-based matching can reduce levels of unemployment thereby reducing expenditure on unemployment insurance benefits. The more sophisticated analysis possible from use of skills-based profiling tools can enable career counsellors to manage higher caseloads and reduce administrative costs. Achieving potential benefits from skills-based profiling tools requires high-quality skills classification systems. Some countries have elaborate skills/competency classification systems (e.g., Czech Republic, Germany, and France), while others use less flexible structured competency lists for matching and placement.

Recent developments in PES skills-based profiling are utilising big data drawing upon AI algorithms and machine learning to improve skills matching. The ***Korea PES Worknet System***, for example, applies ontological and network analysis and deep learning methodologies (Kring and Elder 2022). It connects over 30 public and private job search sites in a one-stop platform, providing a single point of access for all information related to careers, jobs, and vocational training. It particularly supports provision of information to support people entering the labour market by linking public and private systems through interoperable registries to implement automated screening systems identifying skills matches with employment requirements.

3.8 Skills Stakeholder Delivery Partnerships

Successful delivery of skills intervention pathways requires effective partnership working. This needs effective collaboration between PES and other key actors, especially employers, jobseekers, educational institutes, and training providers. Deficiencies in the relationships between these stakeholders is a significant contributor to skills mismatches. In a rapidly changing labour market, it is especially important that jobseekers have the knowledge and importantly the confidence to explore opportunities in emerging growth sectors. Employers often have limited engagement with education and training providers who may lack the information to ensure that their courses and programmes are meeting labour market skills development needs. Poorly co-ordinated systems lead to a lack of information contributing to some jobseekers making poor career decisions. PES and all other agencies involved in providing upskilling support to assist on-going labour market attachment will need to be clear as to their and stakeholder partners responsibilities.

Close co-operation and good co-ordination between PES and education providers is especially important to offer career guidance, which reduces the risk of long-term unemployment. It supports more successful school-to-work transitions (STW), encourages voluntary occupational mobility, promotes longer working lives, and assists career transitions across working lives thereby actively supporting a life-long learning agenda. ***Skills Development Scotland (SDS)*** in the United Kingdom involves schools career guidance, young adults labour market placement, and skills development within enterprises. Services delivered through single (including online) access points such as the ***German PES online Kursnet tool*** can provide client-centred information. To improve service co-ordination, the ***Croatia PES*** has established a parallel network of career information and counselling ***CISOK centres***. The ***Netherlands Career Guidance service***, delivered from Education and Work Centres (SCEW) (Leerwerkloketten), improves co-operation between government agencies, PES and municipalities, and the labour market through facilitating regional alliances including VET providers, schools, and business owners. They develop activities, information packs, products and services that improve co-ordination between education and training providers and the labour market. Independent training and career guidance is also provided in 35 labour market regions.

3.9 Lifelong learning – systems, targeting populations to encourage participation

A significant consequence of changes in the nature of work has been the development of Transitional Labour Markets (TLMs) (Brzinsky-Fay, 2010). The diminution of the "Job for life" concept has been accompanied by significant reductions in mass production as the service economy expands. TLMs are altering the relationship between employers and employees and blurring boundaries between employment and unemployment. This rapidly evolving context within which the labour market functions is generating significant challenges for PES in supporting essential upskilling of their clients. At the same time, the differential impact of changes on more vulnerable clients has significantly enhanced the role of PES in delivering skills policy, particularly providing a gateway to life-long learning, supporting effective job-to-job transitions and increasing the employability of people needing to find new jobs.

Arntz et al. (2019) identified 70 per cent of jobs as having a 70 per cent probability of being totally automated, with 32 per cent having a probability of automation of between 50 and 70 per cent. Although AI will remove many occupations, research suggests that the changes will tend to be concentrated on sectors where processes can be automated to be performed with limited human intervention. A 2019 OECD study predicted a particular impact upon manufacturing, transport, and construction, whilst green jobs and care for ageing populations could significantly increase (OECD, 2019). Giving the likely disruption driven by technological change the PES role could increasingly focus on promoting and, where possible, sustaining quality employment and supporting those made redundant into quality jobs in growth sectors. This will necessitate enhanced PES employer engagement strategies, and measures to assist those in, or with the growth of the platform "gig" economy, most at risk of falling into, precarious non-standard employment (NSE). Research has identified that workers most likely to be displaced are those with lower levels of education (Csillag and Scharle 2019) and especially older workers (Voss and Reide, 2018). PES are both best placed, and will need to redouble efforts, to connect with youth, those with caring responsibilities, and the disabled. They will need to identify their clients' skills development needs and steer them to the most appropriate support.

Effective communication tools play an important role in preventing technology-driven unemployment. Nedeloska and Quinti (2018) identified a paradox that citizens most in need of support to deal with labour market transitions are those least likely to seek assistance. Clear messaging and well-co-ordinated systems can improve matching and labour market operation with messages tailored to reflect the requirements and

expectations of different client groups. PES operations are often key to efforts to reduce labour market imbalances caused by skills deficits and can particularly assist in identifying the non-formal competencies of vulnerable jobseekers identifying skills valued by employers.

Outreach is important, especially to connect unregistered unemployed persons to career development services. ***Finland*** has established an integrated ***One Stop Ohjaamo*** model of client centred outreach, especially targeting persons in harder-to-reach vulnerable groups. The ***Austrian Jugendcoaching*** initiative organises programmes and outreach to prevent long-term inactivity. Both professional school staff and external coaches deliver coaching programmes for young NEETs and school drop outs. And the ***Norwegian PES*** has introduced a system of three contact streams for employers placing vacancies. Standard vacancy filling is through self-service (digital) contact, employers contacting PES are invited to discuss extended recruitment service partnerships which can provide advice and support on workplace adaptations to facilitate the employment of persons with disabilities to fill a vacancy. Enterprises with particularly complex ongoing systemic recruitment challenges can become strategic PES partners establishing longer term on-going recruitment strategies to combat skill shortages. This includes programmes to actively target potential recruits from jobseekers in the most vulnerable groups.

PES, identified as key support actors for young unemployed people, need tools to determine the impact of labour market changes to share vital intelligence with educational institutions. This is particularly important to assist young people in dealing with technological changes as highlighted by the European Council Conclusions on Young People and the Future of Work[18]. Developing motivation from skilled counselling, and short company-focused training arranged through PES employer engagement can provide successful pathways to sustainable employment for young people and life skills training. The ***strong co-ordination of youth employment support services by the Austrian PES*** was noted as an enabler for the successful employment of young people, encouraging flexible training and positive employer attitudes. The ***Portugal PES information strategy*** was also highlighted for its creative approaches to promoting youth integration services, including community outreach and its user-friendly web-based information platform. The ***Danish PES Building Bridges to Education Programme*** supplements employability assistance by facilitating academic and social support to supplement vocational support needed for successful transitions. People aged 18 to 29

18 Draft Council Conclusions on Young People and the Future of Work Brussels 29th April 2019, 8754/19

years are offered a three-month support programme of modules tailored to meet the needs of the target group. This provides a foundation to complete educational courses necessary to enter training and secure a job including short-term internships, and confidence-building programmes to develop self-esteem.

3.10 Meeting employers' skills requirements and promoting equality of outcome

Through their employer engagement function PES encourage the support of employers for their matching activities, this is vital in the development of programmes to address skill shortages. A fundamental rationale for the provision of PES services are interventions to combat barriers to labour market entry experienced by citizens, especially from vulnerable groups. This supports upskilling thereby contributing to more efficient labour market balance and operation, and economic growth.

Large companies are more likely to be early adopters of new technologies than small and medium-sized employers (SMEs) who may have less capacity to invest in IT and the upskilling of staff to use new systems. Notwithstanding the range of upskilling opportunities which may be available from PES, including: subsidised employment schemes; work trials; and internships. Companies vary in their capacity or interest in programmes. This can be an especially significant factor where employees may acquire non-company specific skills through training, which may encourage their seeking employment with competitors. PES must therefore act as agents for bridging skills gaps caused by technological change, shifts in labour market operation, and particularly alterations to the employer/employee relationship. PES are responding by developing fresh approaches to engaging with their employer customers and providing improved channels for connecting jobseekers with employment opportunities and employability training upskilling programmes. Partnerships between ***PES in Malta and Belgium (Flanders)*** and NGOs are promoting ***job carving*** (see Scoppetta, Davern, and Geyer 2019). Specialist organisations provide consultancy support to companies, advising them as to how more routine components of skilled workers jobs can be "carved", creating open labour market opportunities for persons who might otherwise face long-term inactivity, enabling improved opportunities and increased progression prospects.

The increasing rate of labour market change necessitates more flexible approaches to the content and design of training provision to ensure effective responses to employer demand. The ***Wallonia PES in Belgium*** works with the regional government, trai-

ning providers, and employers to design and deliver training programmes through ***Skill Centres***. These seek to utilise the most recent labour market signals from employers to ensure upskilling courses focus on meeting growing needs and programmes to prevent unemployment. The aim is to support redeployment where required for clients whose skills are becoming obsolete enabling them to transfer to new roles in growth sectors. The ***Luxembourg PES Digital Skills Bridge*** programme similarly assists enterprises to deal with workforce upskilling aiding restructuring requirements created by technological developments. Both employers and employees are offered a counselling service to meet future skills needs and develop solutions to close the gap between existing and required skills. Targeted training is provided, that can lead to either internal mobility of employees to new jobs with their current employer or external mobility to new jobs in other companies.

The ***Swedish PES*** operates a "***Job Matching from Day 1" (MD1) model***. This ensures that all relevant information on jobseeker skills, including soft skills is gathered. A focus on making soft skills visible is particularly useful for migrants who may lack or have limited formal competencies and/or educational certificates. In parallel to mapping competencies, skills, work experience, and educational attainment, potential vacancies and suitable employers are mapped to ensure a match between a job offer and a jobseeker's skills profile. In recent years Denmark has experienced significant skill shortages with very high levels of unsuccessful recruitment. The Danish Government has legislated to introduce a range of measures to address factors contributing to labour market imbalances to increase participation in education and training. The intention is to provide suitable skills to contribute to the policy intention of driving higher participation rates. Changes to pension regulations have also been designed to encourage older workers to defer retirement. Unemployed persons can be entitled to receive a 10% premium on benefits whilst engaging in education, and entitlement spells for graduates claiming unemployment insurance benefits have been reduced.

Le Forem, the ***PES of the Wallonia Region of Belgium***, has identified a need for tailor-made training and upskilling solutions. The PES offers employers a ***Shortage Punch programme*** which provides jobseekers with specific training designed to match the skills profile of employers' current vacancies. The **Incidant 2000 programme** introduced in January 2022 complements these efforts incentivising participation, providing a payment of 2,000 euros for persons completing upskilling programmes in specified shortage occupations, including the construction, wood, and electricity sectors. The ***Estonia PES has customised courses*** to enable as swift as possible filling of vacancies in skill shortage sectors through special online speed courses introduced in January 2022 to fill vacancies in occupations such as nursing assistants. The PES has also in-

troduced a ***"training card"*** which can be used by employed person deemed to be at risk of unemployment to access upskilling courses. The ***Latvia PES*** identifying a need to encourage more efficient and convenient dialogue between jobseekers and potential employers ***organises online meetings*** for potential candidates to learn more about recruitment opportunities.

In ***Ireland employers*** who have benefitted from the extensive range of upskilling programmes for the unemployed provided by government ***act as multipliers.*** They communicate the advantages of these activities in road shows targeting other potential employer participants. Both the volume and quality of engagement between PES and local employers is enhanced during bi-annual Work and Skills weeks involving seminars and job promotion events.

Several countries prioritise skills in the allocation of work permits for ***migrant workers***. ***Austria*** places all shortage occupations on a list, the "***mangelberufsliste"***, which assists employers in securing work permits for migrant workers with skills in shortage areas. ***Slovakia*** permits recruitment of migrants provided that they are filling vacancies contained ***in an official shortage list.***

3.11 The role of Peer Learning

All EU PES are members of the ***EU PES Network***, established in 2014.[19] This provides the main platform to promote ***Peer Learning*** amongst PES across the European Union. The Network has a mandate to support improved service delivery to foster inclusion, with an especial focus on equality of outcome for persons in vulnerable groups. Organizations participate in an ongoing programme of ***Benchlearning*** to identify strengths and areas for improvement in their delivery systems. Peer PES assessment reports provide recommendations of practices from other countries which are suitable for consideration of knowledge transfer and implementation. The Network also supports ***Mutual Learning*** through an annual work programme of activities including seminars, workshops, webinars, publication of studies, and an annual stakeholder conference.

The programme agenda is determined through PES, who identify subjects for discussion most relevant to current issues in regard to operational delivery of the European

19 Decision of the European Parliament and of the Council amending Decision No 573/2014/EU on enhanced cooperation between Public Employment Services (PES) (SWD-2019-319 final) – (SWD-2019-1350 final) Brussels 11.9.2019 COM (2019) 620 final 2019/0188 (COD)

policy agenda. In recent years, the Network learning programme has delivered many events focused on improving Skills Delivery, with a focus on key themes including "preventing unemployment in the changing world of work", the "power of partnerships" in service delivery, "addressing labour and skills shortages in the context of the Twin Transitions", and the 2023 European Year of Skills.

3.12 Conclusions

PES have a key role in the implementation of skills policy, the importance of this function has increased with the increasingly rapid changes in the world of work in the context of the 4th Industrial Revolution. Policy delivery continues to adapt to meet the expectations and requirements of jobseekers and employers keeping pace with technological developments to provide data-driven services. This is essential to enhance the identification of skills needs and improve prioritisation of policy responses to address deficits.

The expectation that many people will encounter a number of transitions, with changes of job and sometimes occupational sector during their working lives, is placing a premium on PES operations with many examples of new measures to encourage and publicise lifelong learning opportunities. Many PES are evolving their functions to establish methods and processes to target those who can benefit most from training and skills development opportunities and encouraging their participation.

The EU PES Network has been an influential vehicle for the encouragement of peer learning and the exchange of good practice. Benchlearning provides an assessment framework to evaluate the impact of PES activities on the employment prospects of unemployed persons. A range of EU PES Network targets focus on encouraging measures supporting those most vulnerable to risks from long-term unemployment and inactivity due to insufficient skills.

In designing ALMP delivery models PES must increase their focus on ensuring equitable outcomes for jobseekers, and further evolve their menu of support options to protect the most vulnerable. Initiatives to encourage and promote Peer Learning are providing a vital mechanism to enable PES and their stakeholders within and across countries to test, compare, and share delivery approaches to enhance skills acquisition. This must be further developed so that PES implement more focused and agile structures, necessary to continue to equip citizens with the skills required for a modern economy. In this regard, applying burgeoning technologies emerging from the fields of AI and machine learning is especially important.

PES have made considerable progress in a number of areas, especially in reconfiguring their services to better position themselves as key agents for the delivery of employment policy priorities, and to respond to changing labour market dynamics. This has been particularly evident in the European Union, where PES have implemented programmes to take advantage of EU policy steers and funding from the ***Youth Guarantee***. PES have adopted a positive approach towards partnership working with a particular emphasis on securing feedback from potential beneficiaries. Consequently, there has been significant progress in facilitating skills development for young people. Similarly, PES have increased their involvement in programmes to activate the long-term unemployed encouraged by the EU ***Long Term Unemployment recommendation***. Improvements from better co-ordinated delivery models are enabling more efficient guidance steering clients to appropriate skills development programmes. The growing application of artificial intelligence and behavioural analytics by employment service providers is creating a catalyst for more sophisticated data harvesting. As a result, increasingly individualised support packages are being developed making a significant contribution to skills needs identification and subsequent referral of clients to suitable training and employment opportunities.

PES are becoming increasingly involved in careers guidance, through both direct provision and growing inter-agency collaboration. This is providing essential focal points for citizens, many of whom will now require support at various junctures throughout their working lives. This longitudinal assistance is needed to update and acquire skills essential to maintain labour market attachment, and is replacing the traditional PES model of a one-off match into a permanent job/occupation.

To continue to adapt and deliver this new mandate, PES must invest in further developing their data collection and analysis capacity, including capabilities in skills prediction. To meet ongoing needs, PES will need to upgrade LMI systems, upskill counsellors to deal with caseloads comprising a higher proportion of clients with barriers to employability, and prioritise stakeholder engagement, especially with employer organizations, the VET sector, and NGOs. Guidance staff will need close to "real time" information to provide clients with the information they need to make optimal choices in acquiring skills needed in an increasingly dynamic labour market.

At present there are variations in the extent to which PES are equipped to meet the challenges and take advantage of opportunities supporting skills development appropriate for the changing world of work. Those organisations best equipped to deliver effective services in this new context are amending their strategies to reflect a future where they will form part of a wider interconnected employment support ecosystem.

They will have an important role as key partners within a framework of delivery agencies in an environment characterised by increasing customer choice. To fully realise this vision and make the best possible transition to mirror changes in the world of work PES will need to: review their institutional settings, assess the adequacy of their investment budgets, ensure resource allocation systems target priority client needs, and crucially evolve partnership development strategies which ensure that they are best placed to support skills development for sustained labour market integration of jobseekers. Evidence to date reflects the feasibility of PES in deploying necessary operational adjustments. These will necessitate varying degrees of political and policy decision making depending upon the context, especially the regulatory environment, within which employment services operate in individual MS. These especially relate to their mandates, the extent of their engagement with employers, VET providers, NGOs, and private providers. The crucial enabler will be their ability to secure sustained, ongoing long-term funding, so that investment in delivery infrastructure keeps pace with external developments.

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CHAPTER 4

Is there a skills problem in Europe?

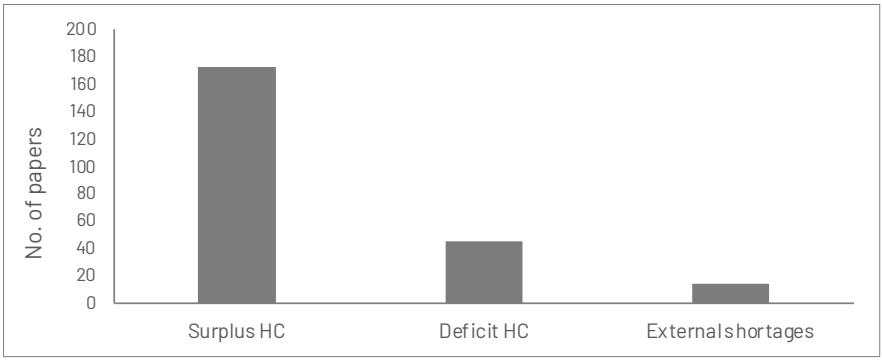
Seamus McGuinness, Elisa Staffa and Paul Redmond

4.1 Introduction

Skill mismatch is a general term that describes a range of labour market disequilibria, some of which are measured from the perspective of the worker and others from the perspective of the firm. Generally, skill mismatches can be classified into three substantial categories: (1) surplus human capital among existing workers; (2) deficits in human capital among existing workers; and (3) shortfalls in qualified workers external to the firm. Studies examining measures of surplus human capital focus on either over-education or over-skilling (see for instance Sellami et al., 2017; McGuinness and Pouliakas, 2016; Ordine and Rose, 2015; Budria and Moro-Egido,2008, 2009; Verhaest and Omey, 2012; Barone and Ortiz, 2011; Croce and Ghignoni, 2012; McGuinness et al., 2018; McGuinness and Sloane, 2011; Sanchez-Sanchez and McGuinness, 2015; Mavromaras et al., 2012; Mavromaras et al., 2007). Over-education refers to a situation where a worker is deemed to possess qualifications higher than those necessary to do or get their current job, whereas over-skilling describes a scenario where the worker believes their skills and abilities are higher than those required in their current job. Studies of deficit human capital, where they exist, are predominantly focused on under-education and under-skilling, which mirror over-education and over-skilling, but describe situations where the worker has a lower level of education or skills than those required in their job. While under-education and under-skilling are exclusively measured from the perspective of the worker, deficits in the competency levels of the existing workforce can also be measured from the perspective of the employer, in which case they are generally referred to as skill gaps. Skill gaps are deemed to exist where the employer indicates that the workforce does not have sufficient human capital, either generally or in a particular skill area, to perform their job effectively. Skill gaps and under-skilling within organisations have shown to be relatively highly correlated (McGuinness and Ortiz, 2018). The third category of skill mismatches is shortfalls of qualified workers external to the firm, and typically describes the inability of employers to fill vacancies due to a lack of qualified candidates. These are generally referred to as skills shortages (see McGuinness et al. 2018 for a review of the various measures).

There are substantial variations, both within and across skill mismatch areas, when we examine how the literature is distributed. Figure 4.1 plots the distribution of academic studies, by skill mismatch area, published between 2006 and 2022 and shows that papers examining human capital surpluses dominate the literature, accounting for 172 (75 per cent) of 231 relevant outputs published over the period.[20] Studies examining the question of deficit human capital account for 16 per cent of the literature (Deficit HC), with papers on external shortages accounting for the remaining 9 percent of total publications. Even within categories, the literature is somewhat skewed with studies of over-education (and under-education) accounting for 84 per cent (73 per cent) of studies on surplus human capital (Surplus HC). Conversely, the literature on over-skilling and under-skilling is much thinner, and this is particularly the case for under-skilling with just five papers published over the period. The lack of attention to the issue of under-skilling is particularly striking given that in instances where policy recommendations are made at a European level aimed at tackling skills mismatches, they typically focus on addressing deficiencies in the skill levels of the existing workforce (McGuinness et al, 2018; Pouliakas 2024).[21] It would appear that there is at least some assumption underlying research and policy approaches to skill mismatches that skill gaps and skill shortages are prevalent and damaging.

Figure 4.1: Published Skill Mismatch Studies (2006 to 2022)



Source: The review for 2006-2017 is taken from McGuinness et al. (2018); for 2018-2022 from McGuinness et al. (forthcoming).

20 We carried out searches on Google Scholar using the various mismatch keywords, and focusing on work published in academic journals. While we attempt to be as comprehensive as possible, the list may not be exhaustive. It is nonetheless representative of the distribution of the mismatch literature.

21 Labour Market Information (LMI) for all Webinar, February 26th, 2024.

While there exists a relatively substantial body of research examining over-skilling, with 28 papers published between 2006 and 2022, very little work has been undertaken on the subject of under-skilling. McGuinness et. al. (2018) review estimates on published studies related to under-skilling between 2006 and 2017 and report an average incidence of 13.2 percent, which is statistically significantly lower than the incidence of over-skilling studies, which was 27.5 per cent. McGuinness et al. (2018) in their review of the skill mismatch literature also point out that there is no consistent evidence of any wage impacts arising from under-skilling, suggesting that the phenomenon may not be a constraining factor on productivity. Furthermore, while some research has been carried out examining the extent to which general levels of over-skilling relate to gaps in particular competency areas, such as literacy, numeracy and transversal skills (Sánchez-Sánchez and McGuinness, 2015), no such research has been undertaken for under-skilling. Outside of the academic literature, there is some descriptive evidence that skill deficiencies among existing workers hampers company level performance. Data from the 2022 UK Employer Skills Survey indicated that skill shortfalls among employees had an impact on most employers experiencing them (65 per cent, similar to the 66 per cent in 2017). The most common consequence of these skill deficiencies were increased workloads for other members of staff (Department for Education, (UK) 2023). This article contributes to the literature by providing an examination of the phenomenon of under-skilling in Europe, using the first wave of Cedefop's European Skills and Jobs Survey (2014), and determining the extent to which under-skilling is correlated with gaps in basic literacy and basic numeracy skills in the labour market.

4.2 Data and Methods

The data used in this study comes from the 2014 European Skills and Jobs Survey (ESJS), administered by Cedefop, which contains information on skill requirements and mismatches, as well as workers' working experiences and characteristics, across all EU Member States (and the UK).[22] The survey's respondents are adult employees, aged 24 to 65. While a second wave of the data was collected in 2021, the necessary variables on under-skilling were not included in that survey, therefore we use the first wave. In this paper, we initially measure skills mismatch in terms of over-skilling and under-skilling rates. General over-skilling and under-skilling is based on the response to the question "Overall, how would you best describe your skills in relation to what is required to do your job?"; a worker is defined as over-skilled if they respond that their

22 *For further information, see:* https://www.cedefop.europa.eu/en/projects/european-skills-and-jobs-survey-esjs#group-details.

skills are higher than required and under-skilled if they respond that their skills are lower than what is required for their job and need to be further developed. We employ measures of basic literacy skills gaps and basic numeracy skills gaps: they are measured in response to the question "How would you describe your basic literacy (numeracy) skills?" with respondents asked to rank those on a ten point scale, ranging from 0 ('my level of skill is a lot lower than required') to 5 ('my level of skill is matched to what is required') and 10 ('my level of skill level is a lot higher than required'). In this paper we identify individuals who have basic literacy and / or numeracy skill gaps as those who scored themselves between 0 and 4 on the respective scales.

Previously, employees were asked "which of the following best describes the highest level of literacy/numeracy skills required for doing your job?". Respondents could reply "basic" or "advanced" skills. If they replied "basic", then they were asked the question on the level of their basic literacy and basic numeracy skills. Therefore, the relevant question for our research purpose is not asked to everybody, leading to a reduced sample size.

Our effective sample consists of approximately 15,000 employees who responded to both basic skill gaps questions and the general question of under-skilling and over-skilling. As the total sample of the ESJS is approximately 46,000, we must ensure that our restricted sample is representative of the overall data, through some robustness checks. In Appendix Table A4.1, we compare country level under-skilling rates calculated on the full sample with those derived from our restricted sample. The under-skilling rates from our restricted sample align well with those derived from the full sample (see Table A4.1), with the exception of Greece and Malta, where the restricted rates are somewhat lower. Nevertheless, the robustness checks suggest that our sample is highly reflective of the distribution of under-skilling in the EU27+ UK, suggesting that the data on basic skill and literacy gaps are also likely to be representative.

In terms of our methodological approach, we begin by assessing incidence of over-skilling and under-skilling in the EU27+U.K., before examining the extent to which basic literacy and numeracy skill gaps are correlated with each other at a national level and the degree to which such basic gaps are correlated with general under-skilling across countries. We then use individual level data to estimate the determinants of under-skilling, focusing on the extent to which they are correlated with basic numeracy and basic literacy gaps. We then assess the extent to which general under-skilling, basic literacy and basic numeracy skills are associated with wage penalties, which will also give some insights into their potential impacts on productivity.

4.3 Results

Descriptive Statistics

In order to assess the extent of skills mismatch at an EU level, in Table 4.1 we measure the extent of skills mismatch within the EU27+U.K. Worryingly, just 55 per cent of employees state that their skills are well matched with their job requirements. While approximately 45 per cent of employees report some type of mismatch, the vast majority of these have surplus skills (39 per cent). The proportion of employees reporting that their skills are lower than those required by their jobs stand at 6 per cent. This would suggest that, at least in terms of the competency levels of the existing workforces, Europe was not experiencing a major skills deficiency problem at the time of the survey, in 2014. It is possible that the extent of skills deficiencies have changed since the time of the survey. As mentioned earlier, we use the 2014 survey as it is the only survey that contains the relevant questions for our analysis. However, we can look to the 2021 ESJS survey to calculate a related measure of skills deficiencies, namely under-education. A person is deemed to be under-educated if their education level is below that which is required to do their job. In 2021, just 10 percent of employees were classified as under-educated, which suggests that, similar to 2014, there was no major skills deficiency problem in 2021.

Table 4.1: Incidence of Over-skilling, Under-skilling and Matched Employment EU28 2014

How would you best describe your skills in relation to what is required in your job?	N	%
My skills are higher than required ('overskilling')	18,768	38.9
My skills are matched to what is required	26,556	55.1
Some of my skills are lower than what is required ('underskilling')	2,917	6.1
Total	48,241	100

Source: European Skills and Jobs Survey 2014 (authors' calculations)

We next assess the extent of general under-skilling and deficiencies in basic literacy and basic numeracy at a country level (see Table 4.2), using the subsample of employees for which this data is available. The average rate of under-skilling across the EU 28 was 5.8 per cent, which corresponds to the rate of under-skilling using the full sample. The incidence of skills deficiencies in basic numeracy gaps was 2.7 per cent, while for basic literacy it was 1.8 per cent. There is, however, substantial variation across countries. Under-skilling rates vary from 1 per cent of employees in Croatia to over 10 per cent in Estonia, Lithuania and Finland. The lowest rate of basic literacy skill gaps was found in Croatia and Cyprus at 0.3 and 0.5 per cent respectively, with the highest incidences found in Austria and Spain at 3.9 and 3.8 per cent respectively. Basic numeracy skill gaps range from 0.2 per cent of employees in Malta to over 5 per cent in Bulgaria, Cyprus, Austria and Slovenia. Finally, in most countries general under-skilling rates exceed the incidence of both basic literacy and numeracy gaps; Austria and Slovenia are an exception, as the basic numeracy gaps rate exceeds the incidence of general under-skilling.

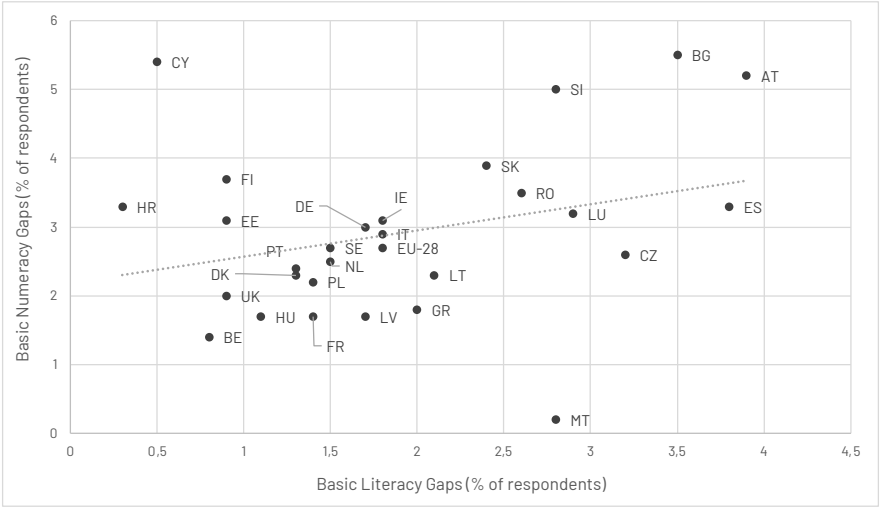
TABLE 4.2: INCIDENCE OF UNDER-SKILLING, BASIC LITERACY SKILL GAPS AND BASIC NUMERACY SKILL GAPS BY COUNTRY

	Under-skilling		Basic Literacy Skills Gaps		Basic Numeracy Skills Gaps	
Country	**%**	**N**	**%**	**N**	**%**	**N**
Austria (AT)	3.0	264	3.9	266	5.2	266
Belgium (BE)	6.2	463	0.8	465	1.4	465
Bulgaria (BG)	6.9	294	3.5	295	5.5	295
Croatia (HR)	1.1	272	0.3	272	3.3	272
Cyprus (CY)	8.5	187	0.5	187	5.4	187
Czechia (CZ)	9.4	466	3.2	468	2.6	468
Denmark (DK)	5.3	393	1.3	395	2.3	395
Estonia (EE)	15.5	438	0.9	440	3.1	440
Finland (FI)	10.4	649	0.9	652	3.7	652
France (FR)	5.0	1246	1.4	1258	1.7	1258
Germany (DE)	3.5	1038	1.7	1043	3.0	1043
Greece (GR)	4.6	735	2.0	738	1.8	738
Hungary (HU)	6.7	434	1.1	434	1.7	434
Ireland (IE)	5.9	329	1.8	329	3.1	329
Italy (IT)	3.8	677	1.8	678	2.9	678
Latvia (LV)	9.7	412	1.7	414	1.7	414
Lithuania (LT)	10.6	417	2.1	418	2.3	418
Luxembourg (LU)	3.3	173	2.9	173	3.2	173
Malta (MT)	5.8	159	2.8	159	0.2	159
Netherlands (NL)	5.0	430	1.5	432	2.5	432
Poland (PL)	6.4	1288	1.4	1292	2.2	1292
Portugal (PT)	3.7	499	1.3	499	2.4	499
Romania (RO)	5.0	422	2.6	423	3.5	423
Slovakia (SK)	6.6	330	2.4	330	3.9	330
Slovenia (SI)	4.1	284	2.8	285	5.0	285
Spain (ES)	3.4	1079	3.8	1082	3.3	1082
Sweden (SE)	6.5	398	1.5	399	2.7	399
United Kingdom (UK)	3.3	1526	0.9	1530	2.0	1530
EU27+UK	**5.8**	15,302	**1.8**	15,356	**2.7**	15,356

Source: European Skills and Jobs Survey 2014 (authors' elaboration).
Note: restricted sample, weights have been applied.

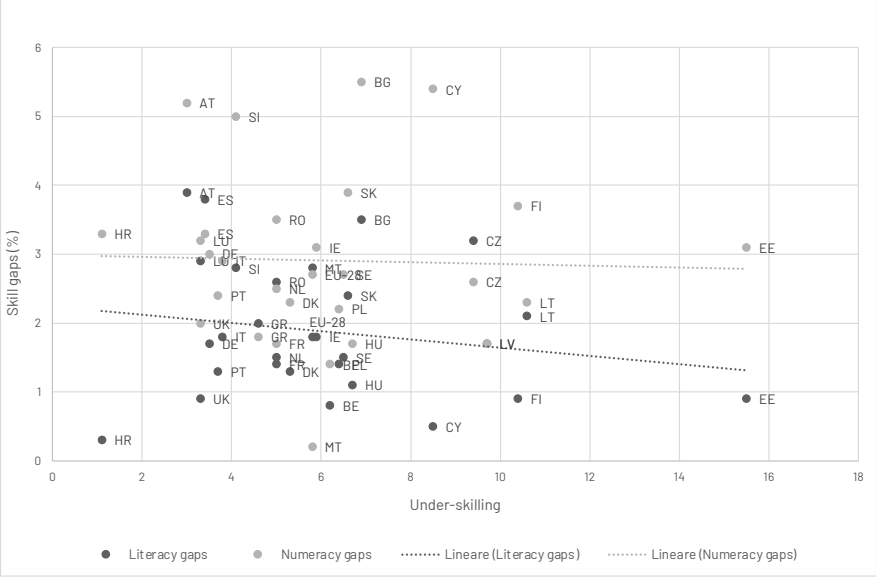
In Figure 4.2 we plot rates of basic literacy skill gaps against numeracy skill gaps at country level, while in Figure 4.3 we plot rates of basic literacy and numeracy skill gaps against general under-skilling rates at country level. It is from Figure 4.2, that there is a positive relationship between basic literacy and basic numeracy skill gaps at a country level. While there is no definitive pattern in terms of country typologies, some Eastern European countries do appear to be somewhat more likely to exhibit relatively high rates of both forms of skill gaps. In Figure 4.3, there is no obvious association between basic numeracy gaps and general under-skilling at a country level, however; while there is a negative association between basic literacy skill gaps and general underskilling, the relation is not statistically significant.

FIGURE 4.2: BASIC LITERACY GAPS AGAINST BASIC NUMERACY GAPS BY COUNTRY



Source: European Skills and Jobs Survey 2014 (authors' elaboration)

Figure 4.3: Under-skilling and Basic Literacy Gaps; Underskilling and Basic Numeracy Gaps



Source: European Skills and Jobs Survey 2014 (authors' elaboration)

Note: blue dots show basic literacy rates against general underskilling rates at country level; orange dots show basic numeracy rates against general underskilling rates at country level.

Multivariate Estimates

In this section, we use ESJS individual level data to model the relationship between general under-skilling and basic literacy and numeracy gaps among employees in the EU27+U.K. Our analysis is based on the following regression,

$$U_{ic} = a + \beta_1 Lit_{ic} + \beta_2 \ Num_{ic} + X_{ic}' \ \beta_3 + \delta_c + e_{ic}$$

Where U_{ic} is a dummy variable that takes value 1 for respondent i in country c who is classified as under-skilled, that is when they state that some of their skills are lower than then level required in their job, zero otherwise; Lit_{ic} is dummy variable that takes value 1 in case the respondent has basic literacy skills gaps, zero otherwise; Num_{ic} is a dummy variable that takes value 1 in case the respondent has basic numeracy skills gaps, zero otherwise; X_{ic}' represents a vector of additional covariates including gender, age, educational attainment, part-time work, temporary contract and previous unemployment status; δ_c are country level fixed effects.[23] As the dependent variable is binary, we implement probit models.

The models are presented in Table 4.3. Given that basic literacy and numeracy gaps are highly correlated, we take a forward stepwise approach beginning with a model containing only background characteristics (specification 1) before estimating specifications within which the basic skill gaps dummies are included separately and then together.

Although there is some weak evidence in specification (1) that having higher educational attainment is associated with a lower probability of under-skilling, it appears that there is no strong relationship between under-skilling and gender, educational attainment, employment characteristics or labour market history. This is in contrast to models of over-skilling in the literature, which tend to be related to factors such as education (see Mavromaras and McGuinness, 2012; Mavromaras et al., 2013) and gender (see McGuinness and Byrne, 2015). We do find that general under-skilling is inversely correlated with age, with older workers having a lower probability of general under-skilling. There is also some weak evidence in specification (1) that having higher educational attainment is associated with a lower probability of under-skilling.

With respect to our measures of skill gaps, we found that having a basic literacy skills gap is associated with a 49 percentage point increase in the probability of general under-skilling (specification 2), while the impact is even stronger for basic numeracy

23 The model standard errors account for clustering at country level.

gaps at 59 percentage points (specification 3). When we estimate a model containing both basic skill gap measures (specification 4), only the basic numeracy skills gap measure shows a statistically significant impact. Taken together, the results in Table 4.3 suggest that basic numeracy skills gaps are the most important factor for under-skilling, increasing the probability of general over-skilling by over 50 per centage points.

Table 4.3: Determinants of General Underskilling, Probit model for EU-27+U.K., 2014

	(1)	(2)	(3)	(4)
VARIABLES	**Being Under-skilled**	**Being Under-skilled**	**Being Under-skilled**	**Being Under-skilled**
Male	-0.04	-0.04	-0.04	-0.04
	(0.037)	(0.037)	(0.037)	(0.037)
Age	-0.01***	-0.01***	-0.01***	-0.01***
	(0.002)	(0.002)	(0.002)	(0.002)
Medium Education	-0.07	-0.06	-0.06	-0.06
	(0.057)	(0.058)	(0.059)	(0.059)
High Education	-0.10*	-0.09	-0.08	-0.08
	(0.056)	(0.058)	(0.057)	(0.058)
Part-time	0.02	0.02	0.01	0.01
	(0.050)	(0.050)	(0.052)	(0.052)
Temporary contract	0.08	0.08	0.07	0.07
	(0.057)	(0.056)	(0.056)	(0.056)
Previous Unemployment	0.06	0.07	0.07	0.07
	(0.046)	(0.045)	(0.047)	(0.046)
Basic Literacy Gap		0.49***		0.18
		(0.127)		(0.172)
Basic Numeacy Gap			0.59***	0.52***
			(0.111)	(0.147)
Observations	15,370	15,370	15,370	15,370

*Source: European Skills and Jobs Survey 2014 (authors' elaboration). Includes country level fixed effects. Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.*
Note: specification (1) estimates a model with only controls; specification (2) estimates a model with controls and basic literacy skills gaps dummy; specification (3) estimates a model with controls and basic numeracy skills gaps dummy; specification (4) estimates a model containing controls and both basic skills gap measures.

In Table 4.4 we present the results of our wage equation models, where log hourly earnings are our dependent variable. Our analysis is based on the following regression,

$$\ln(W)_{ic} = a + \beta_1 U_{ic} + \beta_2 Lit_{ic} + \beta_3 Num_{ic} + X_{ic}' \beta_4 + \delta_c + e_i$$

Where our dependent variable, $\ln(W)_{ic}$, are log hourly earnings for respondent i in country c; U_{ic} is a dummy variable for general under-skilling; Lit_{ic} and Num_{ic} are the basic literacy and basic numeracy skills gaps measures; X_{ic}' represents a vector of additional covariates including gender, age, educational attainment, part-time work, temporary contract and previous unemployment status; δ_c are country level fixed effects.

We ran different specifications, again using a forward stepwise approach, sequentially adding our measures of general under-skilling and numeracy and literacy skill gaps. As expected, our results show that wages are positively correlated with age, educational attainment and being a man, and negatively correlated with temporary employment contracts and previous unemployment. We find a positive impact on wages associated with part-time work, which is unexpected (as a robustness check, we also estimated the model with hours worked, which generated similar results). The models are highly stable across all specifications and consistent with the previous literature (Sanchez-Sanchez and McGuinness, 2015). We find no wage effect associated with the general measure of under-skilling, which is consistent with the previous literature (see McGuinness et. al 2018). While there was no evidence of any wage penalty associated with basic numeracy skills, employees with basic literacy gaps were found to earn approximately 10 per cent less than their counterparts with adequate basic literacy skills. This suggests that while the incidence of basic literacy gaps is relatively low, workers with basic literacy gaps are likely to be associated with lower productivity levels when they are found to be present.

TABLE 4.4: DETERMINANTS OF EARNINGS, OLS MODEL FOR EU-27+U.K., 2014

	(1)	(2)	(3)	(4)	(5)
VARIABLE	Wage_ controls	Wage_Under-skilled	Wage_ BasicLitGaps	Wage_ BasicNum Gaps	Wage_Under-skilled_ BasicGaps
Male	0.13***	0.13***	0.13***	0.13***	0.13***
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
Age	0.03***	0.03***	0.03***	0.03***	0.03***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Age squared	-0.00***	-0.00***	-0.00***	-0.00***	-0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Medium Education	0.12***	0.12***	0.12***	0.12***	0.12***
	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
High Education	0.29***	0.30***	0.29***	0.29***	0.29***
	(0.035)	(0.035)	(0.035)	(0.036)	(0.036)
Part-time	0.07***	0.07***	0.07***	0.07***	0.07***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Temporary contract	-0.14***	-0.14***	-0.14***	-0.14***	-0.14***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Previous Unemployment	-0.14***	-0.14***	-0.14***	-0.14***	-0.14***
	(0.023)	(0.022)	(0.023)	(0.023)	(0.022)
Underskilling		0.01			0.01
		(0.019)			(0.020)
Basic Literacy Gap			-0.11**		-0.09**
			(0.042)		(0.037)
Basic Numeracy Gap				-0.05	-0.01
				(0.037)	(0.036)
Observations	12,869	12,832	12,869	12,869	12,832
R-squared	0.588	0.588	0.588	0.588	0.588

*Source: European Skills and Jobs Survey 2014 (authors' elaboration). Includes country level fixed effect. Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.*

Note: specification (1) estimates a model with only controls; specification (2) estimates a model with controls and general under-skilling dummy; specification (3) estimates a model with controls and basic literacy skills gaps dummy; specification (4) estimates a model with controls and basic numeracy skills gaps dummy; specification (5) estimates a model containing controls, general under-skilling dummy and both basic skills gap measures.

4.4 Summary and Conclusions

This paper seeks to assess the extent to which Europe is facing a skills problem and, specifically, the degree to which existing workers do not have the skills and competencies to perform their current jobs to an adequate standard. Consistent with previous research, we have found that where imbalances exist between the demand for, and supply of, skills in the labour market, these tend to be more likely to manifest as human capital surpluses and rather than deficits. Specifically, 39 per cent of employees reported that their skills and abilities were higher that their existing job requirements, i.e., that they were over-skilled, with just 6 per cent of workers stating that their skills and abilities did not meet current job requirements, i.e., that they were under-skilled. Thus, the existing data would suggest that, at least in terms of the competency levels of the existing workforces, Europe is not experiencing a major skills deficiency problem. That said, the literature on under-skilling is extremely thin and has generally found that the incidence of such mismatches is low and not associated with any wage impacts (McGuinness, et al, 2018). This suggests that productivity impacts and subsequent implications for policy are likely to be relatively minor. Nevertheless, it is clear that the evidence base is not sufficient to dismiss the issue of skill deficiencies in the labour market and while it is clear that general under-skilling is not associated with wage penalties, there is a lack of evidence exploring the incidence and impacts of deficiencies in key competency areas, such as basic literacy and numeracy skills.

Across the EU, the incidence of basic literacy and numeracy gaps are below the incidence of general under-skilling. The EU wide incidence of numeracy gaps in 2014 was 2.7 per cent and basic literacy gaps was 1.8 per cent; however, there is substantial variation in the rates' distribution across countries. Under-skilling rates vary from 1 per cent of employees in Croatia to over 10 per cent in Estonia, Lithuania and Finland. The lowest rate of basic literacy gaps was found in Croatia and Cyprus at 0.3 and 0.5 per cent respectively, with the highest incidences found in Austria and Spain at 3.9 and 3.8 per cent respectively. Basic numeracy gaps range from 0.2 per cent of employees in Malta to over 5 per cent in Bulgaria, Cyprus, Austria and Slovenia. In most countries general under-skilling rates exceed the incidence of both basic literacy and numeracy gaps; Austria and Slovenia are an exception, as the basic numeracy gaps rate exceeds the incidence of general under-skilling.

We find there is a positive relationship between basic literacy and basic numeracy rates at a country level. While there is no definitive pattern in terms of country topologies, Eastern European countries do appear to be somewhat more likely to exhibit relatively high rates of both forms of skill gaps. Finally, there is no strong relationship

between country level rates of general under-skilling and country level incidences of basic literacy and numeracy gaps.

Evidence from our multivariate models find that basic numeracy gaps are a dominant factor determining general under-skilling; basic numeracy skill gaps was found to raise the probability of general under-skilling by over 50 percentage points. Consistent with the previous literature, we find no evidence of any wage effect associated with general under-skilling, but we found that basic literacy gaps are associated with a 10 per cent pay penalty, suggesting that these may be associated with potential productivity costs. From a policy perspective, our research suggests that while there was no evidence of a skills problem in Europe in 2014 in terms of skills deficits among current employees, there are still several issues that need to be addressed by policy. The fact that almost 40 per cent of workers felt that their skills were currently under-utilised in their job should be a huge concern for policy makers due to, potentially, enormous levels of lost productivity. More effort needs to be directed at understanding and developing policies to combat, skill under-utilisation in the labour market. Furthermore, while the incidence of skill gaps are relatively low and much smaller than rates of surplus human capital there is still cause for concern. While there is no evidence that general under-skilling is associated with lower productivity, the finding of a ten 10 per cent lower wage level arising from basic literacy gaps suggests that some forms of under-skilling, linked to specific competency areas, are damaging workers and have potentially negative implications for firm level productivity and, by extensions, general macroeconomic performance levels. Added to this, the continued existence of basic literacy and numeracy gaps among workers, and the fact that relatively high rates of such gaps tend to coexist withing some countries, is worrying.

Finally, from a methodological perspective, the use of a general under-skilling measure within the literature, may be masking the existence of more costly skill gaps that are specific to particular competency areas.

Appendix to Chapter 4

TABLE A4.1: INCIDENCE OF UNDER-SKILLING ACROSS THE FULL SAMPLE AND THE RESTRICTED SAMPLE

	Under-skilling (full sample)		Under-skilling (restricted sample)	
Country	**Mean**	**N**	**Mean**	**N**
Austria (AT)	4.5	982	3.0	264
Belgium (BE)	6.2	1460	6.2	463
Bulgaria (BG)	6.8	988	6.9	294
Croatia (HR)	1.0	996	1.1	272
Cyprus (CY)	6.6	496	8.5	187
Czechia (CZ)	8.5	1487	9.4	466
Denmark (DK)	6.1	986	5.3	393
Estonia (EE)	15.0	983	15.5	438
Finland (FI)	10.3	1988	10.4	649
France (FR)	6.0	3943	5.0	1246
Germany (DE)	4.1	3975	3.5	1038
Greece (GR)	7.0	1989	4.6	735
Hungary (HU)	6.6	1488	6.7	434
Ireland (IE)	7.7	997	5.9	329
Italy (IT)	4.5	2984	3.8	677
Latvia (LV)	10.4	983	9.7	412
Lithuania (LT)	11.6	995	10.6	417
Luxembourg (LU)	2.8	497	3.3	173
Malta (MT)	9.7	495	5.8	159
Netherlands (NL)	5.9	1478	5.0	430
Poland (PL)	6.3	3989	6.4	1288
Portugal (PT)	3.7	1488	3.7	499
Romania (RO)	6.2	1484	5.0	422
Slovakia (SK)	8.2	992	6.6	330
Slovenia (SI)	5.6	990	4.1	284
Spain (ES)	4.6	3923	3.4	1079
Sweden (SE)	7.2	960	6.5	398
United Kingdom (UK)	4.8	3977	3.3	1526
Total	6.2	47,993	5.8	15,302

Source: European Skills and Jobs Survey 2014 (authors' elaboration)
Note: weights have been applied

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CHAPTER 5

Skill shortages in Europe: theoretical considerations and empirical evidence

Dr Ilias Livanos

5.1 Introduction

Skills have recently been set at the heart of the European agenda via several key policies and documents, such as the Skills Agenda and the European Pillar of Social Rights. Even more recently, the emergence of the on-going European Year of Skills aims to address skill gaps and boost the EU skills strategy. According to the Eurobarometer survey , about three quarters of SMEs in Europe say they face skill shortages for at least one job in their company. At the same time almost four in five companies find it difficult to find workers with the right skills and about half of them find it difficult to retain skilled workers. Meanwhile, the digital and green transitions raise the bar in terms of skills required and pose questions about whether Europe will possess the skills in terms of both quality and quantity to fully deploy and implement them.

The concept of skill shortages is often understood in different ways and the literature provides a wide range of alternative definitions such as labour shortages, skill gaps, labour market imbalances, hiring difficulties etc. However, even these refer to different concepts they all come down to one main issue: the discrepancy between the skills (however these are defined) required by the economy, the firm, or the specific job and those possessed in the labour market and by workers. In theory, skill shortages are straightforward to measure and solve. In practice, however, things become much more complicated to the extent that one could argue that their existence is less of an economic phenomenon and more of a socio-economic construct. The present chapter deals with the issue of skills shortages in both theory and practice. The first part (sections 2 and 3) presents the key concepts and theories about the existence of skills shortages and the reasons that may facilitate their persistence, even at times of high unemployment. The second part (section 4) takes a more practical stance, outlining the key aspects when trying to measure skill shortages. The third part (section 5) uses data from Cedefop Skills forecast to measure skill shortages in practice.

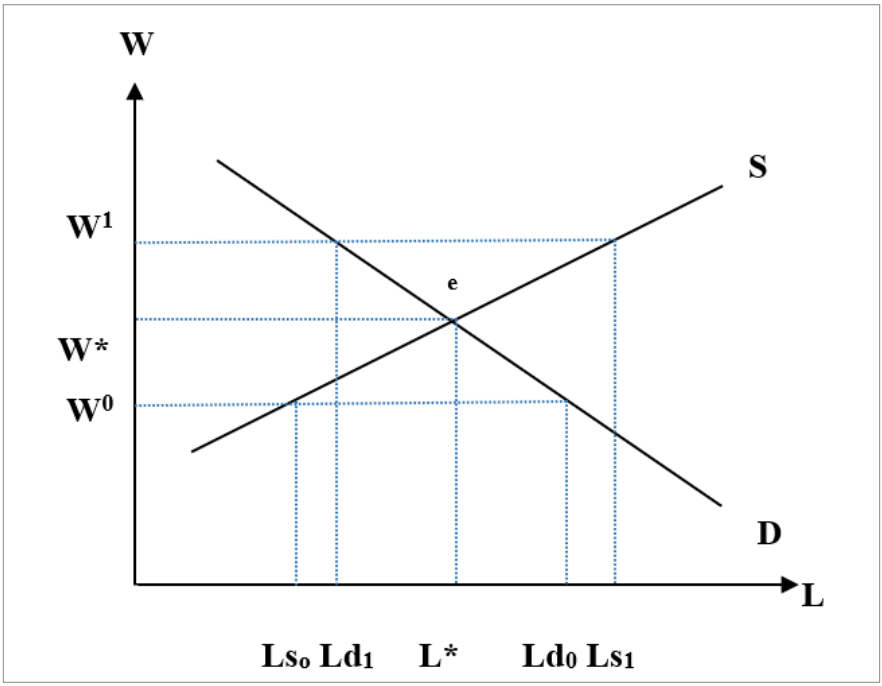
5.2 The Economics of Skill Shortages

According to neo-classical economic theory, the labour market can rely on wages as a clearing device and therefore shortages will not persist for long. If there is a shortage for a specific type of skill, then its associated wage will be increased and, therefore, supply will increase until equilibrium is achieved. So, in theory it is all straightforward. This section presents some key theories on skill shortages before moving on to what actually happens in practice.

A static shortage

The existence of a skill shortage can be easily determined in a traditional and partial equilibrium framework. According to a simple static model, a shortage exists when, for a given skill in each region, demand exceeds supply. Figure 5.1 shows the demand and supply curves for labour services in a particular market. The demand curve, D, indicates the amount of labour services that firms are willing to hire at a given wage rate, w. The supply side, S, shows the amount of labour services that individuals are willing to supply at the given wage rate, w. The wage W* is the market clearing wage at which both supply and demand are willing to exchange L* amount of services (this is illustrated by the equilibrium point **e**, at which the supply and demand curves intersect). If for any reason the wage was higher or lower than that point, the market would not be in equilibrium and either sellers or buyers would not be satisfied. For example, at wage level, w^1, a surplus, $L_s > L_d$, would be created whereas for a wage level, w^0, a shortage, $L_d > L_s$. The level of the shortage is traditionally measured in terms of some absolute difference, $L_{d0} - L_{s0.}$ In the case of a shortage, traditional economic theory suggests that the firms will raise the level of the wage, and this will both increase the supply and decrease the demand, thus helping the market to reach the equilibrium level (L*, W*) over time.

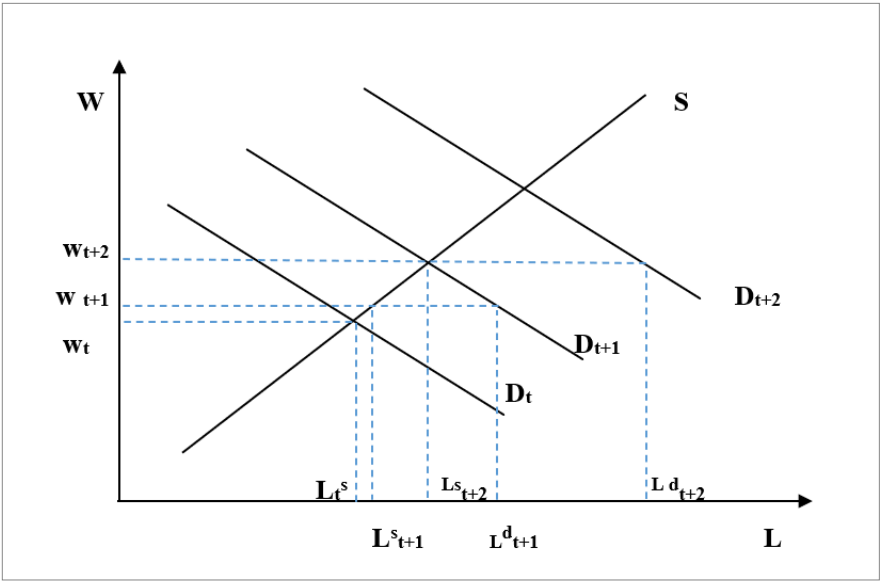
Figure 5.1: A Static Shortage



A dynamic shortage

The concept of a dynamic shortage was introduced by Arrow and Capron (1959). It consists of an extension of the shortage concept outlined above. They took into consideration the importance of the behaviour of wages and focused on the pace of change in demand. Therefore, a dynamic shortage occurs when demand grows faster than the supply. This mismatch between demand and supply can be caused by a persistent rise in demand for a particular occupation or a low elasticity of supply to wage changes and a slow reaction of the market. In the case of the latter, the market reacts slowly to the mismatch between demand and supply and therefore the wage, which acts as a clearing device in the market, requires some time before supply equals demand. A dynamic shortage is presented in Figure 5.2 The demand curve is shifting, $D_t \rightarrow D_{t+1} \rightarrow D_{t+2}$ over time and as a result a growing shortage from $0 \rightarrow (L^d_{t+1} - L^s_{t+1}) \rightarrow (L^d_{t+2} - L^s_{t+2})$, occurs, even though the level of the wage adjusts in the correct direction ($w_t \rightarrow w_{t+1} \rightarrow w_{t+2}$). So, this theory introduces a simple reasoning of why certain shortages may exist even though the supply is responsive to increases in demand.

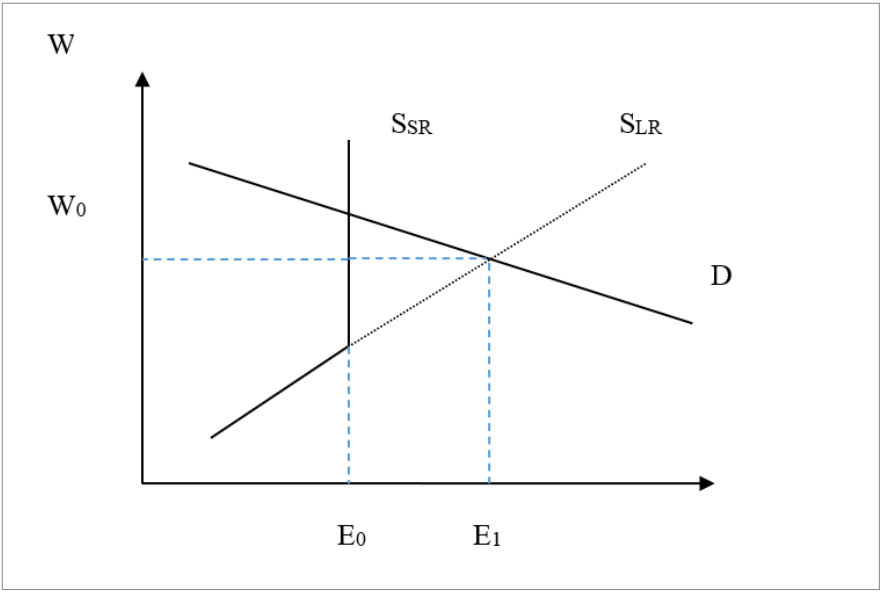
FIGURE 5.2: A DYNAMIC SHORTAGE



2.3 Short and long-term supply of highly qualified labour

Even though in theory the supply may be responsive, when it comes to practice it takes some time to adjust depending on the period required to educate or train labour. In fact, there can be a distinction between the short- and long-term supply curves of highly qualified labour. The short-term supply can become inelastic, as shown by the vertical line S_{SR} in Figure 5.3, due to the impossibility of increasing the supply of relevant skills or qualifications in the short-term. The shortage here refers to the imbalance between demand, D, and short-term supply, S_{SR}. In Figure 3 a shortage is illustrated by the difference E1-E0 at the wage W_0. So, what the above provides is another view on why shortages are difficult to clear in the short run despite the responsiveness of the key actors involved through increasing wages and augmenting supply.

FIGURE 5.3: SHORT AND LONG-TERM SUPPLY



5.3: Imperfections, institutions, and other reasons behind skill shortages

The previous section has presented how economic theory understands skill shortages within a market where wages act as the clearing devise, eventually bringing about an equilibrium where demand for skills meets the supply. However, there are various reasons and theories suggesting why this may not work in practice and skill shortages are still likely to exist. This section presents a review of the most common reasons encountered in the literature.

The Beveridge curve

Shortages, as we have seen in the previous section, can exist in a labour market because of a mismatch between demand and supply. At the same time, in a simple labour market model it is assumed that there will be a wage W_* for which demand will equal supply. This model, however, of the labour market can be rather unrealistic as certain

frictions and imperfections exist. Both unfilled vacancies and unemployed people will co-exist during the searching period. For instance, the unfilled vacancies could exist due to imperfect information and inefficiencies of the matching process. The relationship between unfilled vacancy rates and unemployment is expressed by the Beveridge curve (Beveridge 1948).

FIGURE 5.4: THE BEVERIDGE CURVE

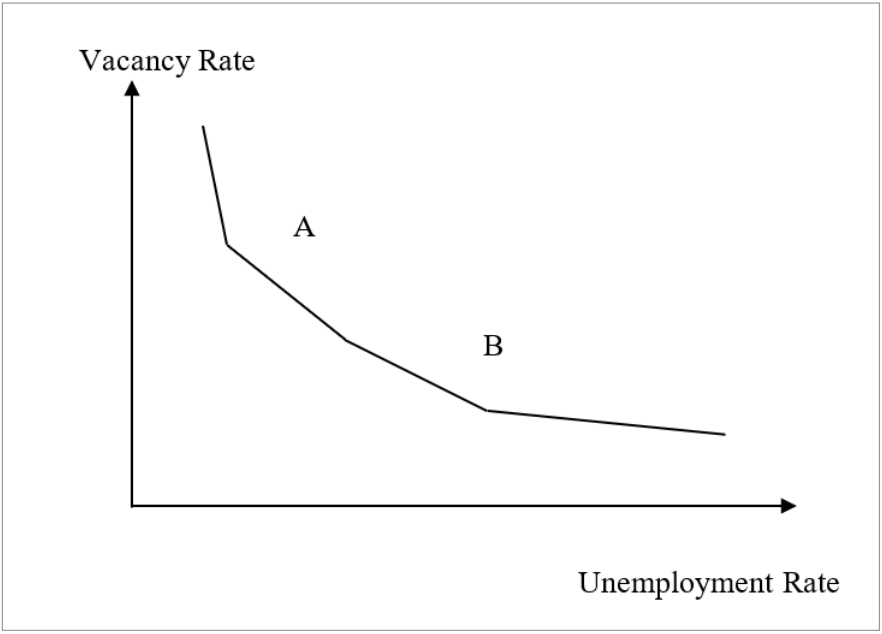


Figure 5.4 plots a Beveridge curve for a country over a period. As can be seen at any point on the Beveridge there is a pattern of vacancies (job) openings and people being temporary unemployed. In general, the further the curve is from the coordinates, the poorer is the matching process in the country. In other words, for several reasons associated with inefficiencies, people find jobs at a slower pace, thus vacancies are filled less efficiently, and people stay unemployed for a longer period. The following sections, delve into the various reasons that wages are often not acting as clearing devises, thus allowing shortages to prevail.

Efficiency wage theory

A prominent explanation about why the market may not clear is provided by the efficiency wages theory (Yellen 1984). According to it, it is optimal for the firm to pay its workers a wage higher than the market clearing wage ($W>W_*$) to ensure increased productivity. In other words, higher pay works as an incentive for the workers to work harder. At the same time, there are unemployed people willing to work for less than the prevailing wage but firms do not offer any jobs on the grounds that it may result in reduced productivity. On the other hand, the firms may as well decide not to offer a market clearing wage (i.e., a higher wage for shortage occupations) because a selective increase in wages may be inefficient in the sense that will increase the wage gap across occupations and reduce the productivity of workers in other occupations. Two other theories which support the argument that the wage level may not act as a market clearing mechanism are the seniority wage profiles theory (Lazear 1981) and the implicit wage contracts theory (Azariadis 1975). According to the first, firms, to ensure maximum effort from their workers, who have little experience, reward them less than their marginal output but pay them more in the future. As for the second, employees in exchange for wage stability and stability of employment accept a markdown on the wage. The above examples serve to suggest why the wage may not work as a clearing device and that skill imbalances may persist for a long time.

Insider-outsider theory

Another reason, less linked to economics and more to industrial relations, comes from the insider-outsider theory (Lindbeck and Snower 1988, 2001) suggesting that firms may have incentives not to pay outsiders more than their own employees to attract workers in short supply. And this is because firms may have to increase the wages of the insiders as well and this may not be of their interest. At the same time, firms are keener to focus on the professional development of insiders and maintain a certain level of talent that employ newcomers. At the same time, insiders are more concerned with their own working conditions and may oppose to an increase of the wages of new recruits. In addition, job seekers (outsiders) may not wish to offer their labour at a lower level, when a surplus exists, as this may lead to lower wage for all the workers in that job category. Therefore, they may prefer to remain unemployed but receive a higher wage when they get employed. All the above serve to suggest that key actors even though acknowledge the existence of shortages or surpluses have their own reasons not to adopt wages as a clearing devise.

Institutional constraints

Franke and Sobel (1970) shift the focus away from wages and suggest that such changes do not play a significant role and therefore should not be seen as a 'unitary instrument', for dealing with shortages. They define a shortage as '*a situation existing over an extended period of time in which employers were unable to hire at going wages or salaries sufficient numbers of qualified persons to fill positions for which there were budgeted funds and for which personnel were required to meet existing demand for services*' (1970, p.7). They argue that the slow adaptation of wages and supply is due to institutional constraints. Institutions (such as educational institutions, trade unions, employers' associations) could be inefficient and slow in ameliorating the shortages when markets put pressures on them to do so (ibid: p. 298). An important aspect is the function of collective bargaining agreements. Frequent bargaining over the wage level slows down the market response and therefore does not make it possible for the wages to adjust quickly and avoid labour market imbalances. In addition, the fact that collective bargaining agreements and pay settlements are centralised, may not make it possible to consider sectoral changes and this restricts mobility between sectors.

Loss in HR capabilities

Another possible explanation justifying the existence of skill shortages looks at the operations of the firm level and suggest that it could simply be the fact that HR competencies in attracting and maintain skilled labour are not efficient enough. This problem is compounded by organisational choices, such as the downsizing of HR departments, that have diminished the organisational ability to deal with all personnel issues, including recruitment. Companies have chosen to allocate an increasing amount of HR functions to external contractors, through outsourcing (Cappelli 2023). The HR workforce may also have suffered because HR tasks have been delegated to Line managers (Szierbowski-Seibel and Kabst 2018) on top of the tasks they already have. This shift of responsibilities may not be accompanied by an increase in the number of line managers and their performance is influenced by the amount of support they receive (Op de Beeck, Wynen et al. 2016). In addition, line managers implement HR practices based on their common sense opinion (Gollan, Kalfa et al. 2015) and not on best practices. Therefore, the ability of company to recruit is further hampered by the number of actors involved and their different roles. The hiring manager, HR professionals, and recruiters (Cappelli 2023). These roles puts different and often conflicting demands on the various role holders, which then have to spend energy and resources to maintain an healthy interaction with the other job role holders in the recruitment process (Gershon 2017).

Labour mobility

Finally, the adjustment process in the labour market can be affected by the existence of other economic and non-economic factors (Gallaway, 1963; Zaidi, 1969). Such factors could be the high costs of reallocation and training, or restrictions on immigration and emigration. Also, mobility may slow if workers do not have adequate information about the employment situation in their respective sectors. Other institutional factors that delay the market adjustment time could be limited capacity of enrolment in training institutions or requirements such as licensing and certification. Additionally, inadequate labour market intelligence may hinder worker's/ job seekers awareness of the opportunities available, or employers may not be sufficiently aware of the going rates for the jobs.

5.4 Definitions, Measurements, and Methods

The previous section outlined the most prominent theoretical aspects of skill shortages and discussed how various factors facilitate their existence. The purpose of the present section is to provide an overview of the concept of skill shortages and how these are measured in practice. In addition, it aims to discuss the various data and techniques used to produce measures and indicators of skill imbalances.

Definitions

In the literature there exist many definitions and different types of skill shortages, but there is not a universally accepted one. On the contrary, various typologies of skill shortages exist. OECD argues that "there is no universally applied definition of labour shortages" (2003, p.105). In addition, Green et al. (1998) suggest that 'we cannot rely on them (i.e. skill shortages) being perceived in a uniform and consistent way by all employers' (p.183). A result of the above is that the concept of a skill shortage can be rather confusing. In economics one of the most long-standing definitions of a skill shortage is the one of Arrow and Capron (1959). They suggest that a skill shortage is "*a situation where there are unfilled vacancies in positions where salaries are the same as those being paid currently to others of the same type and quality*" (1959, p. 307). Skill is often defined as the ability of an employee to perform a given task. Nevertheless, an employer may suggest that a skill shortage exists when he/she cannot find an employee that meets the expected standards even though a pool of available workers who are willing to take the position may exist (Bosworth et al. 1992). In addition, there

are a range of behavioural attributes that the employers may perceive as a skill, such as working without supervision, reliability etc. (Oliver and Turton 1982, Bosworth et al. 1992). Therefore, some academics make a distinction between **skills shortages** and **skill deficiencies**. **Recruitment difficulties** are typically defined as 'when there are not enough people available with the skills needed to do the jobs which need to be done' (Training Agency 1990:29). In other words, recruitment difficulties are an external problem for the companies as they are due to the lack of applicants with the required experience, qualifications, or skills. The Employers Skill Surveys (ESS) uses two definitions of skills deficiencies: **skill shortages vacancies**, and **skill gaps**. The first refers to recruiting difficulties caused by the insufficient number of individuals with the required skills, and the second to deficiencies in the existing employed workforce' skills. **Skill deficiencies** therefore also include **internal skill gaps** (Hogarth and Wilson 2001). According to Green and Ashton (1992) skill gaps are defined as 'the difference between current and some suitably defined optimum level of skills (ibid p: 288). Therefore, an **internal skill gap** relates to a company's current employees not having the required skills. In addition, a third common type of skills deficiency is **latent skill gaps**, which refer to some ideal or optimum performance or behaviour. **Latent skill gaps** may not be reported or recognised by the employers as they may not be aware of the skills needed to maximize their companies' performance (Hogarth and Wilson 2001).

Measurements

In practice, measuring skill shortages is not an easy task. In fact, it is a 'notoriously difficult' task (Bosworth 1993:242) for which there is no one "best way" to do it. The quotations below are indicative of the above statement: "labour shortages are not easy to measure" (OECD 2003:103) "no single empirical measure of occupational shortages exists, nor does it appear that one can easily be developed" (US Bureau of Labor Statistics1999:17). Therefore, there have been various methods adopting different methodologies which are summarised below.

Methods

Employers Surveys: these are surveys in which employers' opinions are asked on subjects relevant to skill shortages such as occupations in which they experience or expect to experience a shortage in the future, occupations that are "hard to fill" when they make an advertisement, coupled with their views on the reasons for this.

An example of such surveys come from the UK where the Employer Skills Survey[24], a large-scale telephone survey, runs every few years, providing information on the skills challenges faced by employers.

Job vacancy data. Such data job refer to the listings of job openings or to the employers' vacancies registrations. Typically, an increase in the length of the time that it takes until a vacancy is filled can be used as an indication of a shortage. Job vacancy data, including data from online vacancies, provide information on the level and structure of demand from labour and could signal potential mismatches between demand and supply. In Europe, such data are collected in most countries and are streamlined by Eurostat[25].

Forecasts of demand: These are forecasts of the future demand for the various occupational categories. These forecasts, or employment projections, are usually conducted by research centres such as the Institute for Employment Research (IER) in the UK. At European level, Cedefop has been running its Skills Forecast since 2005.[26] Their aim is to provide information on the changing pattern of demand for skills and assist governments on designing their educational policy. The employment forecasts do not indicate a shortage, *per se*, but provide an overall picture of the future demand landscape. However, an expected dramatic growth of future employment for an occupational category, when there is no evidence that the supply is also growing, could be perceived as an indication of a future shortage. Demand forecasts provide a useful insight to the future demand for skills; however, they should interact with the supply side in order to be able to provide a clear picture of the needs of the future.

Trends in other indicators: These include various measures indicating the possible existence of skill imbalances which are based on recent historical data such as data on employment, unemployment and wages of different skilled groups, which are usually supplemented by educational attainment and occupational categories. Such data, generally provided by Labour Force Surveys, have been suggested to provide a useful picture of skill imbalances. For example, an indication of a potential shortage might be a growing level of employment, a declining rate of unemployment or an increase in the relative earnings for an occupational group. However, these trends provide

24 *For further information, see:* https://explore-education-statistics.service.gov.uk/find-statistics/employer-skills-survey

25 *Available at the following link:* https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Job_vacancy_statistics#Job_vacancies:_online_job_advertisements

26 *For further information, see:* https://www.cedefop.europa.eu/en/tools/skills-forecast

only an indication about the overall trends in the labour market and cannot provide robust measurements of skill shortages or surpluses.

5.5 Measuring future shortages in Europe.

Identifying future skill needs is indeed a very difficult task and any estimations are subject to large margins of error as the future remains unknown. Adopting a conservative approach entail using information about the evolution of European labour markets already at hand, given the current state of play and a baseline scenario. Cedefop has been producing projections of demand for and supply of skills and jobs for almost twenty years now. This information enables the identification of future skill needs and potential labour shortages.

The focus of this paper is on labour shortages defined as hiring difficulties at the level of occupational groups. To make estimates of future labour shortages, key indicators from Cedefop Skills forecast have been utilised. The Skills forecast is a unique database created by Cedefop, providing projections of future demand in terms of employment, across sectors, occupations for all Member States. A single methodology and harmonised datasets are employed for its estimation. The latest version of the Skills forecast was launched in 2023 and is looking into the period up to 2035. The projections draw on a set of key assumptions about future socio-economic developments in Europe.

Methodology

Three pillars of information have been used. The first is **expansion demand** and the level of change of future occupational employment. Increases in the level of employment for a given occupation could be linked to various reasons, such as trends in sectoral employment, the cycle of the economy or shifts in the occupational structure. Nevertheless, a strong positive change of total demand for a certain occupation can be perceived as an indication of future shortage. Of course, whether the shortage will appear is also a matter of whether the future supply will be available to meet the demand, which in turn relies on factors such as the responsiveness of the wage mechanism, the availability of education and training to cover future demand, and the ease of labour mobility. The second pillar relates to **replacement needs** and looks at demands that will occur due to the workforce exiting the occupation due to various reasons, including retirement, career changes, health, or other. Replacement demands,

generally, create more job opportunities than expansion, meaning that significant job opportunities arise even in occupations where employment levels are in decline. For instance, agricultural workers are a typical example, as ageing workers employed in the sector will need to be replaced. As in the case of expansion demand, the outcome will depend on other factors as companies and organisations may decide not to replace retiring workers due to budget reasons, or even may be substituting labour with technology including AI. The replacement demand rates vary across occupations, as for instance some occupations may be ageing faster than others or have higher turnovers. Therefore, strong replacement rates could signal that a particular occupational group may face labour shortages in the future. The third pillar looks at **labour market imbalances** and captures the share of occupational employment that is likely to encounter difficulties of finding workforce with the right level of education. These difficulties could come at any level of education, as in one occupation there may not be enough highly educated individuals to cover the needs, while in others highly educated individuals may take over jobs requiring lower levels of education. In the first case (not enough workers with the required level of education) firms will have to employ individuals with lower levels of education and this could have a negative impact (e.g., lower productivity, elevated stress levels of these workers etc.). In the second case (more workers with the right level of education than needed), firms could experience some positive impacts (e.g., increased productivity) but there could also be negative ones (e.g., low job satisfaction, high turnover etc.). Nevertheless, even though this measurement does not reveal where the imbalance is coming from, it provides a good indication of possible skill imbalances and taking it into account allows understanding of which occupations may face difficulties in the future so preventive measures can take place now. For constructing the future skills shortage indicator, the three measurements[27] produced by Cedefop Skills forecast have been transformed into indicators measuring the shortage from a scale 1 to 4 where 1 indicates a weak or no shortage and 4 indicates the presence of a strong shortage.[28] The overall future skills shortage indicator is then constructed by an arithmetic average assuming equal weights. The indicator have been elaborated for each level of skill separately, grouping occupations into the following: high-skilled non-manual, skilled non-manual, skilled manual and elementary occupations.

27 These are: a) 2021-2035 per annum percentage net occupational employment change, 2) 2021-2035 per annum occupational replacement change, and c) percentage of occupational employment in 2035 likely to encounter education imbalances.

28 To elaborate, 4 (1) is indicated where e.g., the net employment growth for an occupation is a standard deviation above (below) the average while 2 (3) is indicated where the growth is between the standard deviation above (below) the average and the average itself. In a similar manner, similar indicators have been constructed for all three areas.

Skill shortages to 2035

The results of this analysis are presented in Table 5.1 below. Starting with the highly skilled non-manual occupations, the first observation to be made is that expansion demand is most likely to create shortages for such occupations and this can be explained by the general trend of skills intensive employment, possibly also an outcome of the twin transitions. For instance, science and engineering, business, information and communications and legal professions are those with the strongest expansion, thus a shortage is likely to appear for these in the future. Pressures, however, will also come from the replacement demand side, which will be stronger for chief executives and health professionals, both of which entail certain levels of education and specialisation and, therefore, their replacements will need to be carefully designed. In other words, replacing health professionals may not be that straightforward, due to reasons such as the infrastructure needed, the costs involved, the length of studies, etc. Similar, for chief executives whose experience and skillset is not explicitly linked to specific education obtained. On the other hand, for such high-skilled occupations the shortage seems to be coming less from the side of imbalances and overall future supply seems to be ready to meet the demand. This is a positive message about the future of Europe. The field of study could play a crucial role here, as this analysis does not allow for this aspect and even though high skills would be available it may as well be the case that there could a mismatch between fields studied and those required. Looking at the overall future shortage indicator, the pressures will be strongest for legal, social cultural and related associate professionals, and science and engineering professionals which both are expected to expand in employment but also will express high replacement needs. Other occupational groups with a future shortage index score include production and specialised services managers and business and administration associate professionals.

The second block looks at skilled non-manual occupations. For this group it is observed that no strong shortages are coming from either expansion or replacement demands, except for customer clerk services and personal care workers respectively. In certain cases, a strong shortage comes from possible future imbalances. This is the case for sales workers and personal care workers, which needs to be attended as the skills set needed for carrying out the activities of such occupations may not be easily substituted by higher educated individuals whose background is often more academic. Social and personal skills are typically needed for such occupations, which makes this group a difficult to fill one. Another important aspect that needs to be attended is that of working conditions. In certain cases, such as care workers, is often reported that that employees have to deal with unfavourable working conditions (e.g., low pay,

late hours of work, etc.) which makes both attracting and retaining such workforce a difficult task for employers despite the fact that workers with such skills may be available in the labour market.
On the other hand, numerical and material recording clerks consist of the occupational group where the shortage will be the weakest. Such a group is a good example of occupations that can be replaced by technology and from the fact that employment is becoming more digital so their tasks can be taken up by employees with a different specialisation.

The third block below looks at skilled manual occupations. As can be seen, the shortage for most of these occupations will be coming from future needs to replace existing workers and to an extent from imbalances. As in the case described before, such occupations require certain specialisation and knowledge that cannot always be acquired through different levels of education and they often require specialised hands-on experience. However, the moderate shortages coming from expansion will not create strong shortages except for building and related trades workers, and drivers and mobile plant operators.

The fourth and final block of this section looks at elementary occupations, some of which are expected to grow as an outcome of the overall growth of employment and the fact that they are mainly supporting the activities of the various economic sectors. In this group of occupations, cleaners and helpers will demonstrate the strongest shortage due to the very strong replacement needs and the fact that it is likely that such posts may be filled by workers with higher levels of education, which may create a vicious cycle for such group as higher educated workers having to accept low wages may lead to high turnover so replacement needs may be further intensified in the future.

TABLE 5.1: FUTURE SKILL SHORTAGES TO 2035

Cedefop Skills Forecast 2023	Individual indicators			Future Shortage indicator
	Demand	Supply	Imbalance	
	Expansion	Replacement		
High-skilled non-manual occupations				
11. Chief executives, senior officials and legislators	2	4	2	2.7
12. Administrative and commercial managers	2	2	2	2.0
13. Production and specialised services managers	2	3	3	2.7
14. Hospitality, retail and other services managers	1	3	4	2.7
21. Science and engineering professionals	4	3	2	3.0
22. Health professionals	3	4	1	2.7
23. Teaching professionals	3	3	2	2.7
24. Business and administration professionals	4	2	2	2.7
25. Information and communications technology professionals	4	1	2	2.3
26. Legal, social and cultural professionals	3	3	2	2.7
31. Science and engineering associate professionals	2	2	3	2.3
32. Health associate professionals	2	2	3	2.3
33. Business and administration associate professionals	2	3	3	2.7
34. legal, social, cultural and related associate professionals	4	3	3	3.3
35. Information and communications technicians	2	1	3	2.0

Source: author's estimations based on Cedefop 2023 Skills Forecast

TABLE 5.1 (CONTINUED): FUTURE SKILL SHORTAGES TO 2035

Cedefop Skills Forecast 2023	Individual indicators			Future Shortage indicator
	Demand	Supply	Imbalance	
	Expansion	Replacement		
Skilled non-manual occupations				
41. General and keyboard clerks	2	3	1	2.0
42. Customer services clerks	4	3	1	2.7
43. Numerical and material recording clerks	1	2	2	1.7
44. Other clerical support workers	1	1	2	1.3
51. Personal service workers	3	3	4	3.3
52. Sales workers	2	2	4	2.7
53. Personal care workers	3	4	2	3.0
54. Protective service workers	2	3	2	2.3

Source: author's estimations based on Cedefop 2023 Skills Forecast

Cedefop Skills Forecast 2023	Individual indicators			Future Shortage indicator
	Demand	Supply	Imbalance	
	Expansion	Replacement		
Skilled manual occupations				
61. Market-oriented skilled agricultural workers	1	4	3	2.7
62. Market-oriented skilled forestry, fishery and hunting workers	2	3	3	2.7
63. Subsistence farmers, fishers, hunters and gatherers	1	1	4	2.0
71. building and related trades workers, excluding electricians	3	3	3	3.0
72. Metal, machinery and related trades workers	3	3	2	2.7
73. handicraft and printing workers	2	3	2	2.3
74. Electrical and electronic trades workers	3	3	1	2.3
75. Food processing, wood working, garment and other craft traders	2	2	3	2.3
81. Stationary plant and machine operators	3	2	2	2.3
82. Assemblers	4	2	2	2.7
83. Drivers and mobile plant operators	3	4	2	3.0

Source: author's estimations based on Cedefop 2023 Skills Forecast

Cedefop Skills Forecast 2023	Individual indicators			Future Shortage indicator
	Demand	Supply	Imbalance	
	Expansion	Replacement		
Elementary occupations				
91. Cleaners and helpers	2	4	2	2.7
92. Agricultural, forestry and fishery labourers	2	1	4	2.3
93. Labourers in mining, construction, manufacturing and transport	3	2	1	2.0
94. Food preparation assistants	4	2	2	2.7
95. Street and related sales and service workers	2	3	4	3.0
96. Refuse workers and other elementary workers	3	3	2	2.7

Source: author's estimations based on Cedefop 2023 Skills Forecast

5.6 Conclusions

This chapter has addressed various theoretical and empirical considerations about skill shortages, regarding both their existence and measurement in practice. Even though a universally accepted definition does not exist, and various concepts are used interchangeably, it all comes down to failures of available supply to meet the demand. In theory, such failures could be overcome by using wages as a clearing devise. However, there are various reasons why this does not work in practice allowing their existence even in periods of high unemployment. Labour market and institutional inefficiencies and the behaviour of the various actors involved are among the key reasons. On top of that, working conditions and issues related to labour mobility could augment their prevalence. Data from the 2023 Cedefop Skills forecast have been used to estimate an indicator of Future shortages for Europe. Three key aspects have been looked at, namely expansion demand, replacement needs, and difficulties in hiring. Various interesting insights come out from this analysis calling for policy action. Such information can improve skills anticipation by feeding into education and training policies, but also policies outside the skills agenda such as migration, aiming to improve mobility and reduce future shortages.

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CHAPTER 6

What is a green job or a green skill? Reflections on measures to assess the impact of the green transition on human capital development

Terence Hogarth and Līga Baltina

6.1 Introduction

Green initiatives, however defined, are gaining momentum across the world. In 2022, the Inflation Reduction Act, 2022 (IRA) committed the USA to $500 billion in new spending and tax breaks to boost clean energy, reduce healthcare costs, and increase tax revenues. Similarly, under the auspices of the European Green Deal (EGD), the EU announced that will spend €600 billion between 2021 and 2027 on measures to reduce climate change and environmental degradation to achieve net zero emissions of greenhouse gases by 2050. State interventions to improve the environment are not new, with countries across North America and Europe, amongst others, having introduced a range of measures over many years to prevent damage to the biosphere (Cedefop, 2019). But the pace of change at the beginning of the 2020s has picked up as policy makers look to temper the increasingly manifest impacts of climate change. July 2023, for example, recorded the highest average daily temperatures in Europe since records commenced, the implication of which is that the earth may well exceed the 2015 Paris Agreement's commitment to limit the rise in global temperatures to 1.5°C by the end of the century (UNEP, 2021).

Measures to reduce greenhouse emissions are multifarious. Some are concerned with the production and consumption of energy (e.g., the shift to renewables and an increased focus on energy efficiency). Others are concerned with industrial production processes that will reduce overall levels of pollution and waste. Still, more focus is on the built environment, such as retrofitting buildings and the move towards creating smarter, greener urban environments. More broadly still there is an ambition to create

a more circular economy which looks to repair, reuse and repurpose existing goods rather than produce new ones. Changes in production processes and consumption patterns ultimately have an impact on jobs hence the policy maker's focus on green jobs and green skills if only to ensure that skill shortages do not act as a drag on the green transition (OECD, 2023). The need to develop those skills which will facilitate the green transition is writ large into policy statements such as the EGD. If those skills and capabilities can be developed, then there is the potential to boost employment creation or at least result in no net loss of employment as a result of implementing green policies of various kinds (European Commission, 2021).

Given the increasing focus on green jobs and green skills, it is timely to review what is meant by them. Reference is commonly made to each in the policy discourse without ever specifying what they might be. To help remedy this state of affairs, a review is provided of how green jobs and green skills have been defined and classified over recent years to reveal some of cul-de-sacs and false starts but ultimately show how a multi-faceted approaches to identifying and anticipating green skills, rather than green jobs, might just about provide the information that policy makers require, especially those responsible for developing green or greenish education and training programmes.

6.2 Concepts and definitions

There are various definitions of green jobs or occupations in circulation. The United Nations Environment programme describes green jobs as: **"positions in agriculture, manufacturing, R&D, administrative, and service activities aimed at substantially preserving or restoring environmental quality" (UNEP, 2011).** In other words, "environmental jobs are those aimed at protecting and promoting the environment, or those which consider their impact on the health of the planet at all times and endeavour to minimise it." The ILO takes a more expansive approach defining green jobs as ones that: (i) improve energy and raw materials efficiency; (ii) limit greenhouse gas emissions; (iii) minimise waste and pollution; (iv) protect and restore ecosystems; and / or (v) support adaptation to the effects of climate change (ILO, 2011; ILO, 2016). In doing so, it makes a distinction between outputs and processes. There are jobs which are involved in producing goods and services that benefit the environment (the example of green buildings or clean transportation are provided); and there are jobs in enterprises where the outputs are not necessarily green ones, but which are concerned with processes which, for example, reduce energy and water consumption or improve recycling within the enterprise.

The interest in green jobs is driven for the most part by the desire to gain an indication of the scale of green skill demand. By obtaining an insight into the occupational characteristics of green jobs, an insight is provided into the tasks undertaken by their incumbents and, from there, the skills required to complete those tasks. Occupation, however, is a blunt measure of skill, especially where occupational data are presented at a high level of aggregation or where occupational classifications are somewhat dated in their specification of skills. Accordingly, there have been attempts to define, *a priori*, what might constitute a green skill. Just as with the definitions of green jobs or green occupations, the concept of a green skill tends to be described in general terms. UNIDO, for example, defines green skills with respect to: "the knowledge, abilities, values and attitudes needed to live in, develop and support a sustainable and resource-efficient society." (UNIDO, 2022). Cedefop's definition is similarly extensive: "the knowledge, abilities, values and attitudes needed to live in, develop and support a sustainable and resource-efficient society" (Cedefop, 2012. See also Cedefop, 2011). Cedefop also notes that what constitutes a green job is subject to change as the green transition progresses. In the definition used by the European Training Foundation (ETF) a distinction is made between: "(i) technical knowledge and skills that enable professionals to effectively use green technologies and processes (i.e., resource, efficient technologies or processes that reduce waste and minimise the environmental impact of human action); and (ii) transversal skills, as well as knowledge, values and attitudes that help them take pro-environmental decisions in their work and lives (ETF, 2022a).

The advantage of focussing on green skills is that it allows for the possibility that all jobs to some extent might require their incumbents to possess green skills, especially so as the green transition gathers pace. Green skills begin to highlight the specific skills which will be needed to accommodate measures designed to mitigate or reverse the consequences of climate change.

The brief tour d'horizon provided above suggests that green jobs and green skills, to date, have been defined in rather general terms. The definitions and associated classifications are useful, important even, in shaping thinking about the impact of the green transition on employment and the skills people will need to acquire. They provide a basis for collecting more detailed information especially about skills. How the definitions and concepts might be refined further to provide more detailed, granular level information is now considered.

6.3 Outputs and Processes

Initial approaches to identifying green jobs sought to distinguish between outputs and processes. An output-based approach includes all employment in economic activities classified as producing goods or services designed to protect the environment. In practice, as will be revealed below, this counts employment in a relatively narrow range of sectors. In contrast, the process-based approach is concerned with estimating the number of people employed in any sector who are engaged in activities which are designed to, for want of a better expression, make the enterprise greener. Whereas the output-based approach can readily provide estimates of employment based on, for example, national accounts or labour force survey data, the process-based approach requires estimates to be obtained from employers about the number of their employees engaged in green activities.

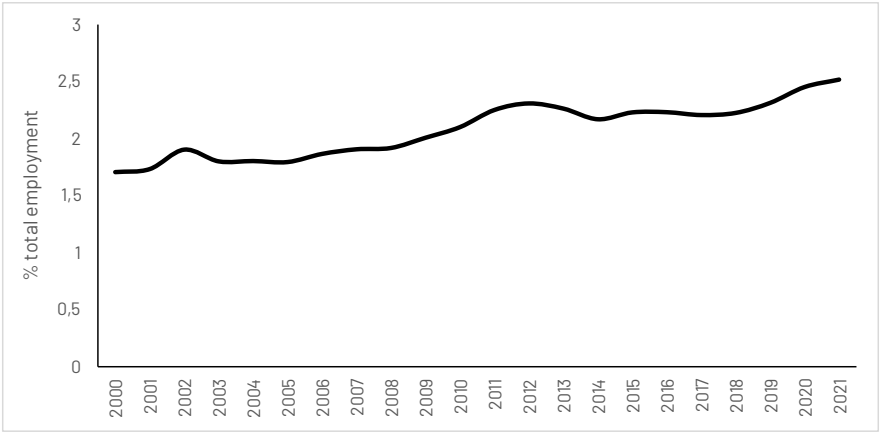
In Europe, producing output-based estimates of employment is relatively straightforward. It is possible to identify sectors defined as ones where the principal economic activity is the protection and management of the environment. (Eurostat, 2009). Eurostat classifies these as the environmental goods and services (EGS) sector as follows:

- protection of ambient air and climate;
- wastewater management;
- waste management;
- protection and remediation of soil, groundwater and surface water;
- noise and vibration abatement;
- protection of biodiversity and landscapes;
- protection against radiation;
- environmental research and development;
- other environmental protection activities;
- management of water;
- management of forest resources;
- management of wild flora and fauna;
- management of energy resources, of which:
- management of minerals;
- research and development activities for resource management;
- other resource management activities.

While the majority of activities are ones which have some bearing on the net zero ambition, not all are such as noise and vibration abatement. This particular activity accounted for around 2 per cent of all EGS employment in 2020, which suggests that, for the most part, the overall classification provides a reasonable measure of employment linked to environmental sustainability. Over time the share of employment in the EU27 accounted for by the EGS sector has grown to stand at around 2.5 per cent of

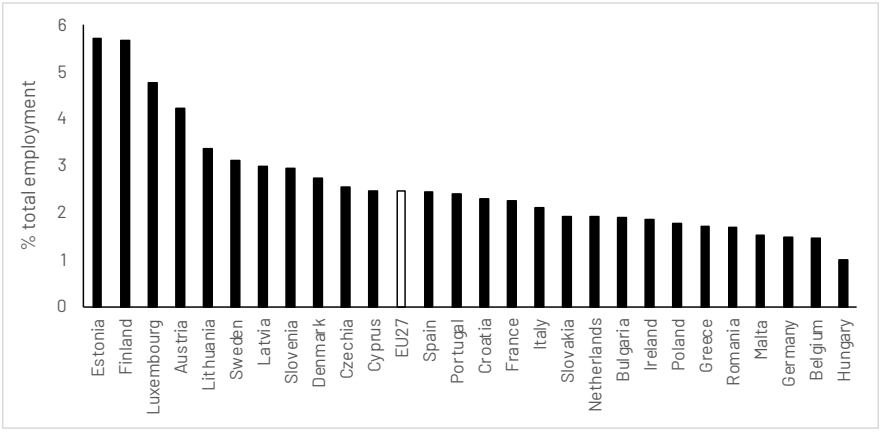
employment in the EU in 2020 compared with 1.7 per cent in 2000 (see Figure 6.1). There are substantial variations by country – from 5.7 per cent in Estonia to 1 per cent in Hungary – which might warrant further investigation (see Figure 6.2).

FIGURE 6.1: EMPLOYMENT IN ENVIRONMENTAL GOODS AND SERVICES IN THE EU27, 2000-2021



Source: Eurostat - Employment in the environmental goods and services sector [ENV_AC_EGSS1]; National accounts employment data by industry [NAMA_10_A64]; own calculations

FIGURE 6.2: SHARE OF EMPLOYMENT IN ENVIRONMENTAL GOODS AND SERVICES IN EU MEMBER STATES, 2020



Source: Eurostat - Employment in the environmental goods and services sector [ENV_AC_EGSS1]; National accounts employment data by industry [NAMA_10_A64]; own calculations

The Eurostat estimates are derived from national accounts data (i.e., from information that all employers are mandated to provide to their governments on an annual basis). In the USA, output-based estimates of employment have been, in the past, produced from the Green Goods and Services (GGS) survey of establishments in green sectors undertaken by the Bureau of Labor Statistics (BLS, 2013). Green sectors were defined with reference to those that were engaged in:

- renewable energies;
- energy efficiency (products and services that improve energy efficiency, including: energy-efficient equipment, appliances, buildings, vehicles, products and services that improve the energy efficiency of buildings and the efficiency of energy storage and distribution);
- pollution reduction and removal, greenhouse gas reduction, and recycling and reuse;
- natural resources conservation;
- environmental compliance, education and training, and public awareness.

Based on this definition, an estimated 3.4 million were employed in the jobs associated with the production of green goods and services, accounting for 2.6 percent of total employment in 2011.[29] The output-based approach used to derive the data in Figures 6.1 and 6.2 for the EU counts all employment in the designated sectors as green. For example, those engaged in administrative tasks which are no different from those undertaken in non-green sectors will be counted as green employment. In contrast, the US GGS asks respondents to estimate the share of their workplaces' activities devoted to producing green goods and services based on revenue. If, say. 40 per cent of a workplace's revenue was derived from environmental goods and services, this was then used to apportion the share of green employment.

Process-based approaches look to obtain an estimate of employment across the economy that is concerned with green processes within the workplace. A pioneering attempt to obtain an estimate of employment using this approach was the Green Technologies and Practices (GTP) Survey undertaken by the US Bureau of Labor Statistics. (Watson, 2013; BLS, 2012). This survey of establishments asked respondents to identify the jobs in which workers' duties involved making their establishment's production processes more environmentally friendly or less resource-intensive. The GTP survey asked respondents if they had used any of the following green technologies or practices:

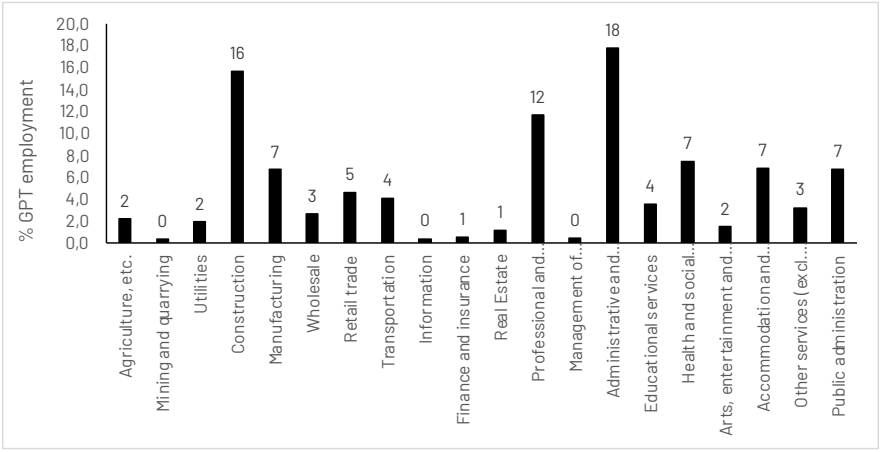
- generation of electricity, heat, or fuel from renewable sources;

29 The data are old because the US no longer conducts the relevant surveys.

- technologies or practices to improve energy efficiency within the workplace;
- technologies or practices in operations to reduce greenhouse gas emissions through methods other than renewable energy generation and energy efficiency;
- technologies or practices either to reduce the creation or release of pollutants or toxic compounds as a result of operations, or to remove pollutants or hazardous waste from the environment;
- technologies or practices to reduce or eliminate the creation of waste materials as a result of operations, such as managing wastewater and collecting and reusing or recycling waste;
- technologies or practices in operations to conserve natural resources.

The survey revealed that around 75 per cent of establishments used at least one green technology or practice with the most common type of green technologies and practices being that of improving energy efficiency within the establishment (57 per cent of establishments), followed by reducing or eliminating the creation of waste materials (55 per cent). Respondents were asked to provide the number of employees who spent more than half of their time involved in green technologies or engaged and asked to provide the job titles and brief job descriptions of those workers. The survey revealed that in 2011 an estimated 854,000 people were engaged in green activities in workplaces, which equates to around 0.7 per cent of employment. The sectoral distribution of employment is provided in Figure 6.3.

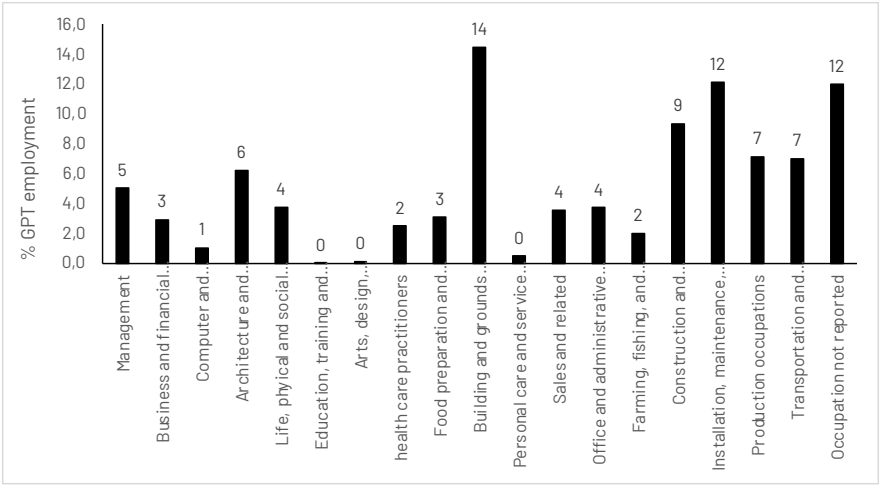
FIGURE 6.3: SECTORAL DISTRIBUTION OF EMPLOYMENT ENGAGED IN GREEN TECHNOLOGIES AND PRACTICES



Source: BLS Green Technologies and Practices Survey, 2011

The survey gives an indication of the skills required in workplaces engaged in green technologies and practices if one accepts that occupations provide a proxy measure of skill. Figure 6.4 shows the occupational distribution of employment. It reveals the mix of jobs and skills engaged in green activities with a large share involved in building / grounds cleaning and maintenance, construction / building jobs, production, and transportation jobs. There is a pronounced blue-collar aspect to green jobs using the GTP definition.

FIGURE 6.4: OCCUPATIONAL DISTRIBUTION OF EMPLOYMENT ENGAGED IN GREEN TECHNOLOGIES AND PRACTICES



Source: BLS Green Technologies and Practices Survey, 2011

The GGS and GTP surveys were discontinued in 2013.

6.4. Towards a classification of green jobs

The classification of green jobs summarised so far has been based on an output and process-based approach – i.e., focusing on the production of green goods and services (output) or being engaged in green activities regardless of the types of goods or services being produced. Both provide a partial view of what might be regarded as green employment and the demand for green skills. A case for a more expansive definition of green jobs, given the direction of policy at national and EU levels, has been made. Potentially this needs to incorporate within existing approaches both the link between digitalisation and greening (the twin inter-connected transitions) and considerations related to a just and equitable transition to a green economy (see for example, Urban et al., 2023).

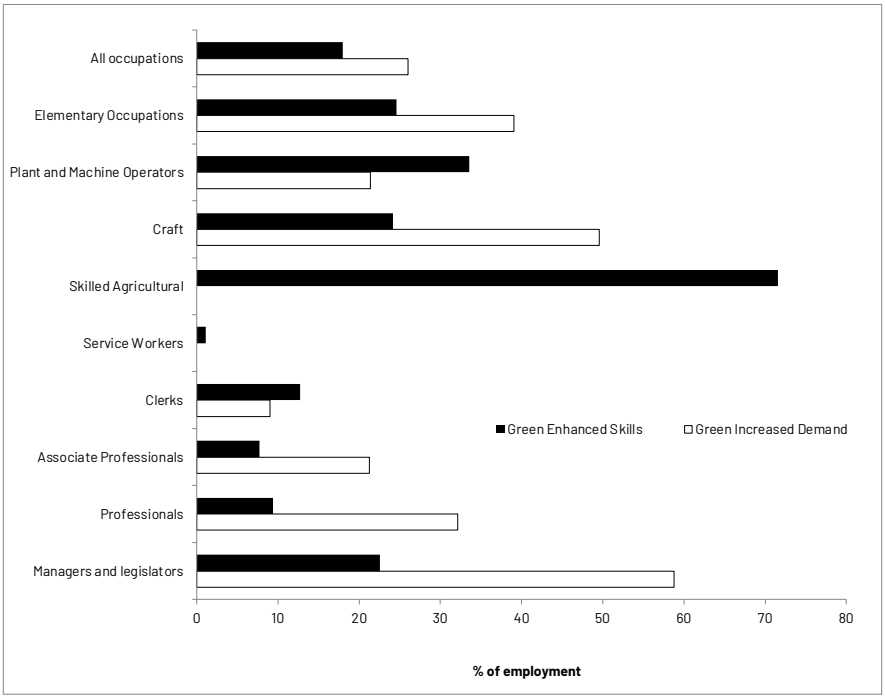
An initial and groundbreaking attempt to provide a more broad based approach to identifying green employment and skills demand across the economy as a whole was produced by O*NET. This classified jobs according to the impact greening will have on content of jobs (Dierdorff et al., 2009; 2011). Jobs were classified with respect to which greening: (a) created entirely new occupations; (b) significantly changed the work or worker requirements of existing occupations; or (c) increased the demand for workers in existing occupations. These were described as follows:

- **green increased-demand occupations** where the impact of green economy activities and technologies results in an increase in employment for an existing occupation but the impact does not entail significant changes in the work and worker requirements;
- **green enhanced-skills occupations** where the impact of green economy activities and technologies results in a significant change to the work and worker requirements of an existing occupation;
- **green new and emerging occupations** where the impact of green economy activities and technologies is sufficient to create the need for unique work and worker requirements, resulting in a new occupation.

Each job is allocated to a type of green occupation based on evidence derived from a literature review and a process of expert assessment. This hints at the classification of green jobs being time dependent. What might be included in the classification in, say, 2010, might be very different from that identified in 2024. An initial attempt to use this classification to estimate green employment in Europe suggested that around 30 per cent of employment might well be in green increased-demand occupations and 20 per cent in green-enhanced ones (see Figure 6.5). (Cambridge Econometrics, et al. 2011). This points to the widespread demand for green jobs across the economy but it

also poses a potential problem. It looks as if large swathes of occupational employment are characterised as green. If, inevitably, all jobs to a greater or lesser degree become classified as green ones, then this questions the utility of such as measure. If all jobs are green to some extent then there is no real reason for counting the number of people employed in them (unless you can estimate the extent to which they are green). A much more important task, it might be said, is that of identifying the specific skills individuals will need to acquire to respond to the changes being introduced in workplace production systems as a consequence of, for example, green regulatory change, the introduction of environment protecting technologies (e.g., carbon capture), and behavioural changes (e.g., consumer embrace of the circular economy).

*FIGURE 6.5: CLASSIFICATION OF GREEN JOBS IN THE EUROPEAN UNION BASED ON O*NET DEFINITION OF GREEN JOBS, 2010*



Source: CE/IER/GHK (2011) / European Labour Force Survey

6.5 From green jobs to green skills

An initial attempt to classify green skills as opposed to green jobs is provided by GreenComp. It provides a framework for considering the types of green skills people may need to obtain (Bianchi et al., 2022). Based on expert views about the types of green competences that people will need to increasingly acquire if economies are to effectively respond to climate change, it reveals a relatively broad list of skills (see Table 6.1). Its purpose, it would seem, is identify the competences that will allow people to think critically to actively promote sustainability both in the workplace and in life in general.

Table 6.1: Areas and competences in the GreenComp skills framework

Area	Competences
Embodying sustainability values	Valuing sustainability
	Supporting fairness
	Promoting nature
Embracing complexity in sustainability	Systems thinking
	Critical thinking
	Problem framing
Envisioning Sustainable futures	Futures literacy
	Adaptability
	Exploratory thinking
Acting for sustainability	Political agency
	Collective action
	Individual initiative

Source: Bianchi et al. 2022

If there is a shift away from trying to identify green jobs or occupations to identifying green skills there is a need to think about the types of green skills which are of interest. To date, frameworks such as GreenComp are concerned with generic skills often linked to the advocacy for change within workplaces. This is important. But from the perspective of providing information which can be used in skills anticipation to provide education and training providers with the information they need to adapt their

courses and programmes, there is a need to focus on technical skills as well. Since the specification of technical skills will be contingent upon the both the sector in which they are required and jobs undertaken in a sector, this tends to narrow the focus of inquiries to particular sectors. To this end, to further support the integration of green skills, ESCO has developed an advanced taxonomy classifying 571 specific skills, knowledge concepts, and transversal skills as green (ESCO, 2022). This categorisation includes technical skills such as monitoring radiation levels and sustainable manufacturing processes, alongside broader competencies such as fostering biodiversity and sustainable consumer behaviours. ESCO's approach categorises skills not only in traditional sectors but also emphasises transversal and emerging skills that adapt to environmental challenges. In doing so, it aligns education and training supply with the skills required by the green transition. By providing a structured taxonomy of skills, ESCO helps delineate the specific competencies required across various kinds of green jobs.

The statistical based approach is, by necessity, a top down one. It takes a definition of green skills and the searches various evidence bases to identify specific green tasks and skills. There is a need in the first instance to provide evidence to populate the various databases which provide the basic information required to identify a specific green skill. Two approaches, which are complementary, are increasingly being used: qualitative, sectoral studies and approaches using natural language processing techniques which are able to process vast amounts of data. Qualitative research methods, for instance, provide a means of providing the detailed, granular level of information required to precisely define green skills in a way that is useful to those with, for example, a responsibility for ensuring the supply of green skills meets demand. An example of this type of approach is the foresight one adopted by Cedefop to look at the skills needs emerging in what might be regarded as key green sectors (Cedefop, 2023a), and the ones undertaken by the ETF in relation to sectors such as renewable energy and agri-food which also employ natural language processing methods (e.g. ETF, 2020; 2021, 2022b; 2024).

The conceptual framework which underlines qualitative approaches to identifying skill needs in particular sectors typically encompasses obtaining information about drivers of demand resulting from greening, how employers have responded to those changes with respect to both technology introduction and organisational change in the workplace, and how this affects the demand for skills. These studies also tend to factor in the difficulties employers face in meeting their skill needs, so that the results indicate not the ideal link between greening and skill needs but the actual ones that emerge. The agri-food sector illustrates the findings these kinds of study produce

(Cedefop, 2023b). In agri-food, the green drivers of change were seen to be those that resulted from the need to respond to climate change, increase biodiversity, increase the efficiency of production (more from less), and respond to consumer preferences for responsibly sourced and produced foodstuffs. In turn, this was seen to feed through into: increased adoption of high technology and regenerative technology farming; adoption of farming processes relying less on resources (soil, space, and water); large scale adoption of organic farming techniques; and a shift towards circular business models in food production. In turn this fed through into a demand for:

- technical skills related to sustainability practices, such as water, waste, energy and soil management, and those related to production methods knowledge of hydroponics, food science, packaging and labelling, food processing;
- digital skills related to the use of robots, data analysis, etc.;
- transversal skills related to management and digital technologies (management skills, entrepreneurship, communication, marketing, risk management, data analysis).

Looking further into the future, skill needs are seen to be linked to the increased adoption of high technology and regenerative technology farming; farming processes relying less on resources (soil, space, and water); more industrial and intensive farming; more waste-based and less crops-based production of bio-fuels; large-scale adoption of organic farming techniques; and a shift towards circular business models in food production.

These types of study provide detailed insights into the panoply of skill needs, within specific sectoral contexts, resulting from the process of greening. There is a degree of trade-off here between the depth of information obtained versus its representativeness and timeliness. Interviews tend to take place with a relatively small number of employers and other sectoral stakeholders and time it takes to conduct the studies. That said, the employers interviewed are selected because they represent particular groups of employers in the sector, and other stakeholders tend to represent the sector as a whole, while contextual analysis provides a comprehensive overview of developments within respective sectors. The timeliness issue is being increasingly addressed by the use of data science techniques which allow a variety of data to be obtained from a range of sources made possible by natural language processing tools (see for example ETF, 2021).

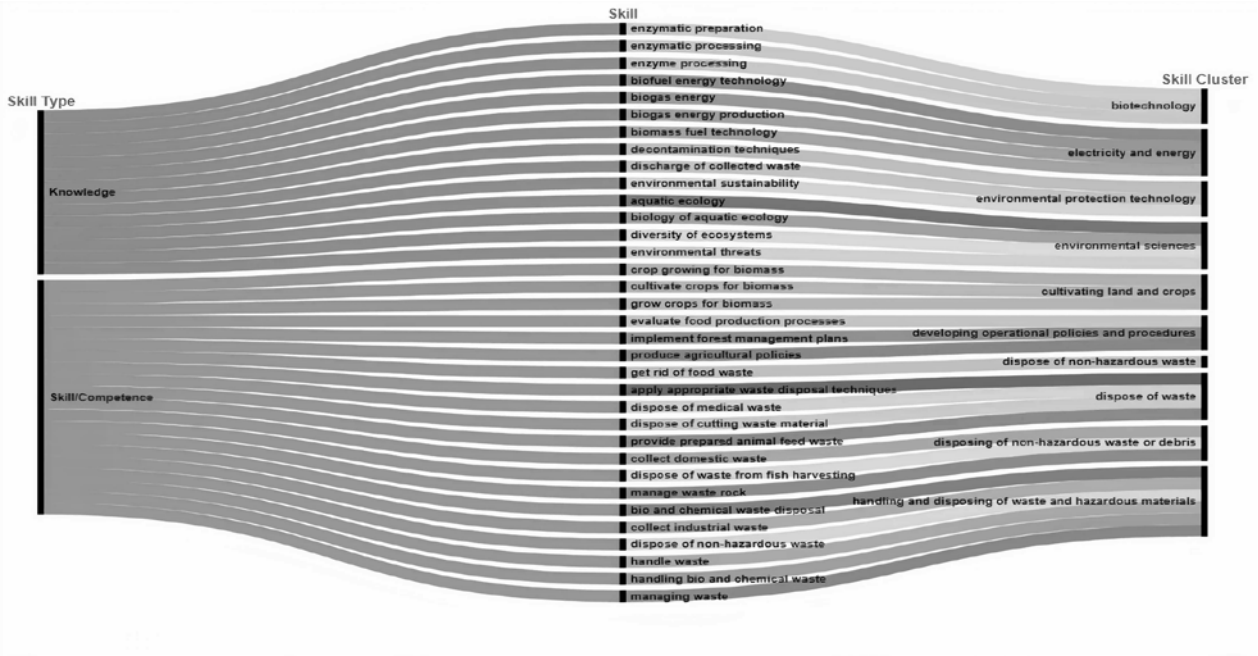
In summary, the qualitative approached outlined above provides detailed insights which can form the basis of more statistically representative investigations such as employer surveys. This takes time and runs the risk of being out of date before the results are made available in those sectors subject to relatively rapid change. An alternative is to undertake text mining analysis based on natural language processing techniques.

6.6 The application of data science techniques to identify green skills

Using natural language processing (NLP) tools it is possible to obtain data from a wide variety of sources previously out of scope of social science research (Cedefop, 2021). If one has a dictionary of green terms, then it is potentially feasible to collate data from online websites and databases that provide information about the specific types of green skills required in particular kinds of job (e.g., for each occupation classified according in the International Classification of Occupations [ISCO] or the EU's ESCO taxonomy of skills). Just as with the qualitative approach the identification of green skills needs to be focused on a particular sector if meaningful results are to be obtained. This simply reflects the fact that skills demand will be dependent, at least to some degree, upon the sectoral context.

One NLP-based approach attempts to identify the drivers of change in a particular sector and the technologies associated with that change to identify emerging skill needs. Data about drivers of change are obtained from bibliographical databases and that on technologies from patent databases. Links can be found to skills for the various technologies from occupational databases such as ESCO, but training manuals linked to various technologies can also be used. An example of this approach is one which assessed skills demand in the bioeconomy (DG RTD, 2022). Here, data were obtained by: (i) extracting data on key technologies relevant to the bioeconomy sector; (ii) extraction of occurrences with which a particular technology is referenced with respect to the bioeconomy; (iii) plotting and comparing the occurrences of the different technologies in papers and patents; and (iv) plotting the analysis of occurrences across different years in papers and patents. This then provides a basis for producing correlations between emerging technologies and related skills relevant to the bioeconomy (see Figure 6.5). The added value here is the granular level at which data are provided about emerging skill needs. The downside is that it is difficult to ascertain the relative importance of particular skills to a sector or a job within a sector. In other words, it identifies all the skills related to a particular green driver of change but does not tell you how important that driver was in practice or the scale of demand for those skills. To some extent that type of information still needs to be derived from other kinds of research methodologies such as employer surveys and / or case studies.

FIGURE 6.6: EMERGING SKILL NEEDS FOR VET: SKILL CLUSTERS DETECTED FROM THE BIG DATA ANALYSIS



Source: DG RTD (2022)

Conclusions

In a relatively short space of time, as the implications of climate change have become all too apparent, knowledge about the skills required to combat, mitigate and potentially reverse its all too abject impacts on economies and societies, has advanced apace. The initial focus – which remains to some extent – has been upon defining green jobs and the number of people employed in them. This approach has been dogged by the problems associated with identifying what might be classified as a green job and the extent to which they can be considered green. When a sector-based approach is adopted, such as the ones which concentrate on sectors concerned with environmental protection, then the number of jobs classified as green in the EU tends to have been around the 2.5 per cent mark. Whether policy makers regard this as a relatively large or small volume of employment is moot. When the definition or criteria about what might be considered a green job is relaxed, there is a tendency towards classifying increasingly large swathes of the employment as being green. As noted in the commentary this tends not be that helpful from a policy perspective.

Arguably the focus on green jobs is slightly misplaced or has been overtaken by events as the need for all sectors of the economy to become greener has become self-evident. But there is still a need to identify the skills required to ensure that skill shortages do not act as a drag on the transition to a greener economy. This is why a focus on green skills is required. An approach which focuses on green skills is not dependent to the same degree as those which focus on green jobs to define what is green. The green skills approach depends upon a systematic assessment of the drivers of skill demand at the sectoral level given that skill is a derived demand. There will be changes taking place in production systems which result directly from regulations related to climate change, as well as other changes designed to protect the environment which take place independently of any regulatory imperative. These can be observed and classified. Once the drivers have been identified, then it is possible to identify current skill needs and, increasingly, those skill needs which need to be satisfied in the future over the short- to medium-term.

In combination, data science and qualitative approaches provide a rich seam of information, but it requires the subject of the analysis to be tightly defined. That said, studies which have employed a mix of qualitative and data science approaches have managed to yield granular level information about emerging skill needs as the evidence presented above indicates. Where they have been less successful is with respect to the quantifying the scale of emerging demand, although they do provide a basis for other types of investigation to do so. Importantly they are able to identify emerging

skill needs at a level of detail that provides education and training providers with the core information they require to develop courses and programmes to meet the demands resulting from the green transition.

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CHAPTER 7

Automation technology and its impact on EU jobs: Evidence from Cedefop's second European skills and jobs survey

Konstantinos Pouliakas

7.1 Introduction

The recent acceleration of new digital technologies, including (generative) artificial intelligence (AI), has renewed interest in the actual and potential consequences of technological innovation on labour market outcomes. Even before the 'digitalisation push' of the coronavirus pandemic, a popular debate about the automation risk of AI had been ongoing. This was initiated by several studies, mostly reliant on expert inputs, highlighting that large employment losses are likely to ensue in advanced Western economies because of the rapid advancement of machine learning or related algorithmic methods (Frey and Osborne, 2017; Brynjolfsson and McAfee, 2014; Ford, 2015). Subsequent studies that deconstructed jobs according to their task composition tended to dispel such fears of rampant job destruction (Arntz et al., 2017; Nedelkoska and Quintini, 2018; Pouliakas, 2018). Relevant research on the impact of AI on labour markets using online job vacancy data, also tended to find discernible negative effects of AI activities on hiring. This is despite the apparent upward trend in demand for AI skills (Alekseeva et al., 2021; Acemoglu et al., 2022; Borgovini et al., 2023) and most likely reflects the slow substitution of non-AI vacancies/activities by AI-related ones. Nevertheless, due to the COVID-19 pandemic but also subsequent energy and geopolitical crises, concerns about greater automation taking place in labour markets have resurfaced.

While the above literature has mostly adopted a prospective approach, there has been little evidence to date about the actual impact of digital technologies on workers' job tasks. Earlier studies that have aimed to detect the automation risk of occupations have relied heavily on expert assessments applied to a small subset/training set of occupations (Frey and Osborne, 2017). Alternatively, they have tried to identify tasks that

are susceptible to machine replacement, by surveying non-representative worker populations (e.g., online platform workers, see Brynjolfsson et al., 2018). Recent analyses using online job advertisements also suffer from methodological pitfalls, given that such data tends to concern a subset of overall labour demand in economies. While the identification of so-called 'AI skills' in occupations is often made using relatively ad hoc lists of generic or specific terms referring to AI technologies (Borgovini et al., 2023).

This study uses instead data from representative samples of adult workers from 29 European countries (hereafter EU+), collected as part of the second wave of the Cedefop European Skills and Jobs Survey (ESJS2). In addition to using a random probabilistic sampling design, the ESJS2 collected robust and harmonised information on the extent to which EU+ workers were affected by technological change in their main jobs during the first year of the COVID-19 pandemic (2020-21). Furthermore, it sought to identify the impact of such technological innovation on the task composition of jobs.

Accordingly, ESJS2 provides unique insights into the extent to which EU+ workers had to digitally upskill during the recent pandemic and on whether such technological innovation led to the displacement or augmentation of workers' tasks. It allows for in-depth investigation of the socioeconomic determinants of the process of job tasks being automated as opposed to reinforced by the advent of digitalisation. Focusing on the labour market outcomes of digital automation technology should inform policymakers and the public about the tangible, rather than prospective, impact of digitalisation on workers' job prospects and overall well-being. This research should hence facilitate the design of better digital transition policies in the EU economy.

The structure of the paper is as follows. Section 2 provides a brief review of the relevant literature focussing on job automation and its labour market impacts. Section 3 describes the Cedefop ESJS2 data deployed in this study. Section 4 explains the empirical methodology used to analyse the determinants of task automation in European labour markets. Section 5 discusses the main empirical findings, while section 6 concludes with some reflections for EU digital and skills policy.

7.2 Literature Review

In earlier economic literature, technological change was typically considered a complement to high-skilled labour, elevating job-skill requirements, and accentuating earnings inequalities (Katz and Murphy, 1992; Autor et al., 1998). Others have refuted this skill-biased technological change (SBTC) hypothesis by arguing that digital technology can more easily automate tasks in middle-skill jobs, than those in jobs at the higher and lower end of the employment/skills spectrum (Autor et al., 2003). It has been posited that viewing technological change as routine biased (RBTC) can help explain the trend towards greater job polarisation, observed in the U.S and some European economies in recent decades (Goos and Manning, 2007; Goos et al., 2009).

Cutting-edge AI algorithms and robotics go far beyond traditional rule-based approaches to computer programming, changing the notion of what can be considered 'routine' in work. They now place within reach of machines and computer technology a wide range of cognitive and even social (language) job tasks that were long considered impossible to automate. There is thus widespread acknowledgement that new digital technology, in particular machine or deep learning and more recent generative forms of AI, are likely to increasingly influence production and business processes in almost all industries. Early debates on the future of work were therefore mostly concerned about the consequences of machines and robotic technologies for employment (Ford, 2015; Brynjolfsson and McAfee, 2014; Acemoglu and Autor, 2011). Fears that about half of all jobs in advanced economies may become extinct due to advancing machine learning methods (Frey and Osborne, 2017) became prevalent. Such concerns were echoed in public sentiment, for instance about one in ten adult workers in Europe were strongly worried, and a quarter moderately so, that new digital technologies at their workplace could automate part or all of their job (Cedefop, 2022).

Several studies deconstructing jobs according to their task composition have subsequently painted a more nuanced picture, partly dispelling claims of massive job destruction due to digitalisation (Arntz et al., 2017; Nedelkoska and Quintini, 2018). A 2018 research paper using first European skills and jobs survey data, found that about 14 per cent of jobs in the EU labour market faced a very high risk of automation (Pouliakas, 2018). But with close to 4 in 10 jobs likely to experience marked task restructuring, most change in labour markets is expected to materialise in the form of within-job transformation, posing significant challenges for the upskilling or reskilling of individuals exposed to new digital technology. Labour market analyses on Europe and other developed economies also failed to find evidence of widespread net job destruction (Dauth et al., 2017). Some labour displacement may occur in technology-intensive pro-

duction, but inter-sectoral job growth and reallocation of job-tasks among incumbent workers tends to offset the negative employment impact of automation (Freeman et al., 2020).

It is now increasingly acknowledged that the impact of AI on labour markets takes place primarily via its transformative potential on job tasks and skill needs, rather than via complete job displacement. As shown by the theoretical framework of Acemoglu and Restrepo (2018) and supported by other empirical evidence (Deming and Noray, 2020; Cedefop, 2018, 2022; Bessen, 2020; McGuinness et al. 2021; Restrepo, 2023), the net effect of technological innovation on jobs and skills is dependent on the adjustment process of skill requirements to the introduction of new technologies and specifically: (i) the extent to which AI and automation may render some of workers' skills and tasks obsolete (*displacement*); (ii) the degree to which new or a broader set of tasks and skill needs are created (*reinstatement*); and (iii) the degree of mismatch between the new skill requirements due to advancing technologies and the skills of the existing workforce (*mismatch)*. The ultimate direction of such effects in dynamic economies is likely to be heavily influenced by the set of incentives, capabilities, assets and collective bargaining processes prevalent in firms and affecting individuals' preferences and behavioural reactions (Cedefop, 2020).

Deming and Noray (2020), for instance, who use US online job vacancy data to investigate the dynamic impact of technological change on changing job-skill requirements, highlight that new technology can both erode and enhance certain tasks and skills within narrow occupational categories over time. The net impact of technological progress on the skill content of jobs can therefore be undetermined a priori. Core work activities that are in general more susceptible to machine displacement tend to be those that rely on highly codifiable information recording and retrieval skills, as well as routine and manual skills (Pouliakas, 2018; 2021). By contrast, work activities that are relatively shielded from machine replacement include those dependent on socioemotional / interpersonal skills, people management skills, and problem-solving/creativity skills.

Some technology-intensive occupations (e.g., STEM) are more inclined to experience higher rates of change in job-skill requirements than others, due to faster obsolescence of older human capital vintages (De Grip and van Loo, 2002) and greater generation of new tasks over the life cycle. In general, while in the past technological breakthroughs would tend to replace blue-collar/routine work, one of the distinguishing features of AI technologies is that many high-skilled economic activities and occupations, including those in healthcare, law, finance, education and other creative industries, may

now be performed faster and more efficiently by AI algorithms than humans (Felten et al., 2023).

The changing task composition associated with new digital advances is also likely to have a differential impact on workers' labour market outcomes and well-being. Using Cedefop's ESJS2 data, Bertoni et al. (2024) show that of the one third of EU+ workers who experienced technological change, those who experienced task automation are four percentage points more likely to engage in training to develop their digital skills than those who experienced digitalisation without task replacement.

7.3 Data and descriptive statistics

The European skills and jobs survey (ESJS) is a periodic survey of EU adult workers carried out by the European Centre for the Development of Vocational Training (Cedefop). A second wave of the survey was fielded in the first half of 2021. It informs the ongoing policy debate about the impact of digitalisation on the future of jobs and the changing nature of work, as well as heightened concerns about the long-term effect of the COVID-19 crisis on EU digital skill needs and new forms of digital and distance learning. It does so by analysing comparative information from 46,213 adult employees from all EU Member States plus Norway and Iceland (EU+) (Cedefop, 2022).[30]

The ESJS2 questionnaire was developed by Cedefop with the support of a group of international experts and a leading survey company. Following a rigorous and high-quality pretesting and translation protocol, fieldwork was carried out using a combination of random probabilistic phone interviews (at least 500 observations per country) with sample top-ups drawn from well-established, reliable and updated socio-economic online survey panels. Sample quotas were enforced to the online interviews to ensure the representativeness of the employee workforce in each country, with reference to gender, age, region, education, occupation, and sector of employment. Appropriate weighting ensures that the ESJS2 data is balanced in line with the distribution of key population variables in each country. The weighting method places particular emphasis on adjusting for the inherently higher digital abilities/aptitudes of online panel respondents. Full information about the ESJS2 sampling methodology is described in Cedefop (2022).

30 In partnership with the European Training Foundation (ETF), the ESJS2 has now been carried out in an additional five Western Balkan countries plus Israel, collecting information about paid adult employees in 35 EU and EU neighbourhood countries.

The ESJS2 collected data on the following themes: (i) the tasks EU+ workers do in their jobs and the skill needs implied, with particular emphasis on digital skill needs; (ii) the exposure of EU+ adult workers to new digital and automating technologies in a cross-country comparative context; (iii) the extent of technological change and digitalisation in EU workplaces and its impact on workers' skill needs, skill mismatches and overall job quality; and (iv) the extent to which EU+ workers are adapting to digitalisation via continuing learning and supportive workplace practices.[31] It also provides robust information from representative samples of adult workers on a core set of socio-demographic and job characteristics; job-skill requirements (literacy, numeracy, digital, analytical, manual and interpersonal skills); skill mismatches (vertical, horizontal, mismatches in specific skills, skill gaps); initial and continuing vocational education and training participation; and labour market outcomes (wages, job insecurity, job satisfaction).

With the debate on the future of work being dominated by technological alarmism, the ESJS2 provides informed insight on whether popular fears of robots or machines taking away people's job are justified by evidence. To understand the real impact of technology on workers, the ESJS2 uses a measure linking major technological innovations to upskilling or reskilling needs. The survey asks users of computer devices at work whether they had to learn to use any new digital technologies – comprehensively defined as computer programmes, software, or computerised machines – to do their main job over the previous year. In particular, European adult workers were asked in two separate questions if:

> *In the last 12 months (for those with more than 1 year of employer tenure) / Since you started your main job (for new entrants), did you learn to use any* ***new***[32] *[computer*

31 An online data explorer for the ESJS2 is available at https://www.cedefop.europa.eu/en/tools/european-skills-jobs-survey

32 The ESJS2 survey questionnaire and fieldwork went to great lengths to provide clear definitions to respondents on key survey terms, to ensure that the responses of diverse employees in a cross-country context are anchored to common reference points and harmonised. For instance, the survey clarified to respondents that:

"By 'new' we mean those you started using for your main job [in the last 12 months/since you started your main job]. **Computer software** *- Consider any computer programs or software, either general or specialised or occupation-specific (e.g. Microsoft Office, database management, multimedia editors, communication apps, enterprise resource planning, data analysis, etc.). Do not include computer programs or software that you had to learn for other purposes such as other or prior jobs or social or recreational activities. Only include major updates to any computer programs or software you use to do your main job;* **Computerised machinery** *- For instance,*

programmes or software] [computerised machinery] to do your main job. Please exclude minor or regular updates.

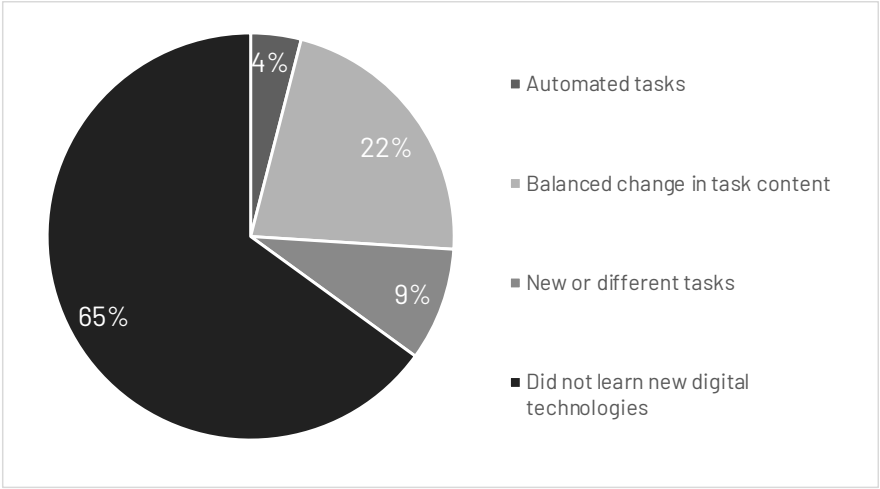
Among those who replied affirmatively to the above question, the following item was asked to clarify whether the adoption of new digital technology is primarily of the task automating or reinstating type:

> *"As a result of the new computer programs or software /new computerised machinery you learnt for your main job in the last 12 months, did your job tasks change in the following way?*
> *- You now do not do some tasks you did before*
> *- You now do some different or new tasks"*

One in three (35 per cent) EU+ employees had to learn to use new digital technologies to do their main job in the year preceding the survey. This measure combines the 32 per cent of European workers who – for job-related purposes – had to learn new computer programmes or software and the 10 per cent who had to master new computerised machines, with some having to learn both technologies. While 14 per cent of the EU+ workforce indicated that they no longer perform some tasks they did prior to the introduction of the new digital technology in their job, some of these workers also responded that they do some different or new tasks. Ultimately, 4 per cent of the EU+ workforce was exclusively affected by job-task automation because of newly introduced digital technologies at work. A markedly larger workforce share (22 per cent) experienced both task destruction and generation, while 9 per cent only saw a positive impact on their job tasks (see Figure 7.1).

digital handheld devices, CNC machine tools, robots, PLCs, 3D printers or any other specialised, sector or occupation-specific computerised machines. Do not include instances where you had to learn to use any computerised machinery for other purposes, such as other or prior jobs or social or recreational activities. Only include major updates to any computerised machinery you use to do your main job".

FIGURE 7.1: DIGITALISATION AND TASK AUTOMATION IN EU+ JOBS



Note: % EU+ workers with positive answers "As a result of the new computer programs or software/ new computerised machinery you learnt for your main job in the last 12 months, did your job tasks change in any of the following ways? (i) You now do not do some tasks you did before (ii) You now do some different or new tasks; weighted data.

Source: Cedefop second European skills and jobs survey *(2021).*

Among those workers who had to learn new digital technology, those affected by task automation tend to be lower-educated, younger-aged, men, and are typically employed in manual and lower-skilled manual or elementary jobs, which typically entail more routine work. They are also more likely to be employed in larger-sized firms and in particular sectors, such as agriculture, utilities, financial and insurance activities but also in accommodation and food services (see Table 7.1). It is worth noting however that in the whole sample of adult employees, it is mostly higher-educated workers, in higher-skilled jobs or industries (e.g., ICT, finance, professional and scientific activities) who have a greater incidence of task displacement. This reflects the fact that non-users of digital technology are disproportionally comprised of lower-educated employees in lower-skilled occupations.

TABLE 7.1 TASK AUTOMATION BY SOCIOECONOMIC CHARACTERISTICS, EU+

		Only sample with digital upskilling	All sample
Gender	Male	41%	15%
	Female	37%	12%
Age	25-34	41%	18%
	35-44	41%	15%
	45-54	37%	12%
	55-64	36%	10%
Education	Low	48%	10%
	Medium	39%	12%
	High	38%	17%
Occupation	Skilled	38%	16%
	Semi-skilled	36%	11%
	Manual	45%	13%
	Elementary	43%	9%
Industry	Agriculture, forestry and fishing	50%	13%
	Mining and quarrying	45%	14%
	Manufacturing	41%	15%
	Electricity, gas, steam and air conditioning supply	41%	15%
	Water supply; sewerage, waste management and remediation activities	47%	16%
	Construction	42%	12%
	Wholesale and retail trade; repair of motor vehicles and motorcycles	36%	12%
	Transportation and storage	43%	13%
	Accommodation and food service activities	44%	10%
	Information and communication	40%	21%
	Financial and insurance activities	45%	20%
	Real estate activities	38%	15%
	Professional, scientific, and technical activities	42%	18%
	Administrative and support service activities	41%	13%
	Public administration and defence; compulsory social security	37%	14%
	Education	31%	13%
	Human health and social work activities	33%	10%
	Arts, entertainment and recreation	37%	12%
	Other service activities	32%	10%
Firm size	1-10	37%	10%
	>250	40%	16%

Note: The shares refer to the sample of EU+ workers who had to learn new digital technology for their job in the last 12 months and as a result they no longer do some of their job tasks.

Source: Cedefop second European skills and jobs survey *(2021).*

7.4 Empirical methodology

To identify which individual and job characteristics of EU+ adult workers are associated with a higher probability of being affected by new digital technology that can be task-automating or task-augmenting, discrete choice, probit regressions are implemented as follows:

$$y_i^* = X_i \beta + \varepsilon_i \qquad [1]$$

Where y^* is a latent variable that takes on values of 0 or 1 depending on (1) if individual, i, had to learn a new digital technology during the reference period, and (2) if some of his/her job tasks were automated (either simultaneously with other task changes or independently), subject to having digitally upskilled; X is vector of socio-demographic and job characteristics affecting one's propensity of being affected by digital technology; β is a set of regression parameters; and $\varepsilon \sim N(0,1)$.

Alongside key socio-demographic (e.g. age, gender, education) and job characteristics (e.g. work hours, tenure, workplace size, sector, occupation), the estimated models include summary indices of the level of job-skill requirements (literacy, numeracy, social, manual) and the job complexity of jobs (see Cedefop, 2022 for details of derivation).

At a second stage, we investigate whether the type of digital technology has differential labour market effects. In particular, the ESJS2 data collects information on several indicators of job quality including workers' earnings, job insecurity and job satisfaction. A series of different regressions are therefore estimated as follows:

$$l = \boldsymbol{A}_i \boldsymbol{\delta} + \boldsymbol{Z}_i \boldsymbol{\beta} + u_i \qquad [2]$$

where l refers to three main labour market outcome variables (wages, job satisfaction, job insecurity). These are regressed on a categorical, dummy variable, $\boldsymbol{A}$, denoting if a worker's tasks were automated or not and a wide set of other independent variables, $\boldsymbol{Z}$.

The main independent variable $\boldsymbol{A}$ is defined either as (i) a binary dummy variable taking the value one if employees who digitally upskilled no longer carry out some tasks and zero otherwise, or (ii) as a categorical variable defined as follows:

$$A_i = \{ 0 \text{ if some job tasks were only automated;}$$
$$1 \text{ if job tasks were both automated and created;}$$
$$2 \text{ if only new job tasks were created;}$$
$$3 \text{ if no new digital technology was learnt at work } \}.$$

Discrete choice, ordered probit models are used to estimate equation (2), where the dependent variable *I* takes the below values:

(i) 0-10 Likert scale of workers' ratings of how satisfied they are overall with their main job;

(ii) 0 if a worker thinks there is no chance at all of losing his/her job in the next year; 1 if there is some chance and 2 if there is a very high chance;

(iii) 1 if an employee's usual monthly net pay is under the lowest quartile of his/her national net individual pay distribution; 2 if it is between the lowest quartile and the median; 3 if between the median and highest quartile and 4 if above the highest quartile.

For all regressions we deploy appropriate pan-European weights, whilst Hubert-White robust standard errors are estimated that are clustered for potential correlation of individuals responses at country level.

7.5 Empirical results

Table 7.2 presents the estimated regression coefficients based on probit models where in column (1) the dependent variable is a dummy variable taking the value one for those who had to learn to use new, major digital software or computerised machines for their job. Columns (2)–(6) subsequently focus on the (selected) sample of workers who were affected by technological innovation, to examine if there is a difference in the profiles of workers who experience task automation as opposed to task enhancement.

The results show that workers who are less likely to have engaged in digital upskilling disproportionately comprise women, older, and lower-educated persons. They are more likely to have longer job tenure (incumbents) and work in privately-owned or smaller-sized firms. Other things equal, jobs involving a higher incidence of digital upskilling tend to be more skilled, complex jobs.

Of those who undertook digital upskilling, lower-educated adult workers are overall more likely to have experienced some displacement of their job tasks. The same holds for employees in the public sector and with permanent jobs. Middle-aged (45-54), male workers are in general less likely to have done some different or new tasks in response to the need to learn new digital technology. Working remotely during the COVID-19

pandemic and in more skill-intensive jobs is associated with greater chances of experiencing some overall change in job tasks, regardless of whether it is of the automating or augmenting type.

Distinguishing those who solely experienced task displacement from those who simultaneously faced task generation alongside it, it is evident that male workers who digitally upskilled, employees working fewer hours in larger-sized, public organisations and those undertaking more socially oriented tasks,[33] are more likely to have suffered from task automating consequences than their counterparts. By contrast, more educated adult workers in private firms and non-permanent, complex jobs are more likely to do different or new tasks also involving more job-related training.

As shown in Table 7.3, EU+ adult workers who are affected by some task automating consequences as a result of new digital technology are found to be less satisfied, other things equal, with their job, compared to those who experience a balanced shift in their task composition or who engage in completely new tasks. The latter are also less afraid of losing their job, as are those who did not undergo any digital upskilling during the previous year of the survey. Nevertheless, they also tend to be in lower wage jobs compared to employees who no longer do some of their tasks following the introduction of new digital technology.

33 While in the literature jobs that depend on social skills are generally believed to be less exposed to the threat of automation from robots/machines (Deming, 2017), the ESJS2 findings may be reflecting the fact that many such interpersonal activities (e.g. provision of advice, interaction with clients, teaching, caring, selling, teamwork) were constrained because of social distancing measures in place during the COVID-19 pandemic. Alternative technological solutions (e.g. online learning, virtual meetings, e-commerce) were heavily deployed instead.

TABLE 7.2: DETERMINANTS OF TASK CHURNING IN EU+ JOBS, PROBIT

	(1) Digital upskilling	(2) Task automation	(3) Task generation	(4) Only task automation	(5) Both task automation and generation	(6) Only task generation
age: 35-44	-0.10***	0.04	-0.07	0.08	0.03	-0.08
	(0.018)	(0.057)	(0.041)	(0.057)	(0.047)	(0.067)
age: 45-54	-0.11***	-0.04	-0.08**	-0.02	0.07	-0.06
	(0.023)	(0.064)	(0.034)	(0.051)	(0.060)	(0.072)
age: 55-64	-0.11***	0.01	-0.07	-0.01	0.09**	-0.09
	(0.027)	(0.045)	(0.064)	(0.090)	(0.038)	(0.071)
male	0.05**	-0.01	-0.10***	0.13**	-0.04	-0.03
	(0.024)	(0.062)	(0.031)	(0.051)	(0.033)	(0.049)
education: isced 3-4	0.12**	-0.18*	-0.03	-0.01	-0.14**	0.18**
	(0.054)	(0.096)	(0.082)	(0.068)	(0.065)	(0.071)
education: isced 5-8	0.12***	-0.23**	-0.10	-0.05	-0.09	0.14*
	(0.047)	(0.104)	(0.079)	(0.054)	(0.077)	(0.079)
tenure	-0.01***	-0.00	-0.00**	0.00	-0.00	0.00
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
private	-0.10***	-0.09***	0.02	-0.08*	-0.03	0.08**
	(0.028)	(0.025)	(0.046)	(0.045)	(0.032)	(0.033)
sme	-0.10***	-0.04	0.00	-0.06*	0.01	0.02
	(0.015)	(0.024)	(0.059)	(0.034)	(0.043)	(0.055)
perm	-0.11***	0.11***	0.01	0.05	0.05	-0.08**
	(0.020)	(0.027)	(0.055)	(0.044)	(0.036)	(0.037)
hours of work	-0.00	-0.00	0.00	-0.00**	0.00**	-0.00
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
remote work	0.17***	0.09***	0.07***	-0.01	0.03	-0.03
	(0.022)	(0.031)	(0.020)	(0.026)	(0.031)	(0.041)
literacy skills	0.16***	0.06**	0.08***	-0.01	-0.01	0.01
	(0.010)	(0.029)	(0.026)	(0.017)	(0.014)	(0.016)
numeracy skills	0.11***	0.04**	0.06***	-0.04	0.01	0.01
	(0.013)	(0.018)	(0.014)	(0.038)	(0.022)	(0.016)
social skills	0.12***	0.11***	0.05	0.07***	0.00	-0.04
	(0.028)	(0.035)	(0.029)	(0.026)	(0.039)	(0.052)
manual skills	0.07**	0.19***	0.18***	-0.01	0.03	-0.03
	(0.034)	(0.068)	(0.052)	(0.048)	(0.055)	(0.061)
job complexity	0.22***	0.14***	0.24***	-0.07	-0.04*	0.09***
	(0.041)	(0.044)	(0.031)	(0.045)	(0.026)	(0.032)
job-related training	0.60***	0.14***	0.24***	-0.00	-0.10	0.12**
	(0.016)	(0.054)	(0.046)	(0.048)	(0.065)	(0.054)
Occupation FE	X	X	X	X	X	X
Industry FE	X	X	X	X	X	X
Country FE	X	X	X	X	X	X
Interview CATI mode (dummy)	X	X	X	X	X	X
Constant	-2.22***	-1.34***	-1.30***	-0.72***	0.16	-0.77***
	(0.113)	(0.195)	(0.227)	(0.277)	(0.234)	(0.266)
N	42,392	17,924	17,924	17,924	17,924	17,924

*Note: Robust standard errors in parentheses, clustered by country; *** p<0.01, ** p<0.05, * p<0.1. The methodology used to derive the indices of job-skill requirements (literacy, numeracy, social, manual skills) and job complexity indices is available in Cedefop (2022). Weighted data. The sample in columns (2)-(6) includes EU+ workers who had to learn new digital technology for their job in the last 12 months.*

Source: Cedefop second European skills and jobs survey *(2021).*

TABLE 7.3: IMPACT OF TASK CHURNING ON LABOUR MARKET OUTCOMES, ORDERED PROBIT

	(1) Job satisfaction	(2) Job insecurity	(3) Wage band
Task automation	-0.03	0.18***	0.05**
	(0.028)	(0.038)	(0.023)
Task generation	0.02*	-0.01	-0.03
	(0.012)	(0.028)	(0.033)
Both task automation and generation	0.09***	-0.04	-0.02
	(0.032)	(0.038)	(0.020)
Only task generation	0.08**	-0.17***	-0.08**
	(0.036)	(0.054)	(0.039)
No digital upskilling	0.08*	-0.14***	-0.05**
	(0.046)	(0.044)	(0.021)
Only task automation (reference)			
Controls	X	X	X
N	42,346	42,051	40,925

*Note: Robust standard errors in parentheses, clustered by country; *** p<0.01, ** p<0.05, * p<0.1. Weighted data. The set of control variables includes those shown in Table 2.*

Source: Cedefop second European skills and jobs survey *(2021).*

7.6 Conclusions

Much public attention focuses on the potential impact that new digital technologies, in particular AI, may have on labour markets. Studies exploring robust data that accurately define and measure the incidence and consequences of technological innovation for workers' job tasks are therefore paramount. This paper uses such information from the novel second wave of the European skills and jobs survey to analyse which European adult workers faced adverse or positive consequences in their jobs following the great digitalisation push of the COVID-19 pandemic.

The analysis highlights that lower-educated workers, men and those employed in larger-sized, public-sector establishments face a greater chance of experiencing some task displacement in their jobs, following the adoption of a new digital technology. Seeing some of their tasks being affected by machines or software is more likely to occur for workers who are, other things equal, in higher-skilled or higher-wage jobs. Such a finding echoes that of McGuinness et al. (2021), who also report that skills-displacing technological progress is in general more prominent among higher-skilled, professional work. This is somewhat opposed to those claiming that automation mostly affects employment in the medium skills spectrum, although the evidence in this paper extends beyond the between-occupational job loss effects analysed in the job polarisation thesis. It may reflect instead the greater complementarity of technology with more dynamically changing or skill-intensive jobs that undergo a faster degree of task churning.

Overall, the empirical results show that those affected by task automation have lower job satisfaction and face greater insecurity than comparable employees, for whom digital technology may simultaneously breed task generation. This implies that policymakers should pay closer attention to the design of skills and digital policies that can shield vulnerable workers from the negative consequences of digital technology. But targeting affected employees ex post with, for instance, the provision of high-quality skills intelligence and effective upskilling or reskilling policies, is only one side of the equation. Conscious ex ante efforts are also required to incentivise technology developers, businesses and policymakers towards the adoption and diffusion of technology that can augment, rather than replace, the tasks of human workers (Cedefop, 2022).

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CHAPTER 8

Demand for Skills in AI-related Occupations: Polish and European perspectives

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8.1 Introduction

Artificial Intelligence (AI) is a reality. The experience of technological breakthroughs in the 20th century indicates that AI may also become an important driver of economic development, especially at a time when populations are shrinking across Europe. As a result of its groundbreaking nature, it may also have negative consequences for labour, alongside posing a number of ethical problems. There are, for instance, concerns about the replacement of workers by machines and increases in labour market inequality resulting from, amongst other things, labour market polarisation and the loss of jobs in the middle of the occupational structure.

Theoretical developments in labour economics since the beginning of the 21st century point to a gradual reduction in the demand for labour engaged in the performance of routine tasks. These tasks might be quite complicated but the fact they are routine means that they are replicable by, for instance, robots. Replicable should not be read as simple or uncomplicated. The implication that jobs will be replaced by machines suggests significant productivity increases will materialise. To date, automation has replaced primarily tasks and jobs in the middle part of the occupational structure – i.e., mainly in administration and production jobs – while shifting people without higher education to the lower part of the wage distribution (Autor 2024). But this may change in the future. In the case of AI in particular, it turns out that it can learn faster and better than expected such that its future application potentially extends far beyond carrying out routine tasks.

Returning to automation more generally, Restrepo (2023) has summarised its labour market impact as follows:

- automation reduces the share of labour in companies and industries which implement automated processes;
- automation changes the occupational structure of labour in companies, sectors and economies by reducing the demand for labour in professions exposed to the risk of automation;
- automation reduces the relative demand for groups of workers who perform tasks subsequently automated through a displacement effect (professional tasks are transferred from people to machines) and increases labour productivity and profits at the same time; and
- automation may reduce real wages and employment if individuals who lose their jobs cannot shift to other tasks/jobs.

AI-supported technology can perform automatic, routine tasks, but also more demanding ones that require relatively high levels of cognitive ability. In doing so, it can replace some tasks traditionally performed by labour but not necessarily substitute for all of labour's efforts. In an experiment conducted by Noy and Zhang (2023), the effect of ChatGPT on the writing tasks of 444 professionals was analysed. In the experiment, half of the professionals were randomly assigned to use ChatGPT. The results revealed that ChatGPT improved the productivity of professionals undertaking basic (not advanced) writing: the evaluated quality of the writing increased by 0.4 standard deviations (compared with the control group), and time to conduct the task decreased by 0.8 standard deviations. This shows that AI can support or augment labour rather than replace it.

The ChatGPT example mentioned above demonstrates the way in which AI opens up new horizons. Large Language Models (LLM), of which ChatGPT is an example, have the potential to affect a wide range of high and low-level tasks which currently comprise people's jobs. The labour market impact of ChatGPT undertaken by Eloundou et al. (2023) in the USA revealed that:

- ChatGPT can perform at least 10 per cent of the tasks already performed by 80 per cent of the workforce;
- ChatGPT may affect 50 per cent of the work undertaken by 19 per cent of all employees;
- jobs at all levels are affected, but the impact is greater in higher-wage jobs;
- the impact of LLMs is currently concentrated in selected sectors but it is likely that its subsequent development will increasingly affect other sectors;
- trained generative systems exhibit characteristics of general-purpose technolo-

gies, that is, they have potential to affect the whole economy not just specific sectors.

Research studies conducted in Europe indicate a generally positive impact of AI on employment levels but with no impact on wages (Albanesi et al., 2023). The employment gains are mainly amongst high-skilled workers. The impact on wages was statistically insignificant. Similar results were reported by Acemoglu et al. (2023) for the Netherlands. Here, production line workers, conducting routine tasks, were replaced by robots with a negative impact on their wages and employment. In contrast, other employees performing non-routine tasks were seen to benefit. The fact is that high-skilled workers and those involved in non-routine tasks benefit from automation and AI, at least from an employment standpoint. The impact of AI appears to be similar to those observed for previous waves of technological change (from the first to third industrial revolutions).

Much of the evidence on the impact of AI on employment and wages is from the USA (Acemoglu et al., 2022; Alekseeva et al., 2021; Beblavý et al., 2016). This chapter is about Poland. It utilises data on online job vacancies retrieved from:

- the repository at the Department of Economics and Finance of University of Information Technology and Management in Rzeszow, Poland, which contains online job offers from the job portals and public employment services in Poland; and
- Cedefop's OVATE database.[34]

Based on these datasets, skill requirements in AI-related occupations/jobs are identified as well as changes in mix of skills required in these jobs over time. While the focus is on Poland, comparisons are made with other selected European Union (EU) member states using Cedefop's OVATE data.

34 *Authors sincerely thank Eurostat and Cedefop for access to the data.*

8.2 Methodology

The analysis of AI-related labour demand and skills' requirements for Poland is based on the online job offers posted between 2016-2023 on the largest recruitment portal in the country: https://www.pracuj.pl/. The demand for employees in AI-related jobs was estimated based on the number of appearances of selected terms in the titles of advertised job offers. These terms describe job positions closely related to AI which are not yet fully captured by both national and international job classifications. The use of these terms rather than the names of occupations listed in the Polish Classification of Occupations and Specialties (equivalent to the ISCO-08 classification) is justified given that the focus is on extracting information from those job offers related to AI. The selected terms related to AI and its various domains included the following:

- analytical domain related to data analysis: Business Analyst and Data Analyst;
- data-related domain: Data Architect, Big Data, Data Mining and Data Engineer;
- machine learning domain: Data Science (Scientist), Natural Language Processing, Machine Learning and Computer Vision;
- general and other specific aspects of artificial intelligence.

The number of occurrences of individual entries translates into the number of job offers posted for particular jobs. The skills analysed in the study were isolated from the content of job advertisements using natural language processing methods. This provides a basis for identifying the share of offers for a selected jobs in which a given AI related skill is mentioned. For example, for the position of Business Analyst there were 6,844 job offers advertised on the portal's website throughout 2023, of which the competence 'ability to use the SQL scripting language' appeared in 2,384 advertisements. Accordingly, the percentage of advertisements in which this competence was indicated amounted to 35 per cent.

To investigate skill demand across EU countries, data provided by Cedefop were used. The analysis was conducted on job titles defined in ESCO. This is how the Cedefop data are compiled. Among 3,007 formally designated occupations in the ESCO classification five were identified as being related to the AI domain: (i) Computer Image Recognition System Engineer; (ii) Data Analyst; (iii) Data Management Specialist; (iv) Business Analyst in the field of Information and Telecommunications Technologies; and (v) Designer of Intelligent Information and Telecommunications Technology Systems. The skill intensity of all job offers for the AI occupations was analysed. Not all skills found in job postings for the above-mentioned jobs were closely related to AI. Many of them were either of a general IT-related nature or related to more general transversal skills. Some skills, however, were assigned only to the AI-related occupa-

tions specified by ESCO. These included: machine learning; digital image processing; performing dimensionality reduction; image formation; deep learning; and building recommender systems.

8.3 Demand for AI-related skills in the online job offers in Poland

We analysed the text contained in job offers to search for the skills required in AI-related jobs (see Table 8.1). These skills were grouped by area which is broader than an occupation. For example, the area of big data includes the occupations of big data architect, and big data analyst. The analysis was supplemented by including requirements for using specific tools as indicated by employers (see Figure 8.1). Here the analysis was limited to those related to the software or programming languages that employers listed in their job adverts (i.e., not extracted from unstructured text). Using this approach three more skill areas were identified (as shown in Figure 8.1). These data were merged with that extracted from the unstructured data to identify the most frequently mentioned skills related to AI jobs advertised online job in Poland. These included the following:

- the ability to work and operate products and services in the field of cloud technologies: Amazon Web Services, Google Cloud Platform and Microsoft Azure (including Azure DevOps, Azure HDInsight, Azure SQL and Azure Synapse);
- the ability to write scripts using programming languages and scripting languages: Python, Java, SQL, R, C++, Scala, C, DAX, JavaScript, C#, Bash;
- the ability to work with IT software: Docker, Kubernetes, SAS, SAP, Jenkins;
- the ability to work with data visualisation software: Power BI, Tableau;
- the ability to work with databases: PostgreSQL, Oracle products, Microsoft SQL Server, MongoDB, NoSQL, Apache Cassandra;
- the ability to work with machine learning libraries in Python: PySpark, PyTorch, Tensorflow, Pandas, Scikit-learn, Keras;
- the ability to work with operating systems: Linux, Windows Server;
- knowledge of IT paradigms, concepts and areas: computer vision, natural language processing, machine learning, AI, big data, business process model and notation (BPMN), Extract, Transform, Load (ETL), Agile (process management methods software production), data visualization, data engineering, predictive analytics, DevOps;
- other IT skills (ability to work and use): Microsoft Excel, Git version control systems (including GitHub and GitLab), Apache Hadoop, Apache Kafka, Apache Spark, Databricks, Apache Airflow, Confluence, Jira, Terraform, and BigQuery.

Table 8.1: The most frequently mentioned skills in AI-related job offers in Poland, 2023

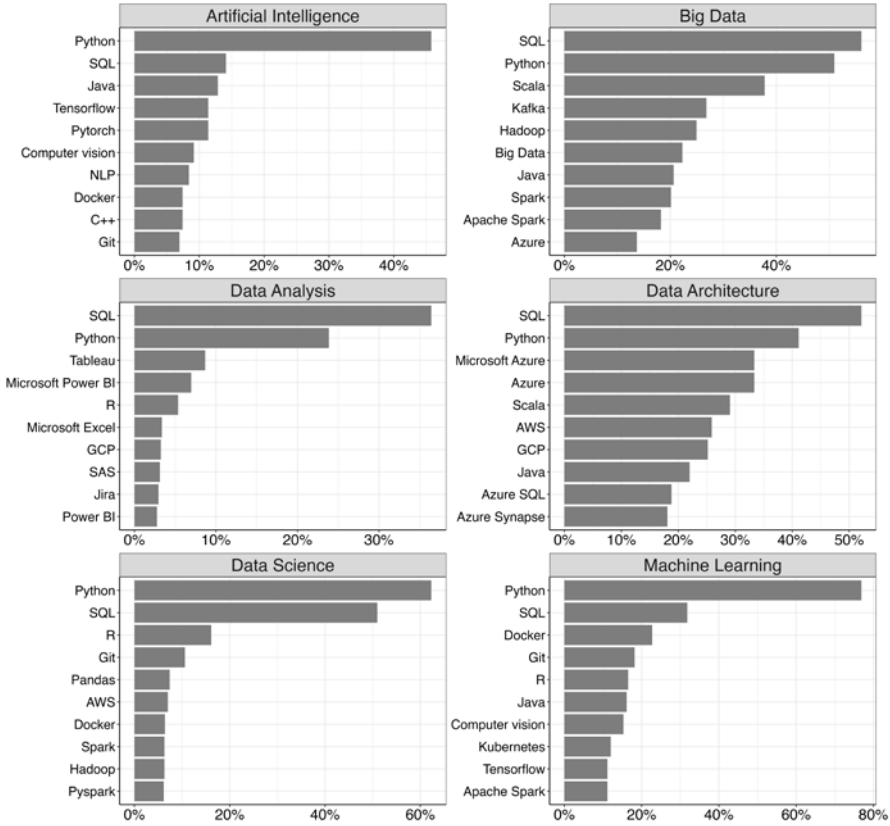
Business analysis	Data analysis	Big Data	Data science
Analytical thinking	English language literacy	English language literacy	Ability to work with models (mathematical/ statistical)
Knowledge of the SQL query language	Knowledge of the SQL query language	Knowledge of the SQL query language	Ability to validate models
English language literacy	Ability to work with Microsoft Azure	Knowledge of Python (data processing area)	Knowledge of how to build and evaluate models based on machine learning algorithms
Team working skills	Ability to develop and implement solutions based on analytical models	Knowledge of Databricks tool	Programming skills
Programming skills	Knowledge of Microsoft Office (especially Excel)	Ability to work with data such as: parquet, delta, xml, json, avro, csv	Ability to analyse data in Python or SAS
Knowledge of low-code platforms	Knowledge of Power BI software	Ability to design and build data processing solutions	Knowledge of tools for processing large data sets (Spark, Hadoop, SQL)
Knowledge of enterprise architect	Knowledge of DAX language	Ability to design and develop ETL processes (SSIS, ADF, synapse, airflow)	Knowledge of neural networks
Knowledge of relational databases	Knowledge of Python or other programming languages	Analytical thinking	Ability to build deep learning models
Knowledge of designing web services and management dashboards	Ability to prepare data visualization	Knowledge of databases: relational (PostgreSQL) and NoSQL (MongoDB),	Knowledge of MLOps and production libraries: airflow, kubeflow, kedro
Knowledge of UML and BPMN	Ability to work with large data sets and data modelling	Knowledge of Microsoft Azure products (event-hubs, storage, synapse)	Analytical thinking

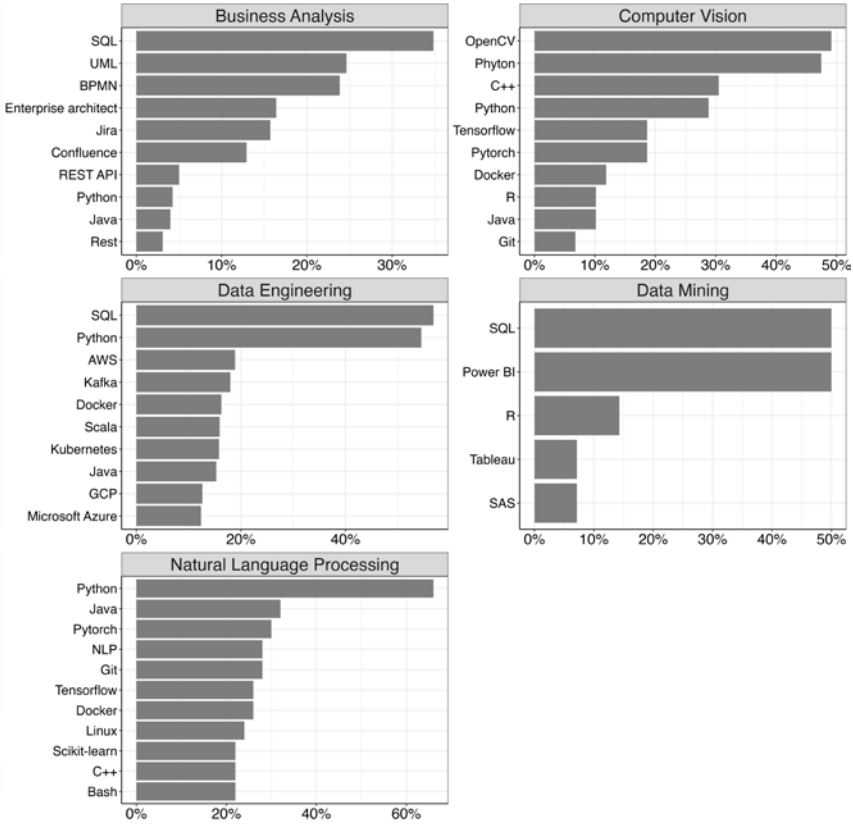
TABLE 8.1 (CONTINUED): THE MOST FREQUENTLY MENTIONED SKILLS IN AI-RELATED JOB OFFERS IN POLAND, 2023

Data engineering	Natural language processing	Computer vision	Machine learning
Ability to work in a Kubernetes environment	Ability to collect data from the Internet and search for information	Python programming skills	Ability to process data for data science projects
Knowledge in creating data flows using Airflow, Spark	Knowledge of machine learning algorithms	Ability to create algorithms and work with OpenCV	Ability to create and optimize statistical models and AI/ML algorithms
Knowledge of Big Data tools, e.g.: Cloudera, Hortonworks Data Platform, BigQuery, Snowflake	Knowledge of NLP tools and algorithms	English language literacy	Knowledge of machine learning algorithms
Programming skills in Python or Scala	English language literacy	Knowledge of the areas: computer vision, machine learning & image processing	Knowledge of Git and GitHub
Knowledge of the SQL query language	Knowledge of the Linux operating system	Knowledge of Docker or similar tools	Knowledge of Docker or similar tools
Ability to design and develop data processing processes	Knowledge of tools: Numpy, Scikit-learn, Tensorflow, PyTorch, Keras, Pandas, Caffe	Embedded computer vision	Knowledge of statistics
Knowledge of databases: relational (PostgreSQL) and NoSQL (MongoDB)	Knowledge of Git and GitHub	Ability to design and implement CV models and algorithms	Knowledge of Power BI software
English language literacy	Knowledge of Docker or similar tools	Knowledge of cloud solutions for machine learning	Knowledge of Azure Machine Learning
Knowledge of ETL/ELT and data migration	Python programming skills	Analytical thinking	Programming skills in Python, R, SQL
Ability to work with Microsoft Azure	Knowledge in data engineering and/or data science	Knowledge of machine learning and deep learning algorithms	Ability to process different types of data

Source: Own elaboration based on data retrieved from https://www.pracuj.pl/

Figure 8.1: The most frequently mentioned skills in AI-related job offers in Poland, 2023





Note: AWS - Amazon Web Services (provider of IT products and services), GCP - Google Cloud Platform (provider of IT products and services), UML – Unified Modelling Language (language for modelling various types of systems), BPMN - Business Process Model and Notation (graphical notation for describing business processes), NLP – Natural Language Processing. The horizontal axis shows the percentage of job offers in which a given skill was listed in relation to the total number of vacancies for a given position.

Source: Own elaboration based on data retrieved from https://www.pracuj.pl/

The ability to programme in Python appeared to be the most frequently required skill by employers for the selected job offers. It was identified among the most frequently required skills for 10 out of 11 selected positions (it was not included among the requirements related to data mining, but another language complementary to Python was indicated – i.e., the R programming language for statistical analyses). The ability to use Python was often required from specialists dealing with machine learning (mentioned in 77 per cent of online job adverts for machine learning positions), natural language processing (66 per cent), specialists in the field of data science (62 per cent), data engineers (55 per cent), and specialists in the field of big data (51 per cent). The ability to write scripts in Python was recorded to a lesser extent in job offers addressed to Business Analysts and Data Analysts. Among the professions related to AI according to ESCO, the Python programming language appeared among the skills requirements of Computer Image Recognition System Engineers and Designers of Intelligent Information and Telecommunications Technology Systems. In job advertisements addressed to computer vision specialists, Python was also required, but the percentage of vacancies in which it was indicated turned out to be lower than in the above-mentioned jobs.

The ability to use the SQL query language was the second most frequently required skill. This skill appeared among the most frequently requested skills for nine out of 11 selected positions. SQL, however, was not among the most frequently sought after skills for Natural Language Processing Specialists and Computer Vision Specialists. In both cases, SQL was in demand, but it was not essential according to employers. SQL skills were most often required in job advertisements for Data Engineers (57 per cent of online adverts for this position), Big Data Specialists (56 per cent), Data Architects (52 per cent), Data Science specialists (51 per cent), and Data Mining specialists (50 per cent).

Java programming language was also important from the employer's point of view. It appeared among the most required skills for eight of the 11 selected positions. Java was not among the most frequently mentioned skills in job offers addressed to Data Analysts, Data Science Specialists, and those involved in data mining. In the case of the latter position, mention of Java did not appear in the job advertisements at all. Relatively often knowledge of Java was present in job offers related to natural language processing (32 per cent), job offers addressed to Data Architects (22 per cent), those related to working with large data sets (21 per cent), machine learning (16 per cent) and data engineering (15 per cent).

Requirements regarding the ability to work with Docker software appeared among the most frequently required skills for six out of 11 positions. Docker was most often required in job offers related to natural language processing (26 per cent), machine learning (23 per cent), in offers addressed to Data Engineers (16 per cent), specialists dealing with computer vision (12 per cent), and artificial intelligence (7 per cent).

Another highly valued programming skill was the R statistical computing language. It appeared among the most frequently requested skills for 5 out of 11 positions. The greatest number of job advertisements seeking the R language were recorded for offers in the field of machine learning (17 per cent), data science (16 per cent), for positions related to data mining (14 per cent), and computer vision (10 per cent).

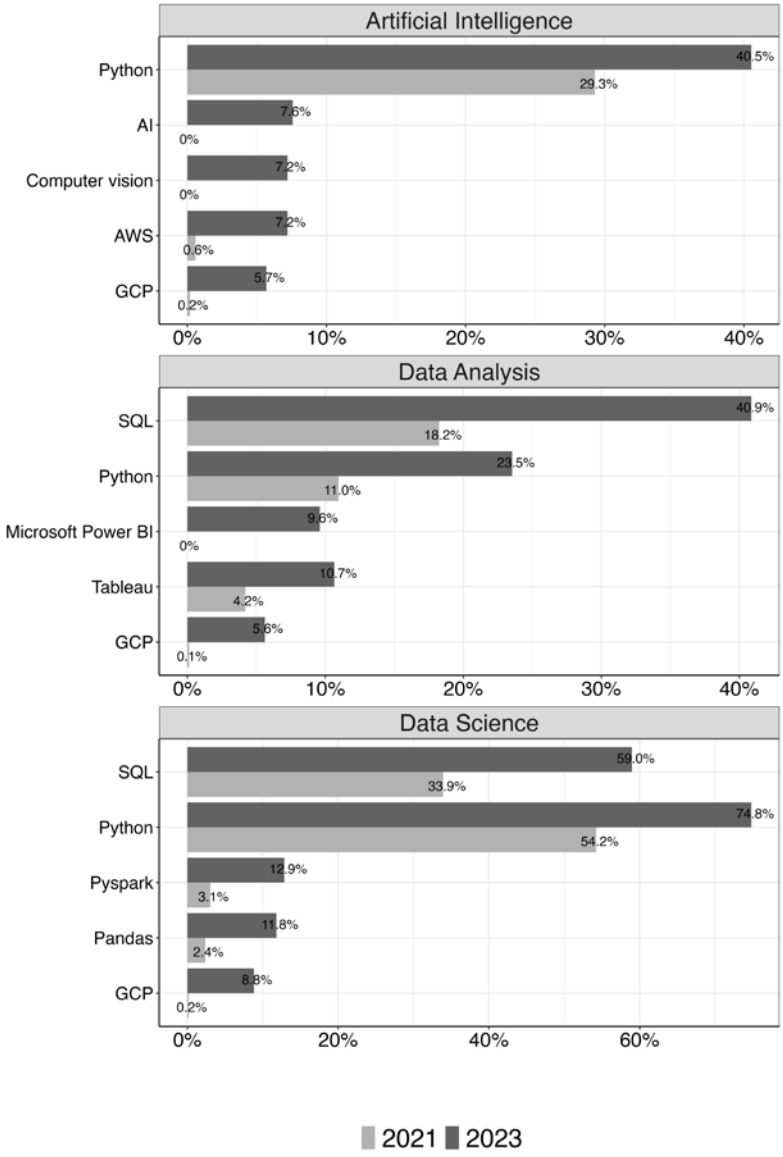
Skills specific to particular jobs were also identified (such skills may also appear in job advertisements for other jobs but much less frequently, see Table 8.1). For example, Data Analysts were required to have the ability to develop and implement solutions based on analytical models, the ability to prepare data visualisations, the ability to work on large data sets and data modelling, the ability to pose and verify business hypotheses and test new solutions. Employers expected Computer Vision Specialists to possess skills in creating algorithms and working with OpenCV, having knowledge in the field of computer vision and machine learning, knowledge in the field of embedded computer vision (including the use of camera interfaces), advanced knowledge in neural networks, experience in camera calibration, knowledge of image analysis algorithms, and/or 3D point clouds (object detection, segmentation, tracking, etc.). Job offers addressed to specialists dealing with natural language processing required: the ability to collect data from the internet and search for information, knowledge of natural language processing tools and algorithms; experience in natural language processing (text classification, corpus linguistics, text analysis. sentiment analysis and extraction information); and experience in building and preparing models based on natural language processing for use in business. The offers addressed to Machine Learning Specialists included: knowledge of machine learning and deep learning algorithms; the ability to create and optimise statistical models and AI/ML algorithms; the ability to work with unstructured data; the ability to process different types of data; and knowledge in the field of statistics.

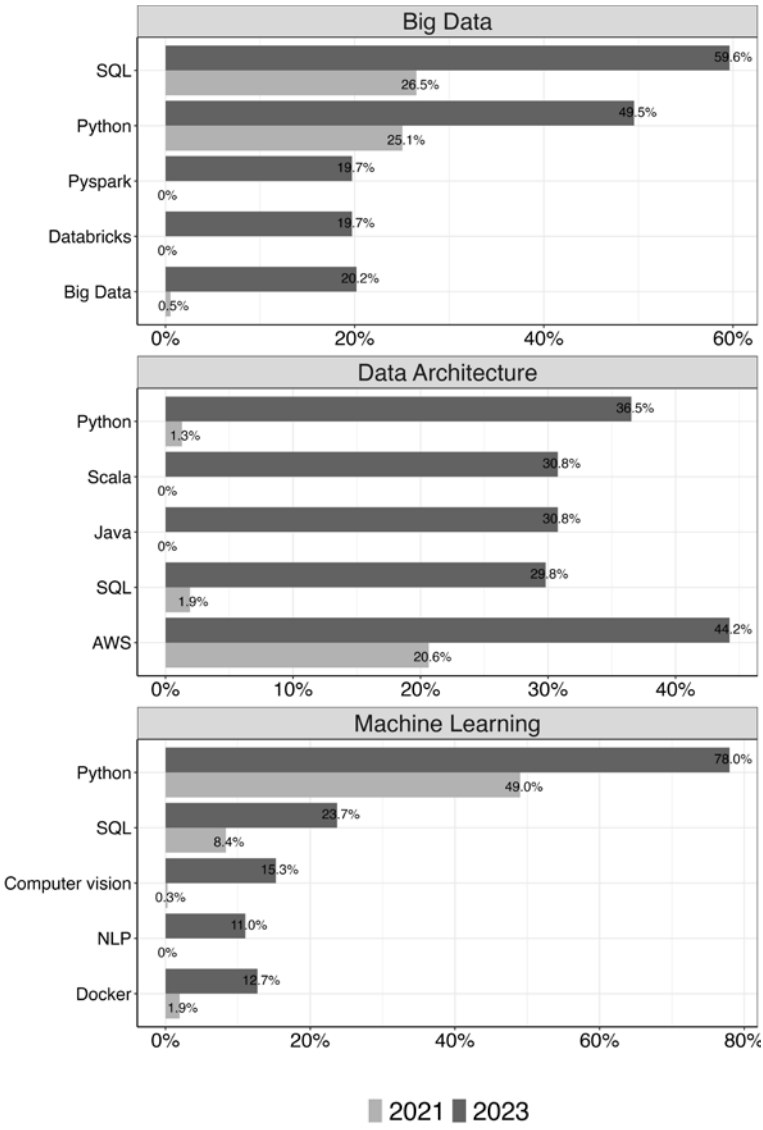
There is also an interest in understanding how the demand for AI-related skills has changed over time. Figure 8.2 shows the skills which recorded the highest increase in demand between 2023 and 2021. It should be noted that some skills did not appear in job offers published in 2021 (or the demand for these skills was very low). This is related to the specificity of the data source, and the methodology of analysing texts from

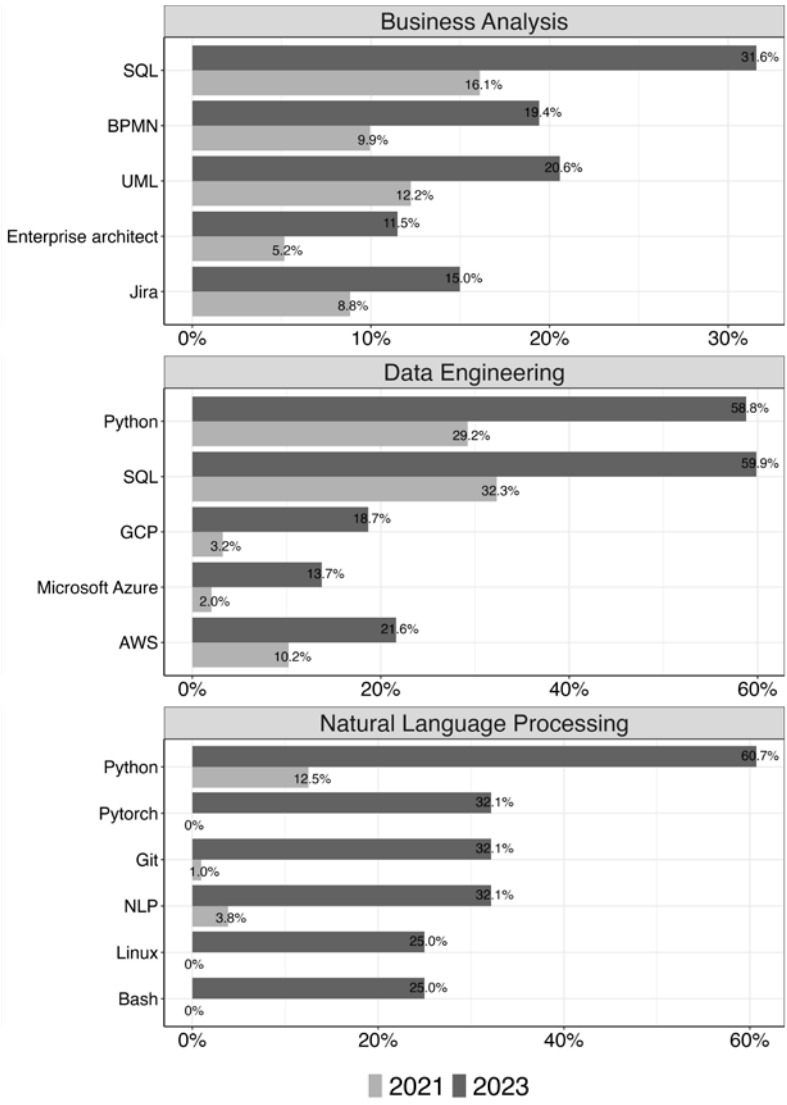
job advertisements. Firstly, even though the chosen recruitment website (www.pracuj.pl) is the largest in Poland, it is a general-purpose job board, not specifically IT-related. Secondly, in 2021 AI-related skills were less well defined by those advertising for AI related skill compared with 2023. This means that some potential AI skills might have been hidden in other terms. Notwithstanding this caveat, the highest increase in demand was for the following skills:

- Python programming skills – appeared among the skills with the highest increase in frequency for 8 out of 11 positions (average increase of 26 percentage points);
- the ability to write scripts in SQL – for seven out of 11 positions (average increase of 24 percentage points);
- the ability to work and use products and services from the cloud solutions provider Amazon (Amazon Web Services) – for four positions out of 11 (average increase of 12 percentage points).
- The ability to work and use Docker software– for four out of 11 positions (average increase of 13 percentage points);
- the ability to work and use products and services from the cloud solutions provider Google (Google Cloud Platform) – for four positions out of 11 (average increase of 9 percentage points);
- the ability to work with the Git version control system – for four out of 11 positions (average increase of 15 percentage points);
- the ability to work and use products and services from the Microsoft cloud solutions provider (Microsoft Azure) – for three positions out of 11 (average increase of 10 percentage points);
- knowledge in natural language processing – for three out of 11 positions (average increase of 15 percentage points);
- the ability to work with the pyspark library – for three out of 11 positions (average increase of 11 percentage points);
- the ability to work with Apache Spark software – for two out of 11 positions (average increase of 12 percentage points).

Figure 8.2: Skills with the highest increase of incidence in AI-related job offers in 2023 compared to 2021 in Poland




Big Data
SQL
Python
Pyspark
Databricks
Big Data
59.6%
26.5%
49.5%
25.1%
19.7%
0%
19.7%
0%
20.2%
0.5%
0%
20%
40%
60%
Data Architecture
Python
Scala
Java
SQL
AWS
36.5%
1.3%
30.8%
0%
30.8%
0%
29.8%
1.9%
44.2%
20.6%
0%
10%
20%
30%
40%
Machine Learning
Python
SQL
Computer vision
NLP
Docker
78.0%
49.0%
23.7%
8.4%
15.3%
0.3%
11.0%
0%
12.7%
1.9%
0%
20%
40%
60%
80%
2021
2023



Note: The results are based on job offers announced between June to December 2021 and 2023. The horizontal axis shows the percentage of job offers in which a given skill was listed in relation to the total number of vacancies for a given position. Skills are sorted in descending order by the difference in the percentage of appearance in job offers in 2023 in relation to 2021.

Source: Own elaboration based on data retrieved from https://www.pracuj.pl/

8.4 Demand for AI-related skills in the online job offers in selected European countries

Skills which were most frequently mentioned in online job offers posted in selected European Union countries (Austria, Belgium, Czech Republic, France, Germany, Ireland, Italy, the Netherlands, Poland, Spain, Sweden, United Kingdom) in 2023 are depicted in Figure 8.3. These skills, according to the jobs assigned to AI in the ESCO classification, included the following:

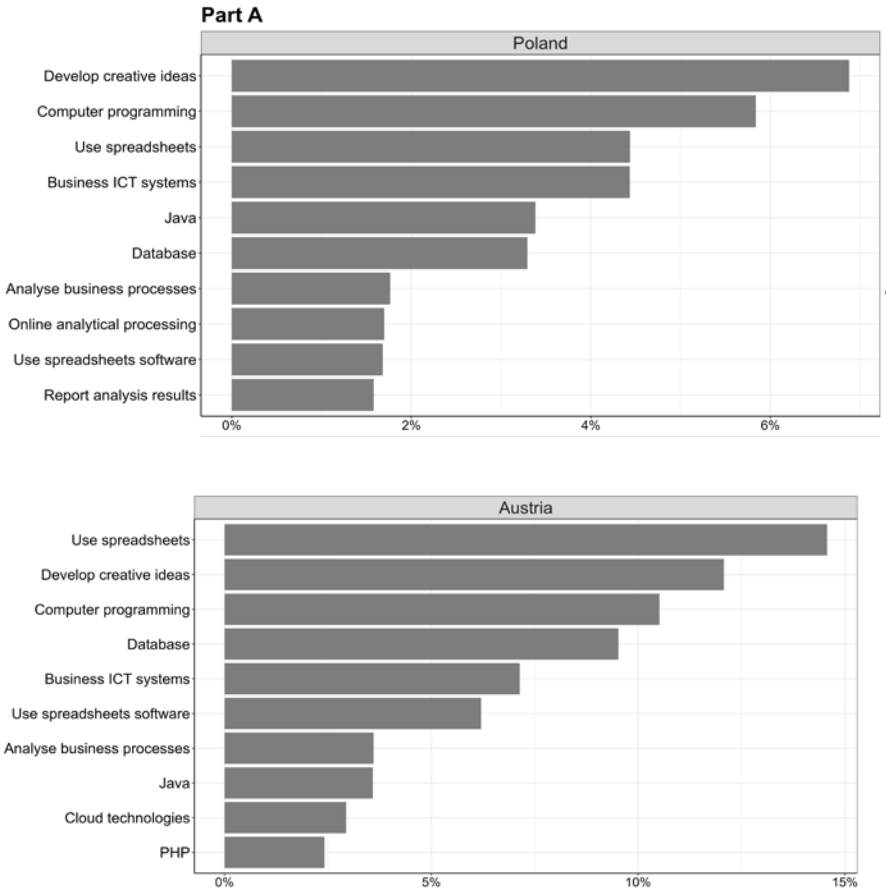
- the ability to work with databases. This was among the most required skills in all selected countries. The average percentage of all job advertisements (not only AI-related) in which this skill appeared was 7 per cent. The highest percentage of job offers mentioning the skill was recorded in Ireland (14 per cent), and the lowest in Spain and Poland (3 per cent);
- the ability to use spreadsheets was among the most required skills in all selected countries. The average percentage of advertisements in which these skills appeared was 10 per cent; the highest was in Ireland (17 per cent), and the lowest in Poland (4 per cent);
- the ability to develop creative concepts was among the most required skills in all selected countries. The average percentage of advertisements including this skill was 9 per cent. The highest was in Ireland (17 per cent), the lowest was in Belgium (5 per cent). In Poland it was 7 per cent;
- computer-programming skills were also among the most required skills in all selected countries. The average percentage of advertisements including this skill was 7 per cent. The highest was in Ireland (16 per cent) and the lowest was in France (2 per cent). In Poland it was 6 per cent;
- knowledge of ICT systems for business was frequently mentioned in all countries. The average percentage of job advertisements mentioning this skill was 5 per cent. This was highest in Ireland (13 per cent), the lowest in France (2 per cent). In Poland it was 4 per cent;
- the ability to use spreadsheet software was a skill frequently required in 10 out of 12 countries. The average percentage of advertisements including this skill was 4 per cent. The highest was in Austria (6 per cent) and lowest in Poland (2 per cent);
- the ability to analyse business processes appeared among the most required skills in nine out of 12 countries. The average percentage of job advertisements including this skill was 3 per cent. The highest was in Ireland (9 per cent), the lowest in Belgium (1 per cent). In Poland it was 2 per cent;
- the ability to prepare reports based on conducted analysis was required in nine out of 12 countries. The average percentage of advertisements including this skill was 4 per cent; the highest was in Ireland (11 per cent), and the lowest was in the

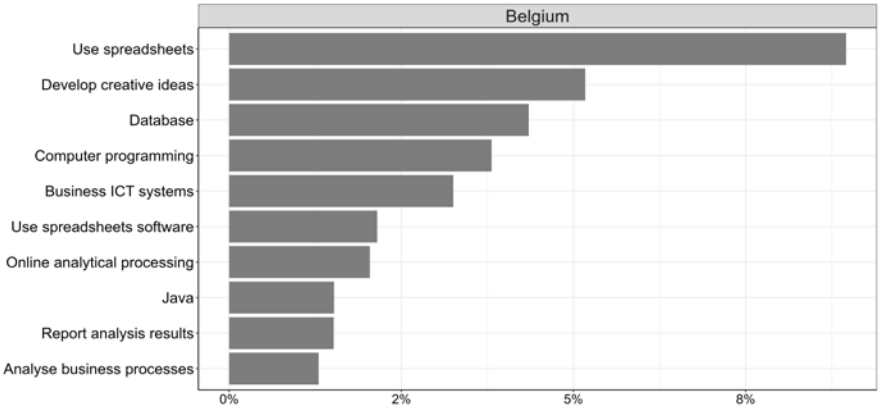
Czech Republic (0.8 per cent.) In Poland it was 2 per cent;

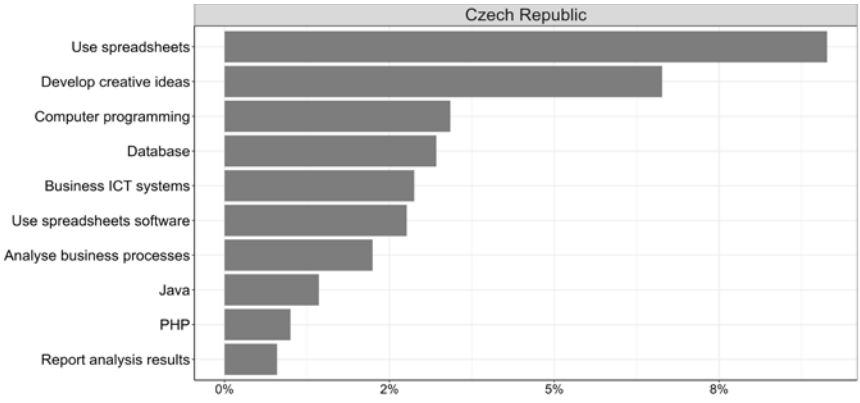
- Java programming skills - Java programming language appeared among the most required skills in eight out of 12 countries. The average percentage of job advertisements including this skill was 2 per cent with the highest was in Austria (4 per cent) and the lowest in the Czech Republic (1 per cent). In Poland it was 3 per cent;
- online analytical processing skills was mentioned in 6 out of 12 countries. The average percentage of advertisements in which this skill appeared was 7 per cent with the highest in the UK (15 per cent) and was lowest in Poland (2 per cent).

These results show that some skills required for job-related occupations become universal reflected in the high percentage of job offers that includes them. Many of the AI-related skills were in higher demand in Ireland compared with other countries. Poland ranks quite low in this respect. The average percentage of the 10 most frequently required AI-related skills (in all advertised job offers) was 4 per cent, the highest for the ability to develop creative concepts (7 per cent), and the lowest for the ability to prepare reports on analysis (2 per cent). Only France, the Czech Republic and Belgium recorded a lower percentage than Poland.

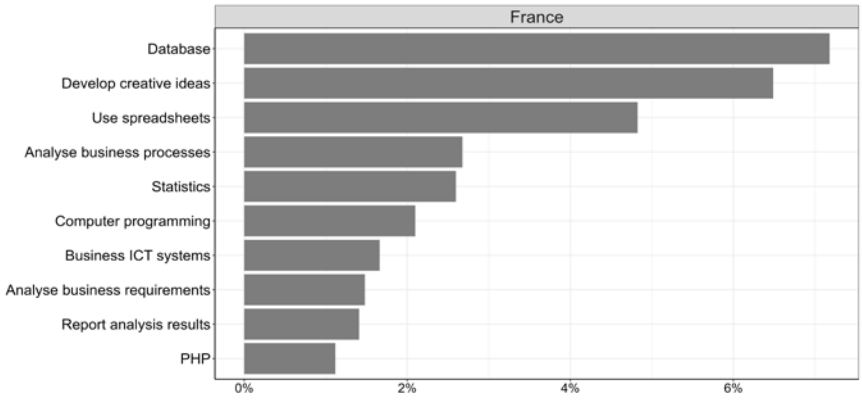
Figure 8.3: The most frequently mentioned skills in AI-related occupations demanded in job offers in selected European countries, 2023

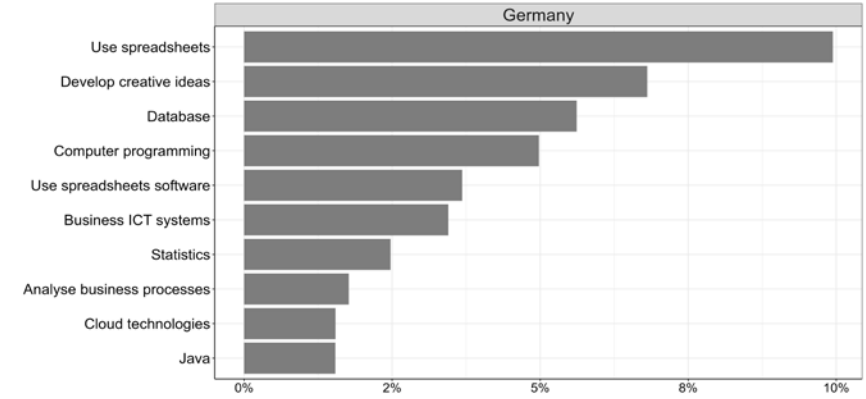


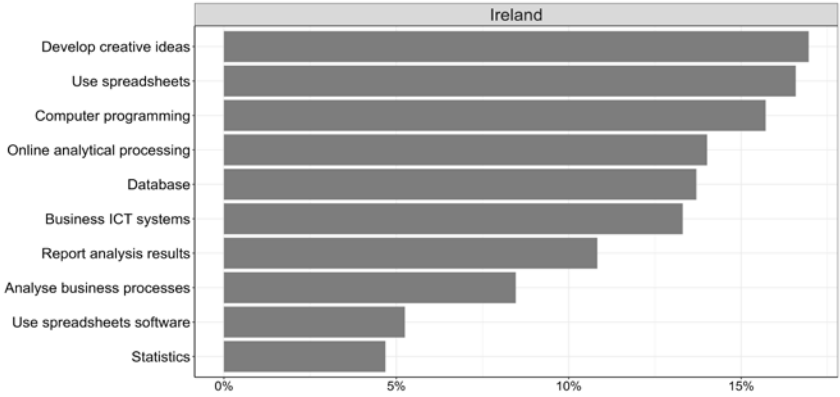

Belgium
Use spreadsheets
Develop creative ideas
Database
Computer programming
Business ICT systems
Use spreadsheets software
Online analytical processing
Java
Report analysis results
Analyse business processes
0%
2%
5%
8%


Czech Republic
Use spreadsheets
Develop creative ideas
Computer programming
Database
Business ICT systems
Use spreadsheets software
Analyse business processes
Java
PHP
Report analysis results
0%
2%
5%
8%

Part B


France
Database
Develop creative ideas
Use spreadsheets
Analyse business processes
Statistics
Computer programming
Business ICT systems
Analyse business requirements
Report analysis results
PHP
0%
2%
4%
6%


Germany
Use spreadsheets
Develop creative ideas
Database
Computer programming
Use spreadsheets software
Business ICT systems
Statistics
Analyse business processes
Cloud technologies
Java
0%
2%
5%
8%
10%


Ireland
Develop creative ideas
Use spreadsheets
Computer programming
Online analytical processing
Database
Business ICT systems
Report analysis results
Analyse business processes
Use spreadsheets software
Statistics
0%
5%
10%
15%

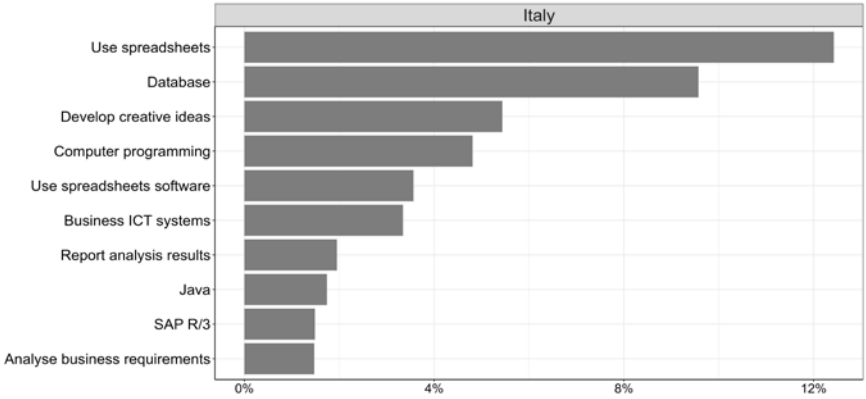
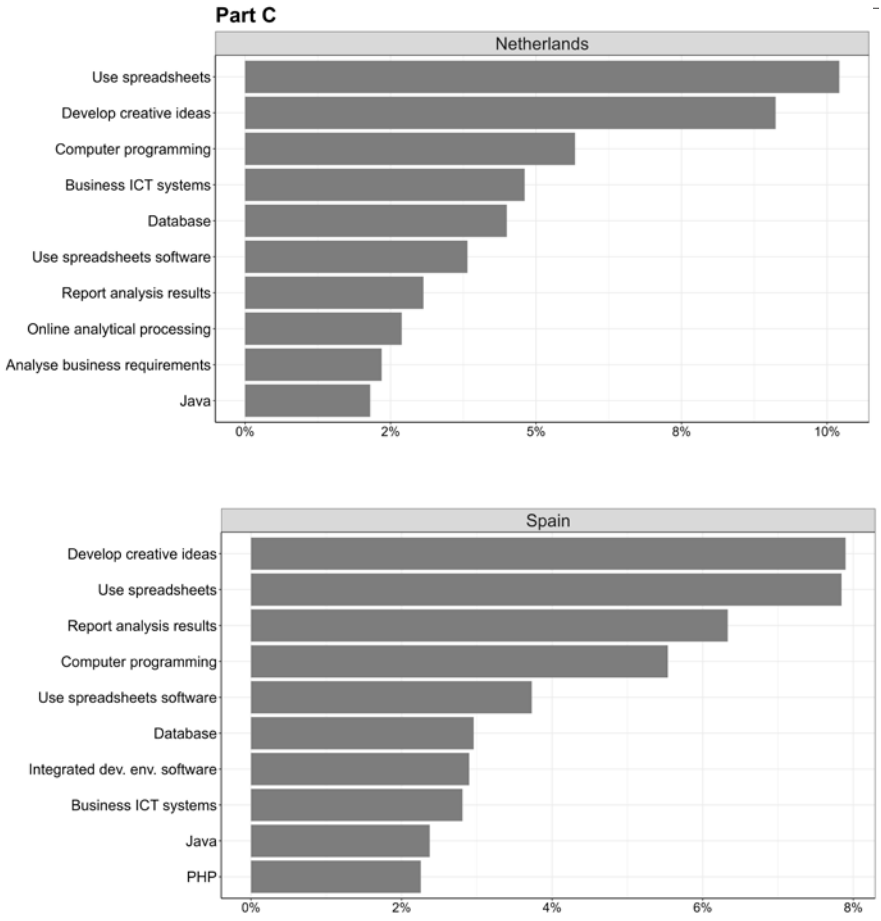
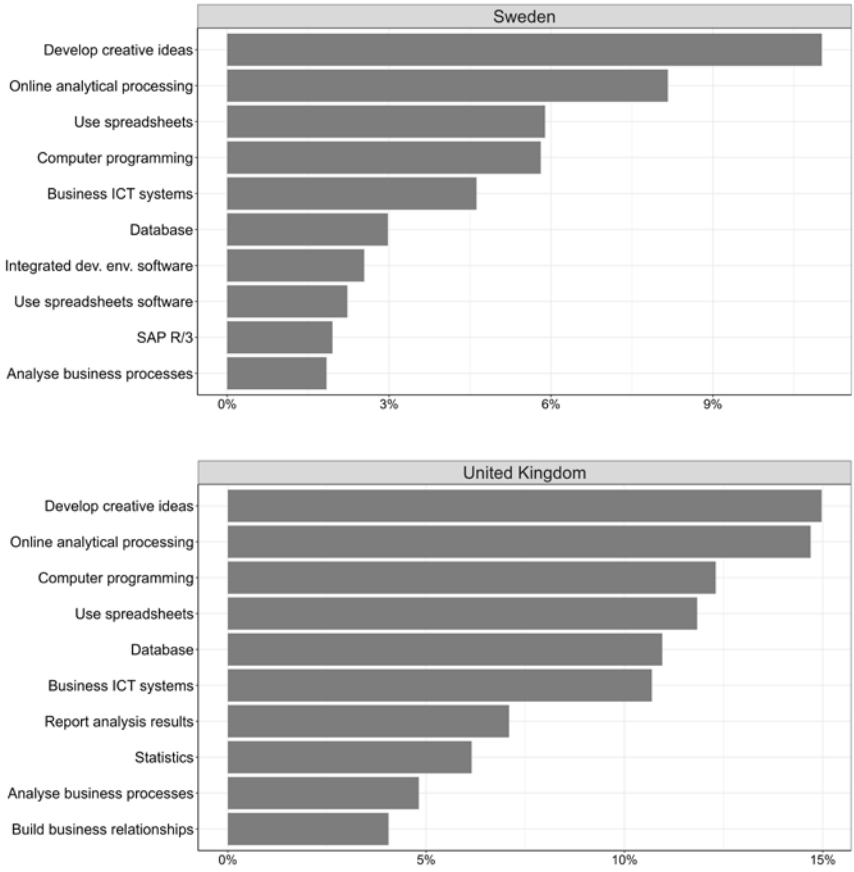

Italy
Use spreadsheets
Database
Develop creative ideas
Computer programming
Use spreadsheets software
Business ICT systems
Report analysis results
Java
SAP R/3
Analyse business requirements
0%
4%
8%
12%

FIGURE 8.3 (CONTINUED): THE MOST FREQUENTLY MENTIONED SKILLS IN AI-RELATED OCCUPATIONS DEMANDED IN JOB OFFERS IN SELECTED EUROPEAN COUNTRIES, 2023





Note: The results are based on job offers posted between January to September 2023. The horizontal axis shows the percentage of job offers in which a given skill was listed in relation to the total number of vacancies for a given country.

Source: Own elaboration based on data retrieved from Cedefop

Among the skills identified in ESCO, only a relatively small fraction concerned those strictly related to AI. These were: machine learning, digital image processing, performing dimensionality reduction, developing data processing applications, image creation, deep learning, development of recommendation systems, data classification management, algorithms, artificial neural networks, creative use of digital technologies, development of statistical software, computer image recognition, and development of prognostic models.

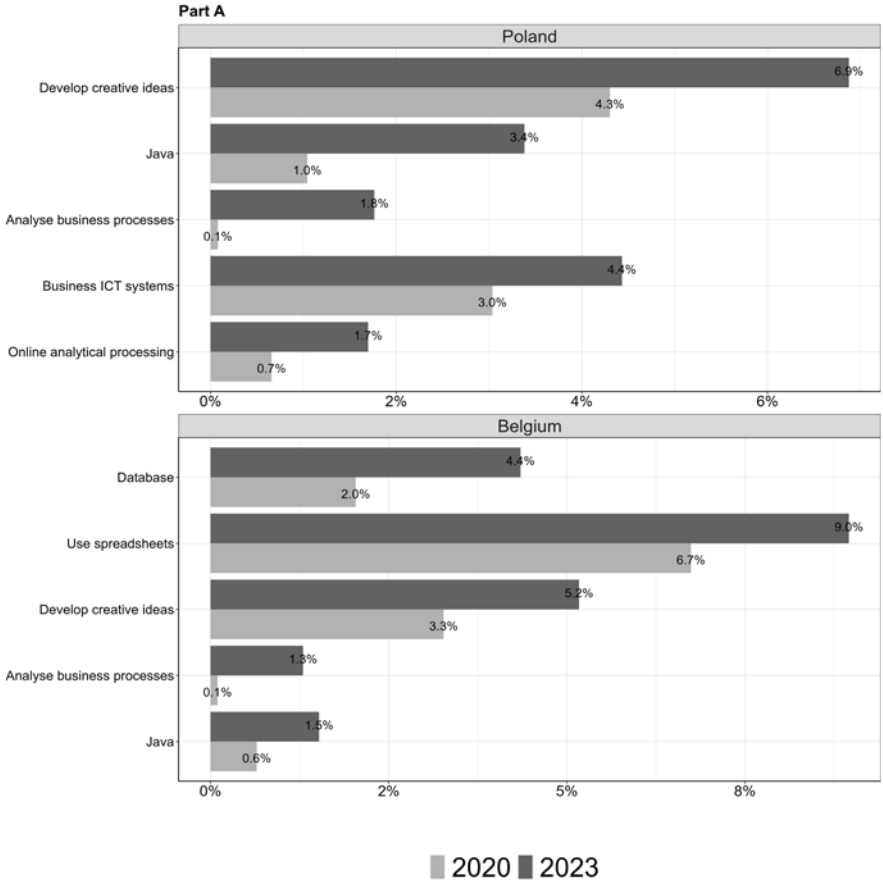
Figure 8.4 depicts the skills which exhibited by the highest increase in demand between 2020 and 2023 across the selected European countries. The percentages shown in the chart were calculated for all advertised job offers. Among these skills the following were identified across the countries:

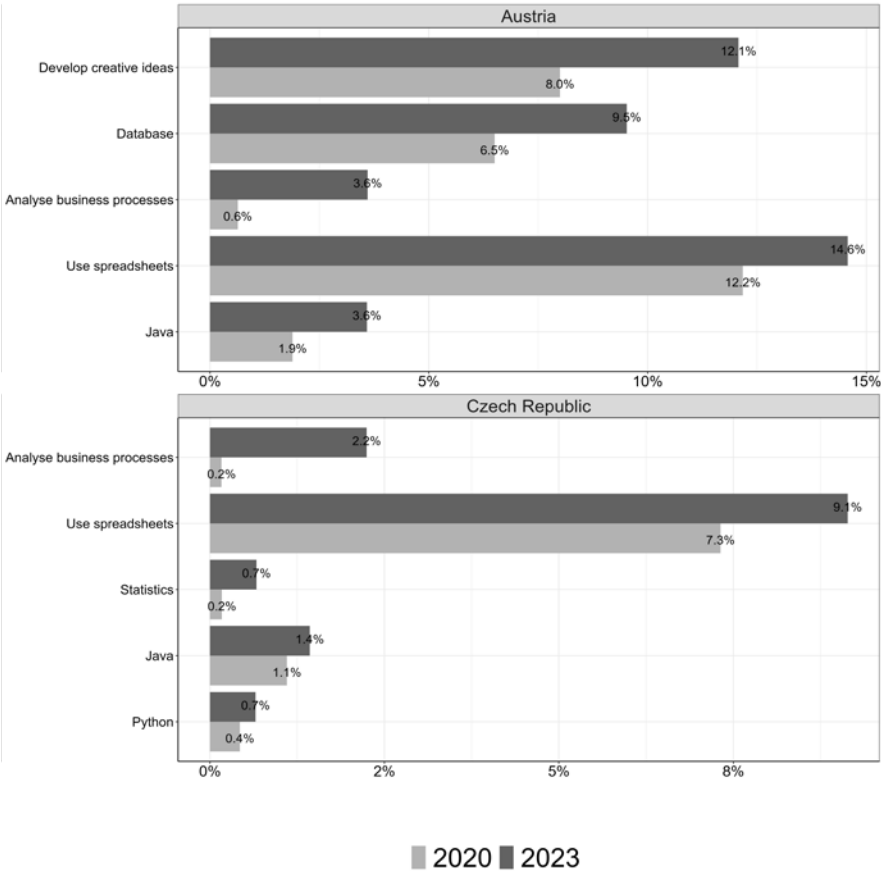
- the ability to analyse business processes – identified in all selected countries (average increase by 2.4 percentage points);
- the ability to write scripts using the Java programming language – identified in 9 selected countries out of 12 (average increase by 0.9 percentage points);
- the ability to conduct scientific research – identified in 9 countries (average increase by 0.5 percentage points);
- the ability to write scripts using the Python programming language – identified in 6 countries (average increase by 0.4 percentage points);
- the ability to conduct analyses based on internet resources – identified in 6 countries (average increase by 0.1 percentage point);
- the ability to analyse business requirements – identified in 6 countries (average increase by 0.5 percentage points);
- the ability to work with databases – identified in 6 countries (average increase by 2.3 percentage points);
- the ability to use spreadsheets – identified in 6 countries (average increase by 1.5 percentage points);
- the ability to develop creative concepts – identified in 6 countries (average increase by 2.5 percentage points);
- the ability to work with cloud technologies – identified in 5 countries (average increase by 0.4 percentage points).

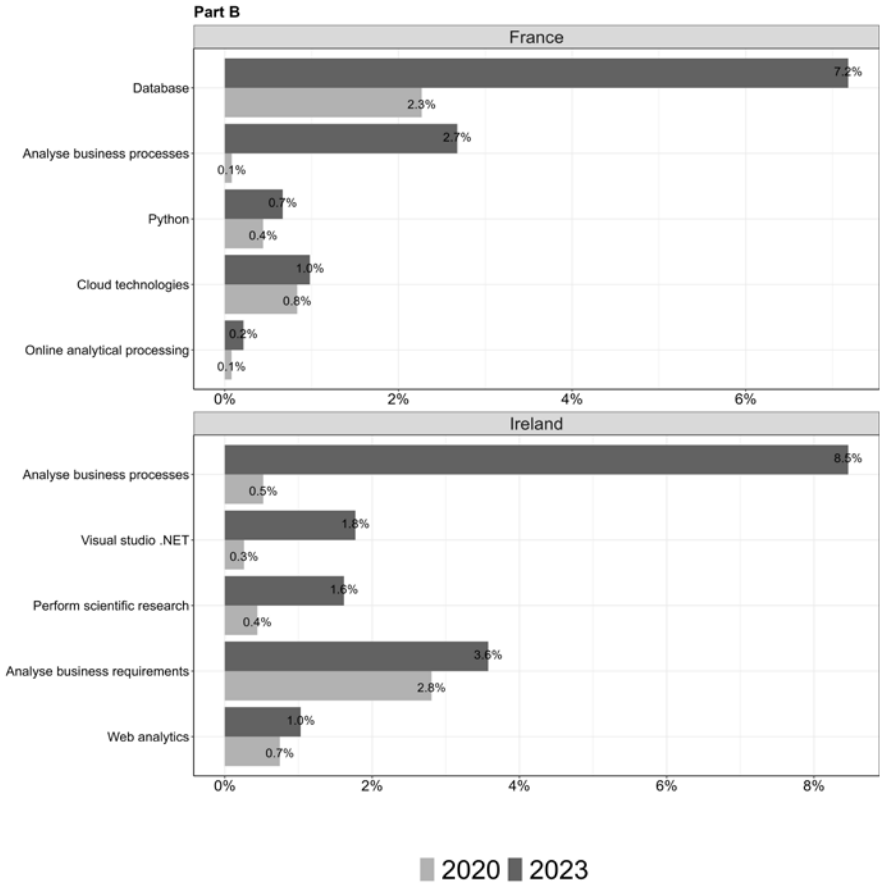
In total, four out of 10 of the skill listed above were ones in relatively high demand in Poland. These included the ability to analyse business processes, the ability to programme in Java, the ability to work with databases and the ability to develop creative concepts. In Poland, compared with other selected European Union countries,

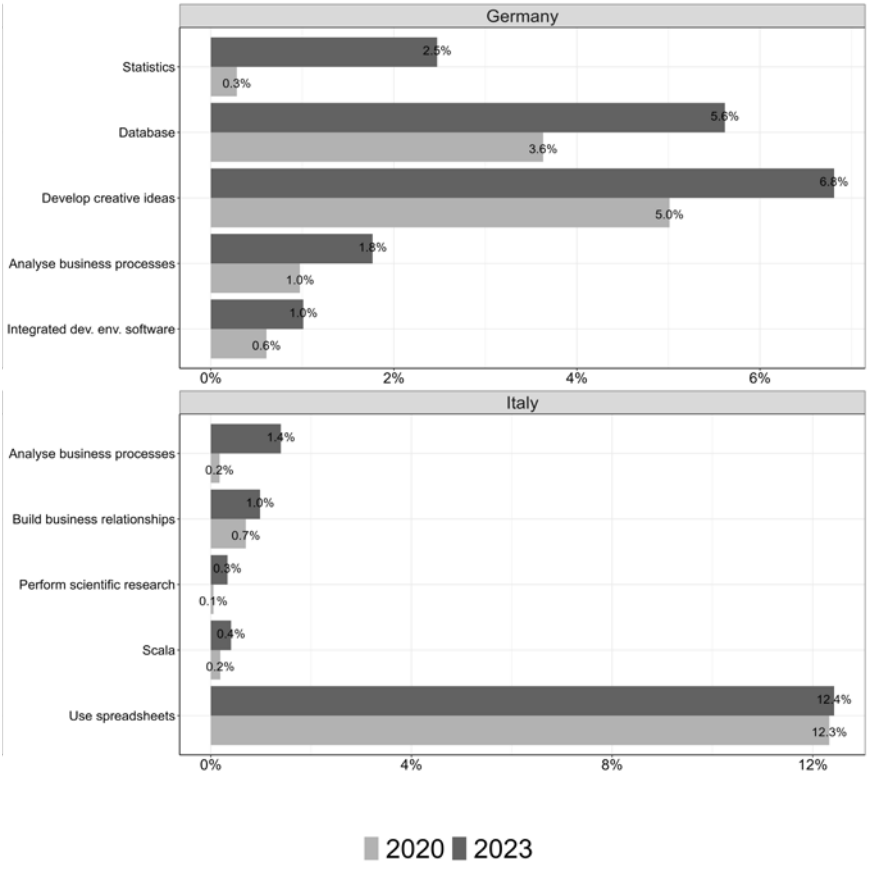
the ability to program in Java appeared to be much more frequently mentioned. The opposite situation was observed in the case of skills regarding the use of databases – a significantly greater increase in this skill requirement was observed in the other European countries. Similar intensity of demand growth was recorded for the ability to develop creative concepts and the ability to analyse business processes in Poland compared with the other countries.

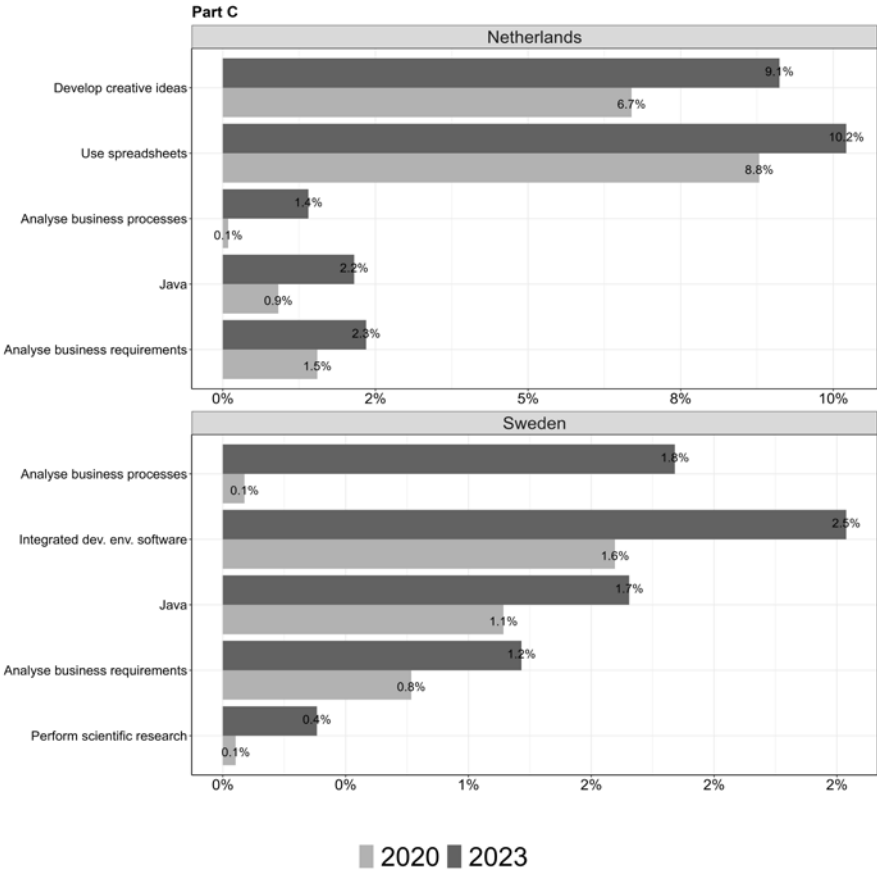
Figure 8.4: Skills with the highest increase of incidence in job offers in 2023 compared to 2020 among those required in AI professions in selected European Union Member States

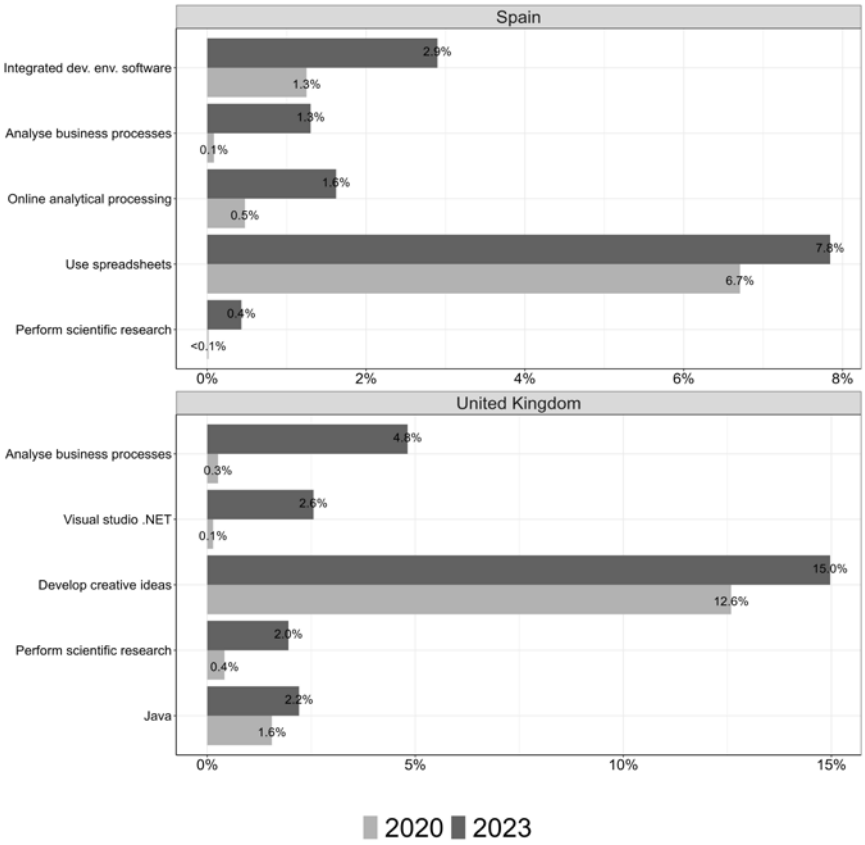



Austria
Develop creative ideas
12.1%
8.0%
Database
9.5%
6.5%
Analyse business processes
3.6%
0.6%
Use spreadsheets
14.6%
12.2%
Java
3.6%
1.9%
0%
5%
10%
15%
Czech Republic
Analyse business processes
2.2%
0.2%
Use spreadsheets
9.1%
7.3%
Statistics
0.7%
0.2%
Java
1.4%
1.1%
Python
0.7%
0.4%
0%
2%
5%
8%
2020
2023


Part B
France
Database
Analyse business processes
Python
Cloud technologies
Online analytical processing
7.2%
2.3%
2.7%
0.1%
0.7%
0.4%
1.0%
0.8%
0.2%
0.1%
0%
2%
4%
6%
Ireland
Analyse business processes
Visual studio .NET
Perform scientific research
Analyse business requirements
Web analytics
8.5%
0.5%
1.8%
0.3%
1.6%
0.4%
3.6%
2.8%
1.0%
0.7%
0%
2%
4%
6%
8%
2020
2023


Germany
Statistics
2.5%
0.3%
Database
5.6%
3.6%
Develop creative ideas
6.8%
5.0%
Analyse business processes
1.8%
1.0%
Integrated dev. env. software
1.0%
0.6%
0%
2%
4%
6%
Italy
Analyse business processes
1.4%
0.2%
Build business relationships
1.0%
0.7%
Perform scientific research
0.3%
0.1%
Scala
0.4%
0.2%
Use spreadsheets
12.4%
12.3%
0%
4%
8%
12%
2020
2023


Part C
Netherlands
Develop creative ideas
9.1%
6.7%
Use spreadsheets
10.2%
8.8%
Analyse business processes
1.4%
0.1%
Java
2.2%
0.9%
Analyse business requirements
2.3%
1.5%
0%
2%
5%
8%
10%
Sweden
Analyse business processes
1.8%
0.1%
Integrated dev. env. software
2.5%
1.6%
Java
1.7%
1.1%
Analyse business requirements
1.2%
0.8%
Perform scientific research
0.4%
0.1%
0%
0%
1%
2%
2%
2%
2020
2023



Note: The results are based on job offers announced between January to September 2020 and 2023. The horizontal axis shows the percentage of job offers in which a given skill was sought in relation to the total number of vacancies for a given country. The results apply only to skills assigned to AI professions according to the ESCO classification. Skills are sorted in descending order by the difference in the percentage of appearance in job offers in 2023 in relation to 2020.

Source: Own elaboration based on data retrieved from Cedefop

8.5 Conclusions

The results of the analysis show that the skills required in AI-related professions across selected European countries necessary to perform professional activities according to the ESCO classification, are not strictly AI-related but are of a rather general IT characteristic (e.g., ability to use spreadsheets or knowledge of business ICT systems). Some of these skills appear quite often in job offers unrelated to either AI or IT. The demand for such skills has been growing recently, which is confirmed by the increasing incidence of AI/IT-related skills in the job offers published online. It needs to be noted that the demand intensity for AI/IT-related skills is unevenly distributed across European countries, with a relatively high intensity of demand for such skills in Ireland compared with relatively low intensity in Belgium, Czech Republic, France, and Poland. This points to differences in the development and readiness to take full advantage of the benefits that new digital technologies offer. More importantly, it reveals the challenges that European Union and the Member States have been facing.

To address these challenges the EU established the Digital Decade Policy Programme 2030. One dimension of the programme is devoted to skills. There are two targets to be achieved by 2030 related to creating a digitally skilled population:

- 80 per cent of adult population to possess at least basic digital skills;
- 20 million ICT specialists to be in employment.

These are relevant to the results presented here. In the future more jobs are likely to be specialist AI-related ones which implies that the demand for highly-skilled AI specialists will accelerate. There is a danger of economically damaging AI related skill shortages increasing. At the same time, if non-IT jobs also increasingly require their incumbents to possess some IT / AI-related skills, this is likely to increase, other things being equal, the incidence of skill shortages in national labour markets. Important policy implications stemming from these observations refer to:

- provision of AI/IT-related skills in study programmes within the formal schooling system (potentially requiring the introduction of changes to curricula);
- development of upskilling and reskilling opportunities for the adults under formal and non-formal training programmes within adult learning systems; and
- combining development of AI/IT-related skills with other cognitive ones required by employers (e.g., ability to analyse business processes is one of the most in-demand skills in AI-related jobs).

More in-depth studies are needed to identify the exact scale and types of AI/IT skills likely to be in demand in the future and the risk of skills shortages and gaps arising.

This needs to be bear in mind, as shown in the analysis presented above, differences between European countries regarding their demand for specific AI-related skills.

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CHAPTER 9

Artificial Intelligence and the Future of Workers

Maria Laura Fornaci and Paolo Gubitta

9.1 Introduction

Technological innovation has always been one of the most important factors affecting the nature of work and the employability of people at work. In the early part of the 21st century, the rapid pace at which radical technological innovations have followed one another has posed challenges for the future of work and workers. The case of ChatGPT is emblematic. It was 30th November 2022 when the American artificial intelligence (from now on, AI) research laboratory OpenAI launched ChatGPT, and in doing so, more or less instantly made the world aware of this breakthrough technology's potential. Only five days after its release, more than a million users had tested it (Chui, et al., 2023). Because of its advanced writing capabilities, ease of use, response speed, and proficiency at carrying out complex tasks, ChatGPT has been described as the best and most promising AI chatbot released to the general public (Schulten, 2023).

The rapid proliferation of new generative AI technologies has led to mixed reactions. On the one hand, there are those who see AI leading to the elimination of many jobs with an increasing number of people facing exclusion from the labour market; on the other, there are those who place more importance on the gentle face of AI, because it will take over repetitive tasks while leaving activities that involve the exercise of judgment to humans. Bearing this in mind, this chapter analyses the impact of AI on competences. The aim is to provide a framework for identifying the characteristics of skills that ongoing technological change will make obsolete and those that will be enhanced. The define of competence used aligns with CEDEFOP's definition (see box below).

Definition of competence

Competence is an amalgamation of cognitive elements, functional aspects, attitudes, and ethical values: (a) cognitive elements (knowledge) include established facts, figures, concepts, ideas, and theories that facilitate understanding in a specific domain or subject; (b) functional aspects (skills) refer to the ability and capacity to carry out processes and utilise existing knowledge, methods, and tools to produce desired outcomes; (c) attitudes and ethical values (social abilities) encompass predispositions and mental orientations towards acting or responding to ideas, individuals, or situations.

Source: European Commission (2019)

This chapter begins by exploring the potential risks and benefits of AI developments for labour. Then, it describes a model (the T-Shaped Model) – already established in the literature – that provides an understanding of how skills can be combined to address technological change. Lastly, there is consideration of public policies and managerial actions that can be implemented to reduce any potential displacement effects in the labour market and increase the likelihood of reinstatement effects.

9.2 Understanding AI and Its Impact on Work

The term "AI" was first coined in 1955 by Professor John McCarthy, to define "the science and engineering of making intelligent machines". More recently, the European Commission defined it as follows in its Communication on AI: "Artificial intelligence (AI) refers to systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals. AI-based systems can be purely software-based, acting in the virtual world (e.g. voice assistants, image analysis software, search engines, speech and face recognition systems) or AI can be embedded in hardware devices (e.g. advanced robots, autonomous cars, drones or Internet of Things applications)"[35].

35 Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions on Artificial Intelligence for Europe, Brussels, 25.4.2018 COM(2018) 237 final.

The process of machine learning has had a significant impact on the automation process and the development of AI-based systems (e.g., intelligent data processing, chatbots, autonomous robots and vehicles), providing robots and software the possibility to sense the environment and learn how to react to changes in it, as well as to process and make sense of a wide array of digital data (OECD, 2023; Kaplan, 2016). In other words, the AI-based systems and automation technologies powered by machine learning have progressively increased their ability to perform non-routine, cognitive tasks, such as natural language and information processing, information ordering, reasoning and decision-making. These are key tasks in many highly-paid occupations, which typically require their incumbents to have completed post-secondary education. This means that several skills previously considered hard to replicate by machines are now more susceptible to automation. Nonetheless, the introduction by companies of AI-based systems might have different impacts on the workforce and, in aggregate, on the labour and skill demand, depending on how and to what extent such technologies are introduced and deployed in company processes.

According to recent studies, automation and AI have an ambivalent impact on employment and job-related skills (OECD, 2023). In some cases, there is a *displacement effect*, because technology encompasses certain activities, thereby nullifying the value of some skills in the workplace. The consequence is a depreciation (net devaluation) of skills in the labour market and a decrease in the job market viability of individuals possessing these skills. For example, assembly line workers in manufacturing, especially in the automotive and electronics industries, have been increasingly replaced by autonomous robots and automated systems. These machines can work faster, more precisely, and continuously without breaks, reducing the need for human labour engaged in repetitive, manual tasks. In other cases, technology creates a *productivity effect*, complementing the way in which humans undertake tasks within their jobs thereby boosting their effectiveness. Journalists or content producers, for instance, may be assisted by language processing systems that quickly collates and recombines information or news available on the web or in specific databases, freeing the human to deal with more sensitive and/or added value tasks, such us the fact-checking, the preparation of in-depth content which involve the expression of personal opinions using the judgment and critical capacity that only humans possess (for now). Similarly, those engaged in marketing roles can leverage intelligent data processing systems to analyse customer data, gaining insights into their buying patterns and preferences. This information can help them tailor sales pitches and marketing campaigns and improve customer interactions. Lastly, there is a *reinstatement effect*, characterised by the new tasks in existing jobs or new jobs which exist solely as a consequence of new technologies being introduced into the workplace. It is the case of some logistics /

warehouse jobs: for example, machines now autonomously move goods around creating new jobs or tasks associated with machine monitoring and maintenance.

The displacement effect prevails in repetitive and manual tasks, given the capacity of AI-based systems to carry out handling activities requiring manual dexterity, reading comprehension, deductive and inductive reasoning skills, fluency of ideas and scheduling skills, typically associated with low and middle-skilled occupations. The productivity and reinstatement effect prevails in those tasks requiring analytical and critical thinking, complex problem-solving, high-level management and social interaction, as well as the functional skills for designing, inputting and monitoring digital and automated processes, typically associated with high skilled occupations (Lassébie and Quintini, 2022).

9.3 The effects of AI on jobs

To better understand the effect of AI on jobs we might want to conceptualise the process of accomplishing a job as performing a series of tasks, knowing that AI can:

- *take over all the tasks of a job*, leading to a total automation and human *replacement* and thus to *job displacement*. As in the case of automated teller machines, which are gradually replacing bank tellers;
- *take over some of the tasks of a job*, leaving workers to perform what the machine cannot and possibly supervise some processes. This is the case of the assembly line workers mentioned above;
- *complement the tasks undertaken by a worker*, taking over tasks that workers do not relish undertaking or are over-qualified for, so they can apply their skills to more valuable, more interesting tasks. As in the case of journalists mentioned above;
- *augment the tasks undertaken by a worker*, leading to changes in the tasks undertaken which affects the efficiency and effectiveness of the worker, and to an increase of the efficiency and effectiveness of task performance and productivity, as in the example of marketeers (in fact, this may be true of all jobs in the commercial sphere);
- *generate new tasks* leading to new job creation.

So, what type of tasks are more resistant to automation and can eventually benefit from it? Automation directly substitutes human labour in executing a subset of tasks involving routine, codifiable and narrowly defined activities that can be fully delineated by rules and procedures, encoded into algorithms and software, and executed by

non-sentient machines. While "non-routine" tasks that require abstract reasoning and interpersonal communication have largely remained beyond machines' capabilities, at least until now (Autor, 2022). Accordingly, not only are tasks involving abstract reasoning and communication not replaced by computers; they can be complemented or augmented by them, since AI can provide improvements in the efficiency and precision which tasks are undertaken, if workers are able to use AI-based systems and software and free extra time for performing more complex tasks. As evidenced from previous waves of technological change, automation can be a double-edged sword. While increasing the productivity of highly educated workers, particularly those with a lower baseline proficiency (Dell'Acqua et al., 2023), it has the potential to displace the tasks of those with intermediate level skills who tasks though sometimes complex were routine and thereby codifiable.

It is important to note that not all tasks resistant to automation are high-skill ones. Jobs requiring dexterity, simple but non-routine communication, and common sense, such as waiting tables, cleaning, picking and boxing items, and so on, rely heavily on tacit knowledge. These tasks remain largely unaffected by automation because they are hard to codify in algorithms. These are often low-waged jobs. Such considerations might raise concerns about the risk of increased *job polarisation* induced by the introduction of AI-based systems, which have a negative or at best neutral on low to medium-skilled jobs but have a largely positively impact on high-skilled ones (Felten et al., 2019).

Whilst it is difficult to predict the medium-term impact of AI on jobs, empirical evidence from recent studies carried out in 16 European countries suggest that there is no positive correlation between potential exposure to AI and job loss (Albanesi et al., 2023). On the contrary, employment opportunities for young, skilled workers have increased, while positions for medium-skilled workers at risk of automation have not decreased much at all. To limit as much as possible the negative automation/AI effect on jobs, whilst increasing its potential to complement and/or augmenting human tasks and work, it can be argued that it will be important to develop two lines of action:

1. equip people with a broader skill set, such as cognitive and social skills enabling the execution of non-routine, non-narrowly defined tasks; and new skills, such as those needed to interact with AI-based systems, for complementing or augmenting human tasks, or those required for carrying out new emerging tasks or jobs created by AI;

2. invest in change management and process re-engineering interventions within companies to design new organisational structures and job roles that embo-

dy both machine and human abilities (Kretschmer & Khashabi, 2020). In words, opt for a value-adding strategy within firms where labour and technology are complementary, which is likely but not exclusively lead to reassigning labour to higher-value work, instead of a cost-cutting strategy where technology is used to reduce costs, especially by reducing those attached to labour (Schatsky & Schwartz, 2015).

The implications of the value-added strategy are explored in the sections that follow.

9.4 The T-shaped competences model for modern workers

How should competences be blended to equip the modern workforce with the skills and abilities to afford them protection from the potential displacement effects of AI and automation? Managerial studies provide analytical models that, starting from a skills perspective, suggest pathways for maintaining workers' employability, even in the face of rapid and sometimes unpredictable technological changes. The evidence suggests that workers need to enhance their *functional competencies* (specific to their job) by acquiring new skills, both soft and digital. Some research reports indicate the emergence of new hybrid or *superjobs* evolving from traditional roles through the integration of several competences: soft skills, professional skills, and digital skills (Schwartz et al., 2019). Some authors define these competences as a collection of essential knowledge, abilities, skills, and other attributes necessary for efficiently and effectively performing job-related tasks in the digital media sphere at work (Oberlander et al., 2020).

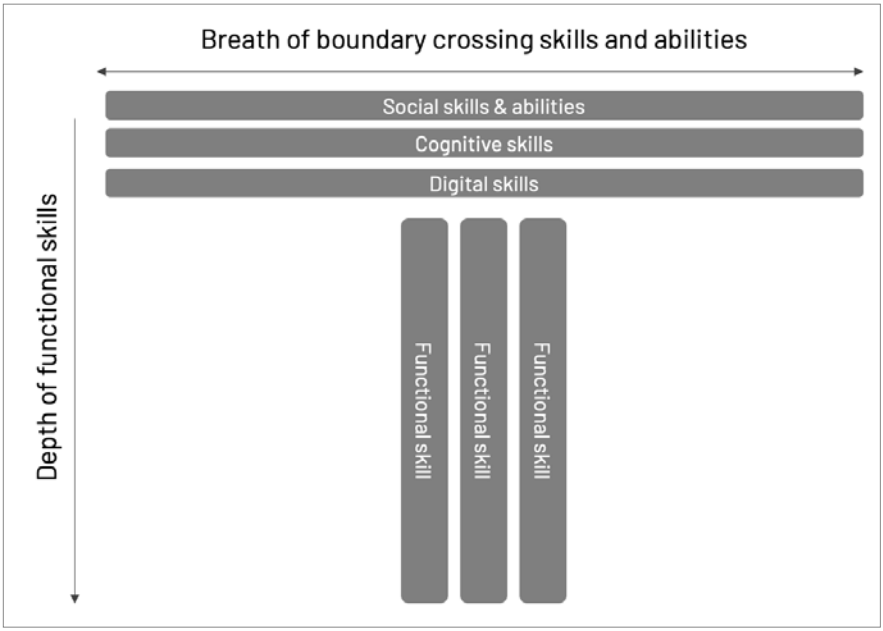
The career path towards these new roles mirrors the attributes of *T-shaped professionals*. This concept, first applied to describe the development of professionals in research and development, was later expanded to characterise professionals who combine deep knowledge in one area with a broad set of skills, enabling quick adaptation to changing roles and improved collaboration in multi-functional environments. Referencing work design literature, it can be stated that these new roles demand both a greater variety of skills, meaning the use of diverse skills in job performance, and increased skill specialisation, or in-depth knowledge in a specific field (Morgeson and Humphrey, 2003; Morgeson and Humphrey, 2006). The T-shaped model of competences offers a holistic framework for understanding and developing the skill sets required in today's work environment. This model, conceptualised as the letter 'T', consists of two primary elements (Figure 9.1):

1. the *Vertical Bar*: it represents deep, specialised knowledge and skills in a specific domain (functional skills). This is where an individual's unique expertise comes

into play, allowing them to make significant contributions in their specific area of focus. Whether it is applying methods to optimise industrial processes or integrating sustainability into product design, this deep dive enables professionals to address domain-specific tasks;

2. the *Horizontal Bar*: it symbolises a broad base of cross-discipline knowledge, skills, and social abilities which interact with and complement the vertical ones. These are the cognitive, digital and social skills that are valuable across different roles and industries and allow us to handle broadly related tasks. They include, but are not limited to critical thinking, data analysis, problem-solving and teamwork, digital and AI literacy, which is defined as "a set of competences that enables individuals to critically evaluate AI technologies, communicate and collaborate effectively with AI, and use AI as a tool online, at home, and in the workplace" (Long and Magerko, 2020). Moreover, the more the breadth of such boundary crossing expertise, the higher is the ability to understand, communicate and act across multiple disciplines and functions.

FIGURE 9.1: T-SHAPED MODEL



The T-shaped model advocates for a balanced development of skills, promoting not just depth in one's chosen field, as seen in traditional I-shaped competence model, but also a breadth of understanding and the ability to connect and collaborate across disciplines. This blend of broad cross-functional and deep specialised knowledge and skills enables professionals to adapt quickly to changing roles, to be drivers of innovation, to cope with complex situations, to communicate effectively, and excel in teamwork, especially in multidisciplinary, multifunctional, or multicultural settings (Leonard-Barton, 1995).

Developing T-shaped competencies among employees could reduce the risk of job displacement by focusing on both specialised and diverse skill sets. In various industries, employees primarily skilled in specific functional competencies may be more susceptible to job obsolescence. This susceptibility is linked to the relative simplicity of automating certain task-specific functions. On the other hand, the horizontal component of the 'T' includes a broad spectrum of:

- non-automatable skills, such as collaboration (a social skill) and analytical thinking (a cognitive skill), areas where robots and AI are currently not proficient; and
- *booster* skills, such as AI literacy / proficiency in AI (for example, AI command input), which, when integrated with other skills from either category (vertical or horizontal), can elevate the performance and productivity of workers in specific tasks, particularly those involving human-machine interaction.

9.4 Policy implications

The development of T-shaped skills by the workforce is crucial to move the bar of AI and automation toward the productivity effect rather than the displacement one and, in doing so, ensure a socially fair digital transition in Europe. The European Council recognises the importance of skill development by setting the primary goal of at least 60 per cent of all adults participating in training activities each year by 2030. If, however, recent trends persist into the future there has to be some doubt as to whether the target will be met. The problems contributing to low and unequal adult participation in learning are primarily twofold: (i) the limited financial support for adult training resulting from low investment, coverage gaps, time constraints, and fragmented assistance; and (ii) the inadequate motivation of individuals linked to limited self-awareness about the need to acquire new or update existing skills, unclear training options, concerns about quality of the training offer and recognition of training attainments, and misalignment with individual needs. To mitigate such constraints, the European Council,

following the outcomes of a series of studies,[36] has put forward two recommendations to Members States for the adoption of specific policy measures and complementary tools able to address some of the constraints above described: the Recommendation on a European approach to Micro-Credentials for Lifelong Learning and Employability (2022);[37] (2022) and the Recommendation on individual learning accounts (2022). [38]

Micro-credentials record the learning outcomes gained from short-term learning experiences, assessed against specific and transparent criteria. The learning experiences aim to impart specific knowledge, skills, and competences addressing societal, personal, cultural, or labour market demands. A micro-credential is awarded to the learner to provide shareable, portable standalone qualification or one that contribute to the award of larger qualifications, all supported by quality assurance processes which adhere to sector-specific standards. The recognised advantage of a micro-credential is its ability to be tailored to the needs of employers and individuals, being available in a "bite-sized" mode that facilitates accessibility, recognition, portability and stackability[39] of training attainments. The adoption of micro-credentials could make education more appealing to would-be learners by offering training in a more digestible, bite-sized manner that is readily exploitable in the job market. Nonetheless, lacking unified European standards to guarantee their quality, transparency, recognition and mutual compatibility across borders might inhibit micro-credentials impact on learning.

Individual Learning Accounts (ILA) provide working-age individuals with a personal budget in the form of a personal account to be spent on training. It targets all working-age adults, regardless of their employment status or professional position. It adopts a new approach to lifelong learning, separating training rights from their initial funder, be it a company or government, and giving full ownership to the individual. If combined

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36 A European approach to micro-credentials. Output of the micro-credentials higher education consultation group : final report https://op.europa.eu/en/publication-detail/-/publication/7a939850-6c18-11eb-aeb5-01aa75ed71a1

Study to support the Commission impact assessment on Individual Learning Accounts https://ec.europa.eu/social/main.jsp?catId=738&langId=en&pubId=8453&furtherPubs=yes

37 Available at the following link: https://data.consilium.europa.eu/doc/document/ST-9237-2022-INIT/en/pdf

38 For further information, see: https://data.consilium.europa.eu/doc/document/ST-8944-2022-INIT/en/pdf

39 Available at the following link: This refers to the possibility, where relevant, to combine different micro-credentials and build logically upon each other

with access to professional guidance and a support framework that includes a public registry of recognised training opportunities and paid training leave, ILAs could help learners surmount financial barriers, time constraints and lack of agency, enabling workers to access high quality education. This may be particularly beneficial to those working in SMEs or in jobs which traditionally have had limited or no access to company-sponsored training. Scenario analyses conducted as part of the impact assessment of ILAs by Fondazione Giacomo Brodolini (FGB) suggested that, if adopted by Member States, ILAs could increase participation in training activities, with the result that the 60 per cent of people in training target could be reached by 2030 (FGB, 2022).

9.5 Managerial implications

Moving from policy to human capital management within companies, the model presented in Figure 9.1 poses a question for human resources department: which human resources practices should be adopted to minimize the risk of *displacement effect* and increase the likelihood of generating a *reinstatement effect*? Work organisation practices and training processes are significant levers for managers and entrepreneurs to improve organisational performance and it is often technological changes which leads to these being reviewed. The key issue is how to ensure that functional skills and cross-discipline knowledge, skills, and social abilities, as required by the new technologies, are delivered in a sufficient and timely manner.

Regarding *functional skills*, an efficient way to heighten these is to create conditions that facilitate on-the-job knowledge transfer, including through mentoring programmes. In these programmes, the mentor, a more experienced individual, shares knowledge with a less experienced one within a relationship of mutual trust. The primary function of the mentor is to be a transactional figure in career development. Their role includes facilitation (understood as the ability to accompany and support a colleague in project development and career path, thanks to greater experience and knowledge) and networking (i.e., integrating the colleague into relational networks that can provide knowledge, sponsorship, and development opportunities). For *cross-discipline knowledge, skills, and social abilities*, it is possible to organise work by involving generations of workers of different ages and with different *skill profiles*. There is complementarity between the competence profiles of *digital natives* and those of more *mature workers*, which can be leveraged by organising activities to facilitate inter-generational knowledge transfer: experienced workers transfer *tacit knowledge* or technical skills learned on the job over their careers; younger workers transfer digital skills; and social abilities are developed through work interactions between such diverse generations.

Regarding *training processes*, there is the "*Lego model*" (Gubitta, 2020), which allows for the rapid acquisition of new skills to be immediately applied at work. This model includes training sessions focused on specific competences and skills that the worker quickly acquires and then, like Lego bricks, adds to their professionalism to adapt "just enough" to meet new requirements. It also uses participative teaching methods, where learning occurs through experimenting, interacting, observing others, and simulating decisions, rather than just following a lecture, taking notes, and solving cases. The certification of the acquisition of a new skill is then validated by micro-credentials (see above). The necessity of accompanying changes in work with the transformation of training approaches is an urgent topic to "set in motion" the delivery T-Shaped skill profiles described in Figure 9.1.

9.6 Conclusions

"There is an active, often sensationalist, debate underway over the impact of cognitive technologies on employment. One side forecasts massive unemployment as these technologies take on work formerly done by people. The other predicts a new incarnation of a familiar historical pattern of technological change: new technologies increase productivity, which increases wealth, drives economic growth, and creates demand for workers with new skills". This quote, from Schatsky and Schwartz (2015), from nearly ten years ago is still valid today. Our analysis fits into the debate that has sought to find a solution to the many new challenges posed first by digital technologies and more recently by AI. To study the impact of AI on work and work organization (Kretschmer & Khashabi, 2020), we propose an approach that develops along a continuum that has, at one extreme, the displacement effect and, at the other, the reinstatement effect. We have shown that there are no jobs destined, by definition, to disappear and others destined, by definition, to have a bright future. Companies have strategic choices or freedoms to decide how they want to skill their workers. The model indicated in Figure 9.1 provides us with a key to understanding both the risks that some jobs face and the interventions to remove the causes of risk, and thus, move from the extreme of the *displacement effect*, passing through the *productivity effect,* to foster the spread of the *reinstatement effect*. The actors who can intervene on these fronts are both policy makers and the business and managerial communities: the former have the task of setting public policies capable of generating the skills that emerge from the T-Shaped Model; the latter can develop the work organisation models and career plans consistent with the rapid development of technologies and in line with the learning capabilities of the workforce.

It is apparent that the radical change introduced by developments in AI is the emergence of new *cross-discipline skills* which need to be disseminated as quickly as possible to the widest possible audience of workers. We refer to the ability to interact with AI-based systems (Nurski & Hoffman, 2022). These are skills that can be traced back to two of the categories found in the Horizontal Bar of the T-Shaped Model: digital skills and cognitive skills. In the coming years, it will be essential for all workers to have a foundational level of knowledge and to cultivate certain basic level of skills specifically for the purpose of issuing instructions. This implies not just a general understanding of their field but also the ability to command and work effectively with technology and automated systems, ensuring they can navigate and utilise these tools to achieve their objectives efficiently. In more detail, we believe that the following *cross-discipline skills* should be guaranteed for all people working in areas where AI will have an impact: being able to create textual inputs that are clear, precise, and capable of guiding the AI to provide the desired responses or perform specific tasks; learning to refine prompts to improve the quality and relevance of the AI's responses, tailoring them to the specific needs of one's job; ensuring that the prompts take into account the specific context in which they operate, to avoid standardised responses; and learning to assess the prompts and the ethical dimension of the responses provided by AI. These are the skills required to increase instances of the productivity and reinstatement effects of AI.

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CHAPTER 10

Entrepreneurship as a Competence: A cross-country comparison of entrepreneurship and vocational education and training

Līga Baltiņa

10.1 Introduction

The discourse on entrepreneurship as a learned discipline traces back to the mid-1980s when Peter Drucker proposed the notion that entrepreneurship could be taught (Drucker, 1985). This idea laid the groundwork for subsequent debates and research on how and when entrepreneurship education should be integrated within an educational framework. The essence of entrepreneurship education, as envisioned by theorists and practitioners alike, is to embed it as a key competence from an early age across all curricula, evolving into a more voluntary and business-focused approach at later educational stages (Lackeus, 2014). The practical implementation of this concept faces challenges, as highlighted by a report from Eurydice (2016), which pointed to the generally low levels of participation in practical entrepreneurial learning and emphasised the need for enhancing the entrepreneurial skills of young people. The development of entrepreneurship education highlights a shift towards viewing it not merely as occasional experiences but as part of a strategic approach which involves teaching entrepreneurship both as a cross-curricular subject and as a specific discipline, augmented by flagship initiatives and programmes. Harvard Business School's emphasis on teaching entrepreneurship as a process in 2002 further strengthened the belief in the capacity to nurture entrepreneurs through education (Harvard Business School, 2002).

Theories such as Biggs' theory of constructive alignment (Biggs, 1996; Biggs and Tang, 2011) and perspectives focusing on the societal contributions of entrepreneurship education, such as those of Wei et al. (2019), advocate for a coherent alignment between learning outcomes, teaching activities, and assessment to ensure deep learning. These approaches emphasise the development of innovative talents and the acquisi-

tion of skills such as political intelligence and social influence, considered important for navigating the entrepreneurial landscape. Entrepreneurship education exceeds traditional teaching methodologies by operating on a systemic or eco-systemic level. This approach fosters collaboration and interaction among various stakeholders within the educational ecosystem, including educational authorities, teachers, students, and community actors. The Triple Helix approach, which promotes an exchange of knowledge between education, industry, and government, exemplifies the collaborative effort required to nurture an entrepreneurial mindset among learners (Toutain, et al., 2019; Chinta and Sussan, 2018). In focusing on vocational education and training (VET), the discourse expands to explore how VET schools can serve as regional hubs for entrepreneurship, integrating multi-stakeholder processes to enrich the curriculum with entrepreneurial education. The role of apprenticeships, policy recommendations, and the development of entrepreneurial learning ecosystems within VET highlight the sector's potential in cultivating entrepreneurial competencies.

The reflective overview provided in the sections that follow sets the stage for a deeper investigation into how entrepreneurship competence is integrated within VET sector, the methodologies employed, and the outcomes achieved. It paves the way for a comprehensive exploration of entrepreneurial learning ecosystems, the varied definitions of entrepreneurship competence, and the systemic factors influencing the effective delivery of entrepreneurship education across different educational levels and contexts.

10.2 A brief insight into main related EU policies and incentives

The EU has recognised the importance of embedding entrepreneurship within VET systems as a strategic component to enhance innovation, economic growth, and employability. Over the recent past, a comprehensive framework of policies and incentives has been developed to foster an entrepreneurial mindset and skills among learners. The EU's approach, initially uncoordinated, has evolved into a more structured and strategic framework over the years. From the early 2000s, the EU began to systematically address the need for entrepreneurship as a key competence through various strategic documents and recommendations. The launch of the European Commission's EntreComp Framework in 2016 was an important moment, establishing a detailed set of competences that define the entrepreneurial mindset. The framework delineates competences across three major areas: (i) ideas and opportunities, resources; (ii) action, and (iii) guiding the integration of entrepreneurship across Europe's educational sectors (Bacigalupo et al., 2016).

Subsequent initiatives have reinforced these frameworks, such as the 2018 Council Recommendation on Key Competences for Lifelong Learning, which updated earlier recommendations to emphasise the need for entrepreneurial and innovation-oriented capacities (European Council, 2018). The EU has also promoted the integration of entrepreneurial learning into the curricula of VET through the European Skills Agenda and various other action plans that encourage practical entrepreneurial experiences (European Commission, 2020). The reinforcement of these policies reflects a growing understanding within the EU that entrepreneurship education should not be an isolated subject but integrated into the broader educational ecosystem. This integration facilitates not only the development of specific entrepreneurial skills but also the broader competences such as creativity, problem-solving, and resilience.

Table 10.1 outlines the major milestones in EU policy regarding entrepreneurship education within VET, showing a trajectory towards greater integration and strategic emphasis on developing entrepreneurial skills as part of a comprehensive educational offer. This policy evolution mirrors the EU's broader economic and social goals, positioning entrepreneurship at the heart of educational reforms and innovation strategies.

TABLE 10.1: THE MAIN EU DEVELOPMENTS IN ENTREPRENEURSHIP EDUCATION IN VET

Year	Policy or framework	Focus on entrepreneurship
2002	Harvard Business School emphasis	Teaching entrepreneurship as a process
2016	EntreComp Framework	Defining entrepreneurship competences (European Commission, 2016)
2018	Revised Key Competences for Lifelong Learning	Emphasising entrepreneurship as a key competence (European Council, 2018)
2020	European Skills Agenda	Promoting entrepreneurial mindsets in VET (European Commission, 2020)

Source: Author.

10.3 Key definitions in entrepreneurship education

Entrepreneurship competence encompasses a set of capabilities that are important for initiating and managing innovative companies. Historically it was described as a "sense of initiative and entrepreneurship" but has evolved to encompass the ability to "act upon opportunities and ideas and transform them into value for others" (Bacigalupo, M. et al., 2016) where the value may be financial, cultural, or social. This competence is recognised as important not only for business creation but also for personal development, active societal participation, and re-entry into the job market, either as an employee or as a self-employed individual.

In formal education systems, particularly within VET, entrepreneurship competence is developed through structured education programmes designed with specific learning outcomes, teaching methodologies, and assessment criteria. These programmes aim to put in place a comprehensive set of knowledge, skills, and attitudes that facilitate entrepreneurial success. It is, however, important to note that the expression of entrepreneurship education can vary significantly. For instance, a CVET course in Modena, Italy, involves students in project work that ends in the development of a business idea focused on valuing local food, demonstrating the application of entrepreneurship skills to cultural value creation (UNESCO-UNEVOC, 2019). Moreover, examples such as a VET provider located in a tourist area, which integrates projects in tourism that create social value by organising events for individuals with disabilities and the elderly, highlights the broader societal implications of entrepreneurship education. These examples show that entrepreneurship competence can lead to increased self-employment and employment opportunities for learners, thereby validating its inclusion in VET programmes.

The concept of an **entrepreneurial learning ecosystem** in VET refers to the dynamic interplay of various elements that collectively facilitate the embedding of entrepreneurship competence. As outlined in the UNESCO-UNEVOC report "Entrepreneurial Learning in Technical and Vocational Education and Training", this ecosystem includes components such as policy support, integration of curricula, teacher support, diverse learning modes, assessment strategies, career support, resource allocation, and effective governance and partnerships (UNESCO-UNEVOC, 2019). This ecosystemic approach recognises the importance of a coordinated effort across multiple levels – from policy makers to educational providers to classroom interactions – to develop a conducive environment for entrepreneurial learning. For instance, policies that encourage entrepreneurial activities within VET can shape the educational offerings and influence the pedagogical strategies employed by institutions. At the classroom

level, the interaction between teachers and students, the pedagogical tools used, and the overall learning environment are important for fostering entrepreneurship competence. The integration of these elements into a coherent system enhances the effectiveness of entrepreneurship education by ensuring that learners not only acquire theoretical knowledge but also develop the practical skills and attitudes necessary to navigate and succeed in complex business environments. This comprehensive approach is important for preparing students to meet the challenges of the economy and for fostering innovation and economic growth at both individual and societal levels and was developed further as part of a Cedefop's study (Cedefop, 2023a).

10.4 Developing ecosystems to develop entrepreneurship skills: a Cedefop study 2021-2023

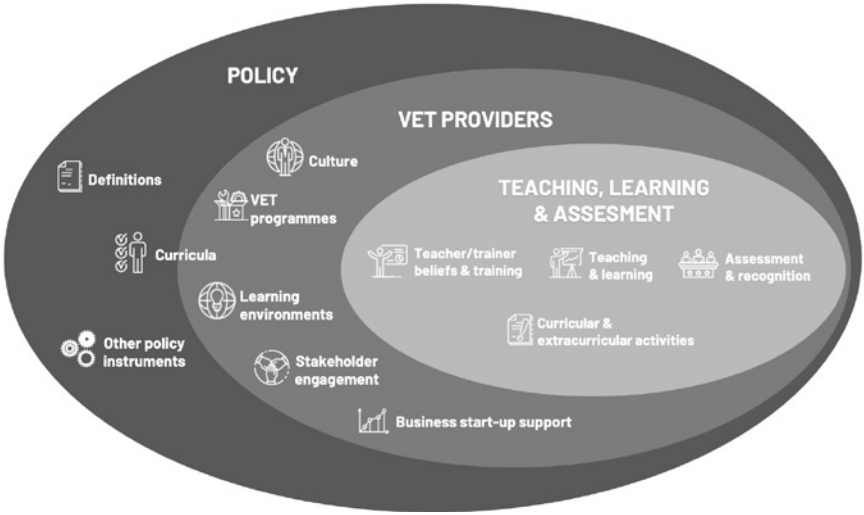
In 2021 Cedefop commissioned Fondazione Giacomo Brodolini (FGB) to conduct a comparative study focused on embedding entrepreneurship competence in VET in Europe to gather new evidence on how entrepreneurial learning ecosystems support the embedding of entrepreneurship competence in VET, identifying the challenges and opportunities that arise, and assessing the variations among different countries. The primary research objectives were to explore how the dimensions of VET entrepreneurial learning ecosystems facilitate the acquisition of entrepreneurship competence and to identify the most effective policies, methods, tools, and approaches for embedding this competence in VET systems.

At the heart of the study was the entrepreneurial learning ecosystem model, which emphasised the importance of interaction and collaboration among key stakeholders in the VET context. This model places VET providers at the core of the ecosystem due to their essential role in fostering entrepreneurial attitudes, aspirations, and activities as outlined by Regele and Neck (2012). The study examines the internal actions of VET providers and how these actions are influenced by external policies and collaborative efforts with other actors in the ecosystem. The concept of "embeddedness" in the context of VET refers to the integration of entrepreneurship competence through a network of curriculum-based and co-curricular activities, which are supported by an interaction between VET providers and key stakeholders across the organisational culture and infrastructures, underpinned by local, regional, and national policies.

As shown in Figure 10.1, the study delineated three interlocking spheres within the entrepreneurial learning ecosystem:

- policy dimension: this sphere examines the influence of educational policies, curricula, and other relevant policy instruments on the development of entrepreneurship competence in VET. Over the past quarter-century, the EU has progressively emphasised the importance of entrepreneurship education, advocating its integration throughout curricula and as a specific subject in some cases;
- VET provider culture and infrastructure: this dimension focuses on the efforts made by VET providers to nurture entrepreneurship competence through strategic decision-making, community engagement, infrastructure development, and collaborations with external stakeholders. These efforts are important for the systematic and coherent development of entrepreneurship competencies, moving beyond isolated actions to structured educational approaches;
- teaching, learning, and assessment: this area explores the execution and planning of curricula, alongside the methodologies and tools utilized in teaching and assessment. It also looks at the interaction dynamics between teachers and learners, highlighting the significant impact of overarching policy and VET provider strategies on educational practices.

FIGURE 10.1: ENTREPRENEURIAL LEARNING ECOSYSTEMS IN VET



Source: Cedefop, 2023a

This ecosystem perspective not only fosters a deeper understanding of how entrepreneurship competence is embedded within VET, but also highlights the dynamic interplay among policy frameworks, institutional culture, and pedagogical practices. The study provided a basis for examining how various countries adapt and implement their entrepreneurial learning ecosystems. This facilitated discussions on best practices and innovative approaches, contributing significantly to the discourse on advancing entrepreneurship education within the European VET landscape.

10.5 Cross-country comparisons

The study encompassed case studies of eight European countries:

- Austria (Cedefop,2023b);
- Croatia (Cedefop, 2023c);
- Finland (Cedefop, 2023d);
- France (Cedefop, 2023e);
- Italy (Cedefop, 2022a);
- Latvia (Cedefop, 2022b);
- Spain (Cedefop, 2023f); and
- Sweden (Cedefop, 2023g).

The study involved in-depth field research including visits to six VET providers in each country and nearly 50 interviews conducted per country with stakeholders at various levels. This extensive fieldwork captured a detailed picture of the current state and variations in entrepreneurship education across different national contexts. The study explored the variability in the definition of entrepreneurship competence across and within countries. For instance, Sweden views entrepreneurship as a broad competence integrated across various educational areas, whereas Italy, Austria, and Finland focus more on entrepreneurship education within specific educational contexts. Latvia encompasses entrepreneurship within its broader framework of transversal skills, contrasting with Croatia's varied terminology around entrepreneurship. In Spain, the term is seldom used explicitly in VET policy documents but is implied within a broader set of professional competencies. These national differences often aligned with the EntreComp and EU key competences frameworks, which describe entrepreneurship competence as the ability to act upon opportunities and ideas, transforming them into value for others through creativity, critical thinking, problem-solving, initiative, perseverance, and collaborative project management. For example, in Finland, the definition emphasises observing opportunities and transforming ideas into actions that generate value. In Austria, it is about enabling individuals to act independently and contribute actively and responsibly to economic and societal needs.

Austria's approach to entrepreneurship in VET exemplifies an integrated system, anchored in a dual framework that combines apprenticeships with classroom instruction. Central to this model is the blending of entrepreneurship across all academic subjects, establishing it as a general cross-curricular objective. This integration is strategically supported by the Austrian strategy for lifelong learning, which identifies entrepreneurship as one of eight essential competences to be cultivated at all educational levels (Federal Ministry of Education, 2011). Further emphasising Austria's commitment to cultivating an entrepreneurial mindset from an early age, the national action plan for entrepreneurship education reinforces this strategic orientation. The plan not only shows the importance of these competences but also facilitates their widespread dissemination through an array of programmes. These initiatives extend across national and regional levels, engaging a diverse set of stakeholders within the educational ecosystem. This structured approach ensures that the entrepreneurial education is not isolated but deeply embedded within the fabric of the Austrian VET system, reflecting a comprehensive and coherent strategy to foster entrepreneurial skills among learners (Cedefop, 2023b).

Croatia's VET system demonstrates a recognition of the importance of entrepreneurship education, yet it encounters significant challenges in achieving coherent integration and practical implementation. Despite the existence of a strategic and regulatory framework, the VET system is characterised by inefficiencies that stem from a lack of specific regulatory measures and concrete strategies for application. These gaps hinder the embedding of entrepreneurship competence within the curriculum and the broader educational environment. The modernisation of the VET system project, spanning from 2017 to 2023, represents a strategic initiative aimed at addressing these shortcomings. It seeks to foster enhanced collaboration among stakeholders with the goal of creating a more effective entrepreneurial ecosystem. This project shows the commitment to reforming the educational landscape by integrating entrepreneurship more effectively across VET programmes. Despite these efforts, the practical application of these strategies face a number of challenges largely because of the absence of tailored regulatory interventions that would facilitate the direct implementation of entrepreneurial components in VET settings (Croatia - Ministry of Science and Education, 2019). This situation reflects a broader issue where strategic intentions are not fully matched by practical execution, indicating an area for potential policy improvement and regulatory adjustment to ensure the full realisation of entrepreneurship education goals within Croatia's VET system (Cedefop (2023c).

Finland has comprehensive national policies for entrepreneurship which collectively aim to cultivate a holistic entrepreneurial ecosystem within the VET system. The Fin-

nish VET strategy is distinguished by its innovative learning environments and the active engagement of a wide array of stakeholders, which are critical in adapting to both regional and global economic trends. The Ministry of Education and Culture's national policy guidelines, updated in 2017, play an important role in steering these efforts. These guidelines not only promote continuous improvement and innovation in VET practices but also emphasise the importance of regional collaboration, ensuring that the educational offerings are closely aligned with the needs of the local labour market. Such a systematic approach enables VET providers to effectively respond to the evolving demands of the economy, ensuring that students are well-equipped with the necessary entrepreneurial skills to thrive in diverse settings (Cedefop, 2023d).

France adopts a decentralised approach to integrating entrepreneurship education within its VET system, characterised by a lack of a unified national policy specifically focused on this area. Instead, entrepreneurship in VET is supported through a variety of regional and local initiatives. This method capitalises on the strengths of informal collaborations between educational institutions and businesses, which facilitate the provision of practical entrepreneurial experiences to students. This decentralised strategy provides flexibility, allowing educational programmes to adapt to the specific economic and social needs of their respective regions. While this flexibility enables tailored educational responses to local demands, it also results in a certain degree of variability in how entrepreneurship is taught across the country. This lack of consistency and coherence might limit the overall effectiveness of France's entrepreneurial education compared to systems with more centralised coordination (Cedefop, 2023e).

Since 2018, **Italy** has intensified its efforts to incorporate entrepreneurship into its VET curriculum, notably through the publication of the Curriculum for Entrepreneurship Education. Despite this initiative, the implementation across the country remains inconsistent, affected by regional disparities and the challenges posed by a decentralised education system. These inconsistencies are further exacerbated by frequent shifts in policy and financial constraints, which undermine the uniform application of entrepreneurship education across different regions. The Italian VET system exhibits a fragmented approach to integrating entrepreneurship competencies. While localised initiatives sometimes achieve success, the national strategy struggles to foster entrepreneurship skills effectively across all regions. This fragmentation is compounded by a high turnover in government, leading to rapid changes in policy priorities that disrupt the continuity and effectiveness of entrepreneurial education initiatives. As a result, while there are pockets of excellence and innovation in entrepreneurship education within Italy's VET system, the overall integration of these competencies remains uneven, reflecting the complexities and challenges of aligning national objecti-

ves with regional implementations and the dynamic nature of political leadership and educational funding (Cedefop, 2022a).

Latvia recognises the importance of entrepreneurship education and supports its integration into VET through strategic national policy initiatives. These initiatives are a priority within Latvia's national development plans, reflecting the country's commitment to fostering entrepreneurial skills among learners. Despite these efforts, the VET system in Latvia exhibits some limitations, particularly in terms of formal recognition and the systematic implementation of entrepreneurial components that are more consistently integrated in other countries' educational frameworks. Efforts to enhance the entrepreneurial learning ecosystem in Latvia focus on promoting innovation and adopting learner-centred approaches. These efforts aim to bridge the gaps in formal recognition and systematic processes, ensuring that entrepreneurship competences are more thoroughly embedded within the VET curriculum. The ongoing initiatives are designed to cultivate a more dynamic and responsive educational environment that adapts to the evolving needs of students and the broader economic landscape. This strategic focus is intended to strengthen the foundational elements of entrepreneurship education within the Latvian VET system, fostering a more cohesive and comprehensive approach to developing the entrepreneurial capacities of learners (Cedefop, 2022b).

Spain's approach to integrating entrepreneurship into VET is based on a decentralised model with significant regional adaptability. This model is distinguished by its flexibility, allowing the entrepreneurial curriculum to be tailored to the economic needs and priorities of various autonomous communities. The foundation of Spain's entrepreneurial education within VET is structured around compulsory modules such as *Formación y Orientación Laboral* (FOL) and *Empresa e Iniciativa Emprendedora* (EIE), which are dedicated to intrapreneurship and entrepreneurship, respectively. These modules ensure that entrepreneurship transcends the theoretical framework and is actively practiced and evaluated within the VET curriculum. This practical application aligns closely with national educational objectives while also granting the regions the flexibility to innovate and adapt the curriculum to local contexts. This regional approach not only maintains a coherent national framework but also supports diverse implementation strategies that are responsive to regional and sectoral needs, thus providing a structured yet adaptable model for entrepreneurship education in VET (Cedefop, 2023h). This methodological flexibility embedded in the Spanish VET system highlights a strategic integration of entrepreneurship, fostering an educatio-

nal environment that encourages both theoretical learning and practical application across diverse regional economies (Cedefop, 2023f).

Sweden's VET system demonstrates a commitment to entrepreneurship education, underpinned by its inclusion in the national educational strategy. This emphasis was strengthened following the strategic reforms of 2009. The integration of dedicated entrepreneurship courses into upper secondary education is an effort of the Sweden's proactive approach in nurturing entrepreneurial skills among its students. An important component of this strategy is the collaboration with Junior Achievement, an organisation known for its contribution to entrepreneurship education. It enhances the formal VET curriculum by providing resources and structured experiential learning opportunities. These initiatives are important in bridging theoretical knowledge with practical application, thereby enriching the learning experience and enhancing the practical aspects of entrepreneurship education within the Swedish VET system (Cedefop, 2023g).

Table 10.2 summarises the approach to entrepreneurship education, key strategies, stakeholder engagement, and challenges faced by each country. This table shows the varying degrees of formalisation and integration of entrepreneurship education in VET systems across different countries. Countries such as Austria and Finland exhibit strong, well-structured approaches with national strategies and stakeholder engagement. In contrast, Croatia and Italy show the challenges of implementation and coherence in decentralised systems. The drivers, however, shaping VET provisions linked to embedding entrepreneurship competence in VET can vary from more policy driven approaches to teacher driven examples. For example, **in Austria**, the *Impulszentrum für Entrepreneurship Education* plays an important role in implementing entrepreneurship education across VET schools, under the directive of the Federal Ministry of Education, Science, and Research. Since 2006, this initiative has expanded to include regional coordinators in all nine provinces, ensuring the programme's reach and consistency. The introduction of quality criteria for "entrepreneurship schools", exemplifies Austria's structured approach to enhancing and recognising entrepreneurship education. This certification process not only elevates schools' educational standards, but also enhances their external communication, showcasing their commitment to fostering an entrepreneurial mindset among students. The continuous feedback and recognition provided throughout the certification process encourage schools to strive for excellence and promote a culture of continuous improvement and learning.

It is notable that **Finland's** approach, particularly the *EduFutura Jyväskylä* initiative, illustrates an effective regional collaboration model. Managed by a consortium including Jyväskylä University of Applied Sciences and other educational bodies, EduFutura is a competence centre that fosters entrepreneurship through comprehensive, research-based educational strategies. Awarded in 2019 by the European Commission as the best entrepreneurship learning model, EduFutura actively involves a wide network of regional stakeholders, including business incubators and chambers of commerce, to provide a diverse range of learning and career support opportunities. This model not only strengthens the region's vitality but also ensures that VET learners acquire relevant and futuristic entrepreneurial skills, contributing robustly to the regional economic structure.

The case of **Italy** presents a case of grassroots innovation in entrepreneurship education within the VET system, highlighted by the efforts of Daniele Manni at the Costa Institute of Lecce. Manni's development of a four-year experimental course in "Self-entrepreneurship education" showcases how educators can navigate and innovate within the constraints of national curricula. This initiative successfully integrated interdisciplinary challenges into the VET curriculum, emphasising the role of teachers in driving educational innovation. Manni's approach not only adapted to bureaucratic limitations but also established a new curriculum that was officially recognised by the Ministry of Education, thus formalising the innovative practices into the national framework.

TABLE 10.2: SNAPSHOT OF COMPARATIVE ANALYSIS BASED ON CEDEFOP'S COUNTRY CASE STUDIES

Country	Approach	Key strategies	Stakeholder engagement	Challenges
Austria	Highly integrated, dual system	Austrian strategy for lifelong learning, National action plan	Government, schools, private sector	Limited challenges, well-implemented
Croatia	Recognises importance but struggles with integration	Modernisation of the VET system (2017-2023)	Stakeholder collaboration	Lack of specific regulatory measures, inconsistent implementation
Spain	Decentralised, regional adaptability	Compulsory modules (FOL, EIE)	Autonomous communities, schools, businesses	Needs more consistency across regions
Latvia	Supports through national policy but lacks formal system	National development plans	Minimal, lacks formal entrepreneurial ecosystem	Lack of formal recognition and systematic approach
Sweden	Inclusion in national strategy	2009 reforms, Junior Achievement partnership	Schools, Junior Achievement	Mostly strategic and implementation success
Finland	Comprehensive policies, high stakeholder engagement	EU's EntrepreneurComp Framework, National guidelines (2017)	High engagement from government and education sectors	Balancing regional needs with national policies
Italy	Fragmented, regional disparities	Curriculum for Entrepreneurship Education (post-2018)	Localised initiatives more successful than national	High government turnover, rapid policy shifts, financial constraints
France	Informal, decentralised	Regional and local initiatives	Collaboration between schools and businesses	Lack of national coherence, inconsistent application

Source: Author.

10.6 Cross-country learning and implementation variability

The role of VET providers in delivering entrepreneurship competence varies and is developing towards more structured approaches, though progress can be gradual and uneven across different regions and countries. The comparison reveals a diverse landscape of how entrepreneurship is integrated into VET systems. While countries such as Austria and Finland reveal structured approaches with strong governmental support and stakeholder engagement, others such as Croatia and Italy struggle with implementation and consistency. Spain's regional approach illustrates a model of adaptability, catering to local economic and educational needs while maintaining a core entrepreneurial curriculum. This flexibility offers valuable lessons on integrating entrepreneurship education to meet diverse regional demands without compromising the overall educational objectives.

Curriculum frameworks across different countries demonstrate how entrepreneurship competence is often positioned as a transversal element that can be explicitly detailed in subjects such as economics or marketing, or integrated more broadly. For example, in Sweden, the introduction of dedicated entrepreneurship subjects has become a compulsory component of certain programmes, reflecting a robust policy response to fostering entrepreneurial skills.

The entrepreneurial learning ecosystems function particularly well at the local level, where VET providers can engage directly with local businesses, chambers of commerce, and other community stakeholders to enrich the learning experience and enhance the practical relevance of the educational offerings. For example, in Latvia, various tools and cooperative networks support the ecosystemic approach by facilitating connections between VET learners and potential career opportunities, including job shadowing and participation in entrepreneurial contests. The challenge remains about how best to plan and implement teaching activities that maximise the resources and pedagogical potential of these partnerships. The engagement of VET providers with local and regional business stakeholders not only adds relevance to the educational programmes but also boosts learner motivation, contributing to the effective development of entrepreneurship competence.

While the goal to embed entrepreneurship in VET is common, the pathways and challenges are diverse, with the following as main ones identified:

- resource allocation: access to both financial and human resources remains a critical challenge, impacting the ability to provide comprehensive entrepreneurship education;

- curriculum design: balancing the incorporation of entrepreneurship competences with existing curricular requirements demands innovative curriculum design and the willingness to adopt interdisciplinary approaches;
- teacher training and motivation: ensuring that teachers are well-prepared and motivated to deliver entrepreneurship education involves targeted professional development and support mechanisms;
- stakeholder engagement: effective engagement of local businesses and community partners is essential for providing real-world relevance and support to entrepreneurial initiatives within VET programmes.

The need to boost innovation and competitiveness across the EU necessitates a forward-looking approach to entrepreneurship education in VET. This education not only equips individuals with critical skills for innovation, but also ensures social inclusion, providing learners with competencies that keep them connected to the developing labour market. Insights from the study highlight the potential for cross-country learning, where successful strategies and approaches can be shared and adapted among various educational systems to enhance the overall effectiveness of entrepreneurship education in VET. To achieve these objectives and foster a more embedded approach to entrepreneurship in VET, several strategic directions can be considered towards transcending traditional learning models and embracing more dynamic and inclusive strategies:

- enhanced policy support: clear and supportive policies at the national and regional levels can facilitate the broader adoption and adaptation of entrepreneurship education within VET;
- collaborative networks: building networks that include educational institutions, industry partners, and community organisations can enhance the resources, ideas and innovations enhancing the scope and quality of entrepreneurship education;
- innovative learning environments: creating flexible and innovative learning environments that encourage experimental and project-based learning approaches can significantly enhance the effectiveness of entrepreneurship education.

Country insights derived from the Cedefop's study demonstrates the variety of approaches taken by different countries in integrating entrepreneurship into VET. While some countries, notably Austria and Finland exhibit highly structured and well-supported systems, others such as Croatia and Italy face challenges in coherent integration and consistent implementation. Spain and France offer examples of how regional flexibility can benefit the adaptation of entrepreneurship education to local needs. Each country's approach provides valuable insights into potential strategies for im-

proving the effectiveness of entrepreneurship education within VET systems globally. Furthermore, the success of such a framework depends on policy support and stakeholder engagement in curriculum design, ensuring that educational strategies develop alongside economic conditions and societal needs. Additionally, embedding principles of sustainability and social responsibility into entrepreneurship education would prepare learners to develop businesses that contribute positively to society and the environment. The future of entrepreneurship education in VET needs to be characterised by continuous innovation in teaching methods and curriculum design to ensure that learners are well-prepared for the changing global landscape. Thus, systemic thinking, rooted in a collaborative effort among governments, educational institutions, industry partners, and local communities, is important to implementing transformative changes that sustain the long-term viability and relevance of VET systems worldwide.

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CHAPTER 11

EmprènFP: A regional policy instrument to support VET providers in the journey towards more holistic approaches to entrepreneurship competence development (Catalonia)

Iván Diego Rodríguez and José Moratal Miñana

11.1 Introduction

Vocational Education and Training (VET) is seen to play a crucial role in promoting entrepreneurship competence defined as the capacity to act upon opportunities and ideas, and to transform them into values for others (European Commission, 2018). Allegedly, this will bring a myriad of positive impacts to VET learners in terms of personal development, employability and entrepreneurial intentions. Yet, research has not kept pace with the steady stream of entrepreneurship education policy and practice in VET across the globe (Liguori, Corbin, Lackeus, & Solomon, 2019).

In order to better understand how entrepreneurship competence is embedded in VET in Europe, the European Centre for the Development of Vocational Education and Training (henceforth, Cedefop) commissioned Fondazione Giacomo Brodolini to undertake a study that aimed to answer two main research questions (RQ):

- RQ1: "to what extent and how do the dimensions of entrepreneurial learning ecosystems facilitate acquiring entrepreneurship competence in VET in Europe?";
- RQ2: "what policies, methods, tools and approaches best support embedding entrepreneurship competence in VET?".

The study entailed identifying related challenges and opportunities and gauging how these vary across eight countries: Austria, Croatia, Finland, France, Italy, Latvia, Spain and Sweden. Research at national level unfolded in three steps:

- literature review and preparation for the field research;
- field research at VET provider's level;

- field research at policy level.

The two-year research project reached its final destination in June 2023 with the release and presentation of the final synthesis report (Cedefop, 2023a), summarising and comparing the insights yielded in 8 national case studies.

Rather than taking readers on a tour of the main results, we opted to seize this opportunity to delve deeper into one of the regional policy measures brought to the surface in the Spain Case Study (Cedefop,2023b): the Programme for the Promotion and Support of Entrepreneurship in Vocational Education and Training (EmprènFP), conceived and implemented in Catalonia (Spain). More precisely, the chapter puts the spotlight on its most innovative aspect: the support provided to VET management teams in their journey towards embedding entrepreneurship in a more coherent, robust and systematic way at VET provider level.

11.2 School culture and organisational aspects

The literature affirms that school culture directly affects teachers' competency and capability. Additionally, it acknowledges the significant role of school leadership practices led by senior management teams in shaping student academic outcomes (Kwan & Wong, 2020). As a matter of fact, the examination of organisational culture has emerged as a cornerstone in comprehending how schools advance equity, inclusion, and democracy. The construction of school culture is an ongoing and dynamic process influenced by factors and actors within and outside schools (Torres, 2022).

Yet, the influence of school culture and organisational aspects on promoting, teaching and learning entrepreneurship in the context of VET is an under-researched area. Recurrent comments and demands from teachers, as documented by various authors, seem to suggest that the school culture and organisational aspects can impact how they perceive, plan and implement entrepreneurship education. Finnish VET teachers for instance, have noted that teaching culture and teaching arrangements did not have an entrepreneurial slant in their existing form (Järvi, 2012). Italian VET teachers also found it difficult to discuss and cooperate with colleagues within school (Morselli, 2018). In China, Entrepreneurship VET teachers have expressed concerns about the content to be covered in relation to time available and the lack of understanding or support from senior management (Bell & Liu, 2018). Similar concerns around the lack of time or the fact that entrepreneurship steals time from other curricular demands were echoed by VET teachers in Sweden (Fejes et al., 2019) and in Estonia, where VET Teachers reported difficulties in planning timetables (Loogma et al., 2021).

In the UK, Beresford & Michels (2014) emphasised the key but often overlooked brokerage role of middle leaders (e.g., heads of department, curriculum co-ordinators, middle managers) in encouraging the exchange of ideas, leading collective meaning-making or setting up infrastructures more conducive to sustainable entrepreneurial cultures at VET provider level, as well as facilitating the interaction between senior management and teachers. In Austria, the criteria to obtain the Entrepreneurship School (EntreSchool) certificate developed by the e.e.si - Impulse Centre for Entrepreneurship Education contemplate a set of organisational aspects, such as the inclusion of entrepreneurship in the school mission statement and website, the appointment of a member of staff in charge of coordinating the entrepreneurship agenda, the involvement of internal partners in the school, networking with external stakeholders and the implementation of monitoring and quality assurance procedures (Lindner, 2019).

In the next sections, we delve into a comprehensive analysis of the case study conducted in Spain, which provides interesting insights on the influence of school culture and organisational aspects in the promotion of entrepreneurship in VET.

11.3 Entrepreneurship education in Spanish VET

For those not familiar with the Spanish education system, it is important to understand curriculum-making in Spain is a complex interplay involving the central government, national and regional departments of education and VET providers. The national core curricula of all VET qualifications contemplate the development of entrepreneurship-related skills among their general goals. Since 2008, all VET learners are required to take a specific subject on entrepreneurship, *Empresa e Iniciativa Emprendedora* [Enterprise and Entrepreneurial Initiative] (henceforth, EIE), in the final year of training. This module aims to provide knowledge about business management, entrepreneurship, and the skills necessary to create and manage one's own business.

The basic contents, the sequencing, the duration, the weekly hourly distribution and basic pedagogical guidelines for this subject are defined at central level, but regional educational administrations exert their right to introduce modifications, which, in the case of entrepreneurship-related subjects, implies an increase in the allocation of hours and the incorporation of additional learning outcomes.

While the creation of domain-specific subjects is still touted as a key aspect to embed entrepreneurship in VET, field research in Spain has revealed major shortcomings in this silo-based approach that has been in place for more than 15 years. VET teachers

who were interviewed as part of the study felt the curriculum requires a major update in order to leave behind a narrow and theoretical focus on business-planning and increase the relevance of a subject that is still seen to play second fiddle to technical modules. Strategies deployed by some EIE teachers to engage students favoured the adoption of new methodological approaches and a better integration with technical subjects, an impossible task if undertaken at individual level.

To overcome these challenges, some regions have deployed additional policies and specific support programmes to support and promote more integral and comprehensive approaches to entrepreneurship in VET. As a general rule, regional Departments of Education lead the implementation providing training and support to teachers and VET management teams as they play a substantial role in securing the conditions (culture and organizational) to make this happen. The pioneering Programme for the Promotion and Support of Entrepreneurship in Vocational Education and Training in Catalonia (henceforth, EmprènFP) will be used as an example to disclose the rationale, level and type of support provided.

11.4 EmprènFP, a programme for the promotion and support of entrepreneurship in VET in Catalonia

Key policy developments at state and regional level paved the way for the genesis of EmprènFP in Catalonia. The Organic Education Law of 2006 highlighted the need to infuse an entrepreneurial ethos into the educational system at state level. Five years after, this commitment was reinforced in Catalonia with the approval of *Catalunya, escola d'emprenedors* [Catalonia, school of entrepreneurs], a government agreement outlining measures across educational levels including VET. Pilots undertaken in 2012-13 helped to shape the Programme for the promotion and support of entrepreneurship in VET. EmprènFP was officially launched in 2015 with the remit of "guiding and supporting Catalonian VET providers in the implementation and development of methodological strategies that promote entrepreneurship and business creation or self-employment skills" (Catalonian Department for Education, 2015).

EmprènFP represents one of the building blocks of a broader support device (ImpulsFP) that caters for the needs of VET providers willing to make progress in a host of other areas such as methodological innovation (ActivaFP), career guidance (OrientaFP), technology transfer (InnovaFP), skills forecasting (FuturaFP) and skills competitions (CatSkills) (see Table 11.1).

Table 11.1: ImpulsFP programmes (Catalonia)

IMPULSFP [40]				
EmprènFP	**ActivaFP**	**OrientaFP**	**InnovaFP**	**FuturaFP**
Entrepreneurship	Methodological change	Career guidance	Transfer of knowledge and cooperation with companies and entities in the environment	Prospecting for future needs

Far from being conceived as silos, these programmes are designed, managed and implemented under similar core principles and present a high degree of complementarity.

VET providers join EmprènFP on a voluntary basis. The regional Department for VET releases a call for proposals once a year with precise entry requirements. Candidate VET providers are required to submit a detailed annual work plan describing the goals, budget, timeline and staff in charge of coordinating, implementing, monitoring and disseminating actions.

Crafting such a comprehensive document from scratch poses a formidable challenge due to the intricate balance needed between clarity, detail, and structure. The Department for Education, however, streamlines this daunting task by offering a template and a comprehensive menu of actions, simplifying the otherwise complex process of document creation.

The programme looks to assist VET schools in creating the ideal conditions for fostering students' entrepreneurship competence. Yet, the programme focuses its efforts on equipping teachers with a wide range of methodological tools and strategies to design and implement a coherent portfolio of activities in two areas: entrepreneurship competence development (BizBox), entrepreneurship events (BizRoute).

40 https://projectes.xtec.cat/impulsfp/.

11.5 BizRock, a capacity-building programme for VET management teams

The extent of the response to effectively move away from patchy and isolated initiatives to more comprehensive approaches is clearly beyond the sole remit of teachers. In response, EmprènFP devised BizRock, a specific capacity-building programme for VET management teams bearing in mind their crucial role in securing the conditions for this long-distance journey. To navigate this organisational transition in a structured and progressive way, BizRock presents to the management teams a series of milestones that include, among others:

- inclusion of entrepreneurship in the school policy documents;
- establishment of a committee for entrepreneurship, comprising members from the teaching staff and management team;
- implementation of specific processes and key performance indicators in the Quality Assurance System of the school to ensure entrepreneurship activities are consistent and up to standards;
- design of a portfolio of services offered by the school to entrepreneurs and companies in their local area;
- creation of open spaces to develop and prototype project ideas;
- design of a 3-year strategic plan for entrepreneurship at VET provider level.

VET providers select some of the milestones from this list depending on their needs and incorporates them to the annual work plan submitted to the regional Department of Education. This document will be used as a benchmark to gauge the achievement of goals at the end of the school year.

The next section explores the achievement and impact of some of these milestones on the entrepreneurship school culture and educational leadership at the Institut Escola del Treball, a publicly-funded VET provider located in Lleida (pop. 143.094), that joined EmprènFP in 2012.

11.6 The impact of EmprènFP in entrepreneurship school culture and educational leadership at Institut Escola del Treball.

Establishment of a committee for entrepreneurship, comprising members from the teaching staff and management team

BizRock prompts VET providers to establish entrepreneurship coordination units to facilitate teacher collaboration and advance the entrepreneurship agenda. In 2014, the management team at Institut Escola del Treball engaged in a thorough assessment of teaching timetables in order to identify and eliminate superfluous routine duties. This exercise allowed to free up an average of 3 or 4 hours per week and per teacher. This time was redirected towards developing work in strategic areas: entrepreneurship, communication, labour guidance, and innovation, through the formation of stable commissions. The Entrepreneurship commission, set up in 2016, is a stable team of eight teachers who met regularly to organise and coordinate actions to promote entrepreneurial culture at VET provider level.

Both the management and teaching staff acknowledged the advantages of having these structures, as the following comments illustrate:

> *'Without these committees, it would be impossible to cover all the work that is carried out' (Management team).*

> *'Devoting time to these commissions rather than routine work is a recognition of our work' (VET teacher).*

Systematising identification, assessment and recognition of entrepreneurship actions and competences

The programme provided a scaffold for sense-making and stocktaking of current practice that was used as a basis for the gradual development of a coherent and comprehensive portfolio of curricular and extracurricular activities. In 2015-2016, all actions were encapsulated under the *Roda de Gestió del Talent* [Talent Management Wheel],[41] a framework conveying the cyclical and regular nature of the activities and events contained therein as regards student and teacher training, collaborative project-based learning, employability and dissemination.

41 https://www.escoladeltreball.cat/emprenedoria/.

"To provide structure to actions, so that no action depends solely on the teacher's motivation. To generate a structure within the school that provides support." (Senior Management Team)

Institut Escola del Treball has also taken steps to equip themselves with a common competence framework. The process entailed selecting a reduced number of competences and agreeing on simple definitions so that they could be used as a reference by any member of the teaching staff in the design, delivery and assessment of teaching and learning activities. The competences are listed below:

Dictionary of complementary skills, Institut Escola del Treball:

- initiative, planning and organisation, concern for order and quality;
- leadership, teamwork and cooperation;
- commitment to the organisation, flexibility and change management;
- creativity, innovation, versatility, proactivity, analytical thinking;
- technical skills additional to those addressed in the curriculum.

The management team considers this skillset reinforces the technical profile of students and improves their employability. Thus, the dictionary has informed the development of a protocol for the assessment and monitoring of transversal competences with two components.

1. Tracking kit. The kit consists of a template that allows teachers to weekly record observations that are made about competencies as defined in the dictionary.

2. Student Competence Assessment report. At the end of the VET programme, the teaching team agrees on the level of development for each competence and drafts a personalised student report with a brief description of the competences in which they excel. This document is added to the student e-digital portfolio.

11.7 Inclusion of entrepreneurship as part of the statutory and curriculum policies

The promotion of entrepreneurship is a priority area in this VET provider and, as such, it is explicitly mentioned in different strategic documents. The Strategic Plan (Institut Escola del Treball, 2019) sets out the way entrepreneurship is conceived and the expected results on students:

> *"Understand entrepreneurship as an attitude that encourages our students to open their minds and learn to observe their environment through a different perspective to adopt a more active role while becoming aware of the skills needed to do so and to be able to use them in a more effective way".*

This statement of intent is supported by the integration of a dedicated process within the school's Quality Assurance System, guaranteeing the alignment and adherence of entrepreneurial initiatives to set standards. Entrepreneurship activities are detailed alongside designated leads, schedules, and available resources. Monitoring each activity annually through key performance indicators ensures transparency, with these metrics being openly available in the General Workplan (Institut Escola del Treball, 2022) released at the beginning of the academic year.

Finally, this whole-school approach to entrepreneurship is also showcased in the school website with a dedicate section to entrepreneurship outlining the purpose, the portfolio of activities and related news. ([42])

As previously indicated, the efforts to provide greater coherence and structure to the entrepreneurial activities require a long-term perspective. The journey at Institut Escola del Treball began in 2012. For more than a decade, EmprènFP has provided the roadmap and support needed to undertake organisational changes and ultimately change the school culture (see Annex 11.1). In the knowledge that the journey is long and challenging, especially when undertaken alone, EmprènFP encourages networking with other VET providers immersed in the same process as described in the next section.

42 https://www.escoladeltreball.cat/emprenedoria/.

11.7 Xarxa EmprènFP, a community of practice of VET schools involved in the programme.

EmprènFP encourages collaboration and the transfer of knowledge among the participating VET providers. Xarxa EmprènFP is a regional network of 122 VET providers involved in the programme. The network is structured in four territorial clusters (see Table 11.2).

TABLE 11.2: EMPRÈNFP NETWORKS

Network	Number of VET providers
Barcelona	67
Girona	20
Lleida-Catalunya Central	27
Tarragona	18
Total	122

Source: Compiled by author based on data from EmprènFP Pla de Treball /2022-2023

Each cluster acts as a community of practice, understood as "a group of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis." (Wenger, McDermott & Snyder, 2002). The participation and contribution varies according to the level of expertise of VET providers involved. A zone coordinator, normally a staff member of the most experienced school, leads and facilitates the network's activities. A schedule of eight meetings throughout the academic year plus various training actions and complementary events enable the ongoing interaction of members in a structured way. These meetings are an opportunity to address a series of thematic challenges set in the agenda by network coordinators. EmprènFP coordinators at VET provider level, get together to discuss and agree to implement a set of tasks in their schools that will be presented and discussed in the next meeting. As indicated by one interviewee:

> *"[Being a member of this network is] fundamental as a way to look up and see what others [VET providers] do." (Management team)*

The recognition and acknowledgement of the work undertaken by VET providers and teachers is another important feature of EmprènFP programme. In the case of VET

providers, this recognition is obtained upon the validation of the annual report of activities submitted to the regional Department for VET.

Staff recognition schemes acknowledge the engagement and time invested by appointed EmprènFP coordinators at VET provider level and the rest of teachers involved as evidenced by another excerpt of the EmprènFP programme in Catalonia.

> *7. Certification of activities and recognition*[43]
>
> *7.1 Attendance at network meetings are part of the Permanent Training Programme and, as such, are certifiable by the General Directorate of Initial Professional Training and Special Regime Teaching, as training activities.*
>
> *7.2 In publicly-funded VET providers, coordination of the programme is certified as an educational innovation activity [...]. The active participation of the teaching staff in the coordination and/or commissions is also considered as an educational innovation activity.*

11.8 Concluding remarks

EmprènFP represents an inspiring example of a regional measure connecting practitioners with policy in a meaningful way with a focus on developing practice that is fit for purpose. The centrality of specific support measures for teachers and management teams in EmprènFP contrasts with the absence of guidelines for governance and leadership, implementation plans and professional development opportunities reported in the evaluation of the Swedish Strategy for Entrepreneurship Education (IVA, 2022).

The carefully conceived network structure that sits at the core of the model favours sharing expertise, building additional capacity and generating and pooling resources that can be used across the system (Priestley et al., 2021). EmprènFP networks confirm the importance of networks and the need for effective communication identified in entrepreneurship education policy evaluation conducted in Finland (Finnish Education Evaluation Centre, 2018).

43 *Catalonian Directorate General for VET, 2020.*

Further work is needed to evaluate the impact of this policy measure though. At present, monitoring and evaluation lean on a limited set of indicators capturing the degree of satisfaction of participating learners and teachers through surveys, but none of them are obviously fully suitable to evaluate the achievement of the main policy outcome, the development and acquisition of entrepreneurship competence of VET learners.

In highly decentralised countries like Spain, the development of entrepreneurship competence in the field of VET is shaped through a complex interplay of European, state and regional policies and practices. In cases like the one described in this article, regional policies can adopt more advanced approaches, anticipate, or even inspire further developments at the national or European level. Further research is needed to expand the empirical evidence available on the impact of regional policy developments in shaping entrepreneurship school culture in VET and, ultimately, its influence on teaching and learning practices.

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Annex 11.1: INSTITUT ESCOLA DEL TREBALL

TABLE A.11.1: VET PROVIDER DATA

Name	Institut Escola del Treball
Location	Lleida
Teachers	74
Students	760
VET type	IVET
Sector branches	7
VET diplomas	14

TABLE A11.2: SECTOR BRANCHES AND VET QUALIFICATIONS

Sector	VET QUALIFICATIONS
Administration and Management	CFGM Administrative Management CFGM Administrative Management in the Legal Field CFGS Administration and Finance CFGS Management Assistance
Trade and Marketing	CFGM Commercial Activities CFGS International Trade CFGS Transport and Logistics CFGS Marketing and Advertising
Electricity and Electronics	CFGM Electrical and Automatic Installations CFGS Industrial Automation and Robotics
Energy and Water	CFGS Renewable Energies
Wood and Furniture	CFGS Carpentry and Furniture
Chemistry	CFGS Laboratory Analysis and Quality Control
Security and Environment	CFGS Environmental Education and Control

FPB – Basic VET
CFGM – Intermediate VET Diploma
CFGS – Higher VET Diploma

TABLE A11.3: MAJOR MILESTONES IN ENTREPRENEURSHIP AT INSTITUT ESCOLA DEL TREBALL

Year	Description
2012-2013	Institut Escola del Treball joins EmprènFP (pilot experience), the Catalonian programme to support entrepreneurship in VET. They consider it 'a fundamental milestone, a way of looking up and seeing what others are doing in order to share and undertake actions around entrepreneurship'.
2013-2014	Organization of 1st Entrepreneurship Week. The event continues to be held annually and is fully planned and managed by VET students.
2014-2015	The Espai e-Lab, which in the future will become the Entrepreneur's Office, is set up. In this same year, the Open Space (multi-purpose classroom) is also created. The Píldora Emprendedora Programme is launched. The programme includes 12 short training actions delivered by external experts, either in school or out of school hours. They are voluntary and are certified.
2014-2016	Timetables are restructured in order to eliminate shifts and superfluous hours. This move freed up time for teachers to engage in the identification of needs and key improvement areas (e.g. Entrepreneurship)
2015-2016	Creation of the Talent Management Wheel, which brings together, unifies and gives coherence and continuity to all the actions carried out in the field of entrepreneurship.
2016-2017	First pilot experience in the implementation of High Performance VET Diplomas in the Higher VET Diploma on Renewable Energies. This entails a conviction-led change towards the adoption of new methodological strategies.
2017-2019	Participation in Erovet, an Erasmus + project to improve the employability of VET students and with strands of work focused on career guidance, internationalisation, dual training, entrepreneurship and team management.
2019-2022	Participation in Erovet+, this time with a stronger focus on working on team management. A third edition is planned, focusing on the topic of micro-credentials
2021-2022	Set up of necessary structures and protocols (Entrepreneur's Office) to support the creation of companies by students and alumni (Level 2 of the EmprènFP programme).
Challenges ahead	Increase the portfolio of strategic actors to reinforce the entrepreneurship ecosystem and generate contacts with key associations that also promote actions through financial support; Raise the profile of VET bringing it closer to the concept of profession and moving away from the cliché of trade; Become a relevant actor in the RDI Ecosystem at local and regional level.

CHAPTER 12

Building and Securing Reskilling and Career Transitions: the Career Development counselling service (CEP) in France

Anais Chatagnon and Matteo Sgarzi

12.1 Introduction

At a time of major societal shifts (climate, digital, and demographic) and increasing global turmoil (pandemics and international political instability), economies are experiencing a period of transformation. The skills required in the labour market, and the content of people's existing jobs, are often subject to substantial change. It is under these conditions that career transitions take place. Change is part of people's lives, affecting both private and professional spheres, driven by the need to secure one's own position in the face of future uncertainties, improve one's work environment and conditions of employment, and/or meet personal aspirations. In France, public policies are increasingly focused on supporting careers and career changes. Publicly funded schemes, particularly those stemming from the 2018 reform of vocational training,[44] have sought to respond to employees' needs for upskilling and reskilling. The legal decree which established the CEP (*Conseil en Évolution Professionnelle*) states: "Supporting people throughout their working lives is an essential lever for securing career paths, developing autonomy and thus people's ability to choose their professional future".[45]

The CEP is intended to be an "essential lever" and to play a decisive role in supporting the career mobility of working people. Designed to give effect to the right to lifelong guidance, the CEP is not intended to be just another scheme, but a service available to all citizens active in the labour market, which they can use, on their own initiative, at any time during their working life, in conjunction (or not) with other schemes or resources (funding, training, etc.).

44 *Law no. 2018-771 of 5 September 2018 on the "freedom to choose one's professional future".*

45 *Extract from the decree of 29 March 2019 setting the specifications of the Career Development counselling service (Conseil en Évolution Professionnelle, CEP) recognised in Article L 611-6 of the Labour Code.*

The CEP has high ambitions. It is intended to offer personalised support taking into account the situation, needs and expectations (explicit, expressed or yet to be revealed) of each individual, as well as the resources, needs and dynamics of the local labour market. The CEP is intended to act as a landing place for users, providing them with clear and comprehensive information, to enable them to make informed choices and encourage them to express their desire and/or ability to move forward in a secure way. It offer users a space or time where counsellors listen, encourage reflection, and help users to define their career preferences or intentions. To achieve this, the provision of the service is entrusted to several operators, depending on the target audience (see Box 12.1), who are all required to comply with same set of specifications set out for the delivery of services under the CEP. Figure 12.1 provides information on the main stakeholders involved in the CEP.

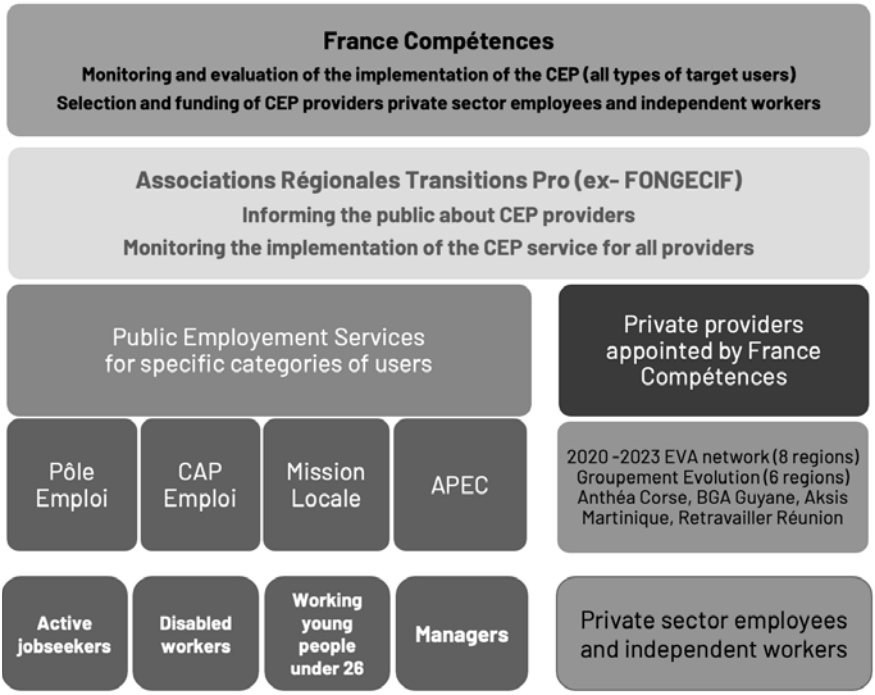
Box 12.1: Ambitions of the CEP

The CEP's basic principles were established by the social partners in the National Interprofessional Agreement on Vocational Training of 14 December 2013. It was introduced by Law no. 2014-288 of 5 March 2014 on "vocational training, employment and social democracy", then revised and consolidated by Law no. 2018-771 of 5 September 2018 on the "freedom to choose one's professional future". The latter led to a reconfiguration of the players involved and the allocation of a dedicated budget to support CEP delivery to workers (employees or independent ones) in the private sector. A newly funded national governance body for vocational training and apprenticeship, *France Compétences*,[46] was given the task (among others) of organising and financing (via a share of the *Contribution Unique à la Formation Professionnelle et à l'Alternance (CUFPA)* levy) the CEP service for workers. These changes in governance have resulted in the withdrawal of CEP services from the joint players (FONGECIF)[47] who were charged with its delivery before 2018, and its handover to private operators, selected on a regional basis by *France Compétences*, as part of a four-year public procurement contract (the first framework agreement was for 2020-2023).

46 France Compétences is the core institution of the French vocational training system since 2018. It is responsible for financing, regulating and improving the vocational training and apprenticeship system.

47 The FONGECIF (Fonds de Gestion des Congés Individuels de Formation), inter-professional joint bodies, were created in 1983 to help employees access training and progress in their professional environment. They were replaced in 2020 (following the 2018 reform) by the Transition Pro associations whose main tasks are to manage funding schemes supporting workers career transitions.

FIGURE 12.1: MAIN STAKEHOLDERS IN THE CEP AFTER THE 2018 REFORM



Source: Authors

While reference to the application of the same specifications by all providers is intended to guarantee "universality" and maintain the "uniqueness" of the CEP service, the parcelling out of CEP service delivery to a plurality of stakeholders/providers may call into question the effectiveness of these principles, as well as the legibility of the service and the understanding of what it covers, by its intended users. It may also raise questions about the level and degree of coordination between providers (between themselves and with other players) to ensure that support throughout working life runs smoothly and constructively. These questions were raised in a study carried out by Céreq shortly before the 2018 reform (see D'Agostino et al., 2020). The study revealed that provision of career guidance at the local or regional level varied, according to a number of factors such as local economic conditions, the degree of local political support, or the degree of coordination among local stakeholders, amongst others.

The entry into force of the law of 5 September 2018 would therefore need to "meet the challenge of effective and equitable access to the CEP", particularly to meet the needs of those in private sector employment who had hitherto been poorly represented among the users of the service.[48]

This chapter draws on the findings of a study conducted for Cedefop, one part of which looked specifically at the CEP and the services it provides to those working in the private sector with a particular focus on less qualified workers (see Box 12.2).[49] The study revealed: (i) sustained efforts on the part of the new operators/providers to carve out a place for themselves in the ecosystem which emerged from the upheavals following the 2018 reform; (ii) asymmetries in the perception of the service and its objectives which were reflected in the relationships with stakeholders; and (iii) CEP scoping still being defined in relation to the human resource (HR) issues facing companies and career transitions towards occupations and sectors experiencing labour-shortages.

Box 12.2: Data sources

This chapter is based on a partial examination of data initially collected for the Thematic Country Review on Upskilling Pathways for Low-Skilled Adults in France, conducted by Céreq and IREDU, and coordinated by FGB, for the European Centre for the Development of Vocational Training (Cedefop) between 2020 and 2023 (Cedefop, 2023).[50] The CEP is one of the guidance schemes observed in the thematic review. Forty qualitative interviews were conducted in three different regions of France between 2021 and 2023, with CEP counsellors and members of the teams delivering CEP services, and with other stakeholders in the guidance and support ecosystem (e.g. Transitions Pro, OPCO[51]) which were also affected by the governance changes introduced by the 2018 reform.

48 In 2017, less than 2 per cent of employees said they had met a career development advisor and 15 per cent said they had been informed about the CEP by a line manager, company director or someone in the HR department (Défis / Céreq data).

49 The study was conducted jointly by FGB, Céreq, IREDU and INAPP for the European Centre for the Development of Vocational Training (Cedefop) during 2020-2023.

*50 Publications are available on Cedefop web site. (*https://www.cedefop.europa.eu/en/publications/5594)

51 Operateurs de Compétences: joint bodies supporting sector councils to implement skills development policies and companies training strategies; financing and supporting companies with fewer than 50 employees, helping them define and implement their skills development plans.

12.2 The new CEP providers practicing a new ecosystem of stakeholders

The first contract relating to the implementation of the CEP for private sector employees and independent workers took place at a time of a major institutional reconfiguration following the 2018 reform and, to make matters even more difficult, during the COVID-19 pandemic. The resulting instability, the "multiplication of players",[52] and the "fragmentation of services" all contributed to a loss of reference points, a fragmentation of information and even, at times, an overload of offers from a variety of providers. The stakeholders who were interviewed – including those in the CEP target groups and those delivering the service – reported a "loss of legibility" and a feeling of "confusion". It has taken time to come to terms with the new roles and sometimes to "mourn" the loss of the old ones,[53] to become acculturated both internally (within each organisation) and reciprocally (to re-understand one other). This has had a disruptive effect on the establishment and nurturing of relationships between stakeholders, as well as on the availability and completeness of information on the services and schemes available to the public. It has resulted in a puzzled ecosystem with a limited time horizon (the public procurement process will require services to be re-tendered at a given time) within which consortia of providers mandated by France Compétences (see Box 12.1 and Figure 12.1 above) have had to rapidly find a place for themselves as CEP operators in the wider employment-training-vocational guidance landscape (see France Compétences, 2019).

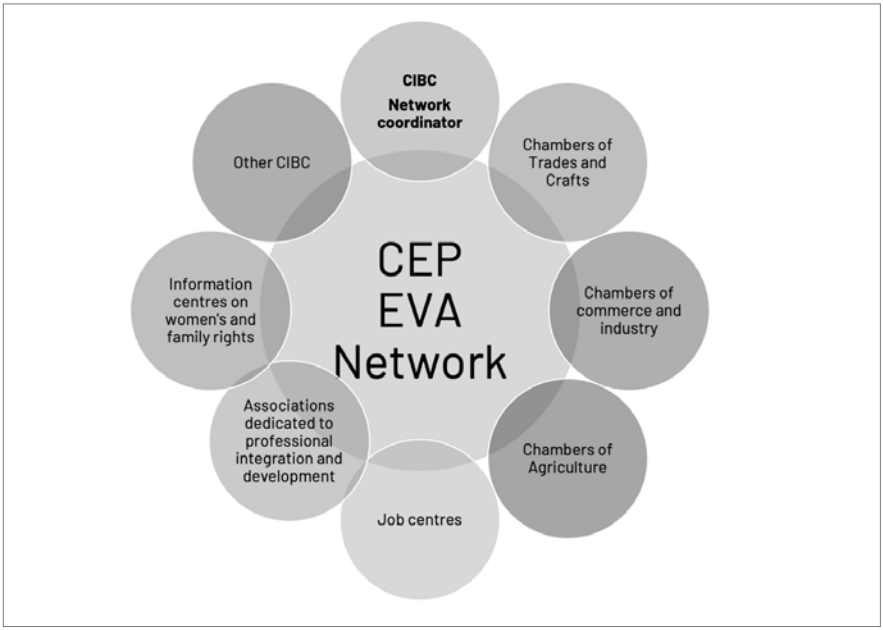
The regional CEP consortia are made up of a wide variety of players. For example, in the three regions studied here, the lead partners are inter-institutional skills assessment centres (CIBCs) and their co-contractors are players with very different statuses, areas of expertise, and backgrounds (see Figure 12.2). This diversity is, on the one hand, an asset for the service. It ensures good territorial coverage, proximity to the places where potential users live and work, and complementary skills and expertise. On the other, it has the disadvantage of blurring the link between the CEP and its operators, especially when the latter is renowned for being involved a multiplicity of different fields. This is the case, for example, with the Information Centres for Women's and Family Rights, which are more closely associated with the provision of support

52 In the rest of the chapter, passages in inverted commas represent extracts from interviews with stakeholders.

53 For example, new OPCOs (Opérateurs de compétences) replaced the former OPCAs (Operateurs Paritaires Collecteurs Agrées), but their scope of action has been revised and is now largely focused on funding work-based training and apprenticeship. Their remit also includes helping companies with fewer than 50 employees to draw up and finance skills development plans for their employees.

for women and families in difficulty than career guidance more generally, or the consular chambers, which are more closely associated with their missions to represent and support businesses and craftworkers. The highly differentiated and entrenched identities of the operators can limit understanding of the CEP service. The creation, however, of a common brand such as the "Réseau Eva"[54] has helped to address this problem in the regions concerned.

FIGURE 12.2: COMPOSITION OF REGIONAL CONSORTIA IN THE THREE REGIONS OBSERVED



Source: Authors

While the diversity of operators makes it possible to bring together different professional backgrounds and sensitivities, it does not necessarily help to obtain a synthesis of professional cultures and practices around the CEP service. Operators are working hard to ensure that the initial organisational heterogeneity evolves into a common, shared position, particularly for the CEP counsellor role. This process of professionali-

54 *"Réseau Eva" is the single name to be adopted in 2021 by the groupings of CEP operators in the eight regions in which the CIBC network has been mandated by France Compétences as lead partner.*

sation, not yet completed, has been based mainly on voluntary participation in training courses and workshops for sharing practices. Several of the operators interviewed had a fairly positive assessment of the process and supported the idea of setting out reference standards for the CEP profession (i.e., CEP counsellor training leading to official certification). Regional consortia managers, at the same time, said they were committed to deliver the same service across all territories. Support to counsellors was also provided. Managers themselves were in close contact with France Compétences, which offers additional assistance to support the uniform deployment of the service over different geographical areas. The managers interviewed were generally positive about the relationship that had developed with France Compétences, which was, they said, based on "continuous improvement" and "dialogue". From the point of view of the co-contractors, the support they received for the delivery of the service and the professionalisation of their counsellors was also viewed fairly favourably. Some, however, mentioned the difficulties of operating in a "highly fragmented market". They would like to see more inter-connection between consortium members, and also to be more involved in discussions with France Compétences.

Partnership building is not confined to internal relations within the regional networks of providers; it characterises the very essence of the work promoting the service and implementing a "link" between users, other stakeholders, and the resources to be mobilised. Partnership initiatives are intended to contribute to service awareness, to the professionalisation of counsellors, to the enrichment and fluidity of the career pathways supported, and to the inclusion of the service in local labour market development strategies. Collaborative actions (e.g., co-organisation of webinars and forums, inter-stakeholder meetings, etc.) also make it possible to clarify or re-establish links between the different organisations and the services they offer,[55] and also to pool funds and human resources.

Partnerships are created at several levels. At regional level, priority has been given to strategic and institutional partnerships with a wide range of stakeholders (e.g., public CEP providers, Transitions Pro associations, OPCOs, the regional authorities, etc.). More recent initiatives show the will to extend connections to a wider range of interlocutors (e.g., those providing occupational medicine, social or psychological support to workers, etc.) so that they can play a relay role, particularly with more vulnerable employees (sometimes in a situation of "distress" or "exhaustion" at work) and, impor-

55 *The CEP often works in conjunction with other schemes offered by other players: for example, Transitions Pro for financing career transitions or the OPCOs for workers' continuing training. The CEP can also advise employees on the use of the training credits registered in the personal training account (CPF) or access to Regions funded training leading to a qualifications.*

tantly, so that they have the potential to include CEP referral in their toolkits.

At local (sub-regional) level, the aim is to develop and make operational the political and institutional partnerships, taking into account local particularities (linked to the geography of the area, the composition of the local economic fabric, and the diversity of training and employment offers, etc.). It also involves developing or maintaining relationships with stakeholders who can be a resource at some stage in the support process (e.g., training organisations, organisations dedicated to business start-ups, business associations, etc.). Weaving this web of inter-connections is dependent upon co-contracting organisations rooted-in, and with knowledge of, the local environment. Counsellors' personal networks of acquaintances, often preceding the CEP mission, are also important. Ultimately, the links established locally influence the service offering and the variety of support options and solutions available.

The CEP service providers have therefore made great efforts and undertaken a range of actions to become part of the guidance and training ecosystem and "acquire legitimacy". What remains to be done is to scale-up provision to a level consistent with the ambition of "democratising the CEP as much as possible" and reaching all the target populations (in particular less qualified individuals and those most in danger of exclusion from the labour market).

12.3 Asymmetries in the perception of the CEP service reflected in relations between stakeholders

To date, the increase in the use of the CEP has been based, to a large extent, on workers' requests for support to effect desired future career changes. These are frequently concerned with leaving their current employer and following a pathway which often includes a period of training/reskilling[56]. The CEP then deploys its pedagogical and financial engineering capacity to support the individual.
It assists with obtaining funding to support individuals' career transition plans, the main sources of which are the Professional Transition Project (PTP),[57] and the Resi-

56 *This is referred to career transitions defined as "the passage from one profession to another without a direct link with the first or a change of status which radically transforms the exercise of the profession (creation of a company for example)" (see report by the Réseau Emplois Compétences (June 2023) Relever le Défi des Transitions Professionnelles.*

57 *The PTP replaces the former individual training leave from 2019. "The PTP is a special way of using the personal training account (CPF), enabling employees wishing to change job or profession to finance training leading to qualifications in line with new prospects and plans. Under this scheme,*

gnation Scheme,[58] both managed by the Transitions Pro associations. Their inter-professional regional joint committees assess the proposals for funding and then evaluate the applications according to funding priorities that are mainly national ones (defined by *France Compétences*) or marginally adapted to regional priorities.[59] They establish the "real and serious nature" of the proposals. In both cases, CEP support can help to secure career transitions, in particular by helping to consolidate proposals. The guidance-support-financing continuum, previously provided by a single organisation (the former FONGECIFs), has been redistributed between the CEP providers and the Transitions Pro associations.

In the context of the Resignation Scheme, CEP support is compulsory before submitting a funding application to Transitions Pro. Therefore, a timely link between guidance support and (potential) funding is ensured. The CEP stage, however, can sometimes be reduced to a mere administrative formality. In the context of the PTP application process, CEP support is merely recommended, and it is not uncommon for it to be provided only after funding has been refused, or where an application is not provided in sufficient time to allow enrolment in a training programme.

Coordination between all the parties involved appears to be central to promoting smooth pathways to career transition. This varies from one player to another and from one region to another. By way of illustration, the CEP providers often report a lack of fluidity in their exchanges with Pôle Emploi.[60] For example, they would like to have dedicated contacts for the Resignation Scheme, which would make it possible to have comprehensive information on the possibilities for covering training costs, and have visibility on the future of career transition projects.

With the Transitions Pro associations, close relationships were most often reported by CEP providers. On the one hand, these relationships are facilitated through the task

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employees are entitled to be financially supported during the training leave for the duration of the training course". https://travail-emploi.gouv.fr/formation-professionnelle/formation-des-salaries/article/projet-de-transition-professionnelle

58 The Resignation scheme (Dispositif Démissionnaire), created by the law of 5 September 2018, can be used, under certain conditions, by employees with a business start-up/takeover project or a reskilling/retraining project, enabling them to receive unemployment subsidy after resigning. The subsidy is allocated by the public employment service Pôle Emploi.

59 Identifying jobs and skills needs in the region is one of the tasks assigned to the Transitions Pro associations.

60 The main French public employment service

of monitoring the regional implementation of the CEP service by the Transitions Pro associations, which can encourage coordination between the different CEP providers for all target groups combined (see Figure 12.1 above). On the other hand, these easy-going relationships relate to the link between career guidance support and project funding. Most of the CEP advisors interviewed highlighted the fact that they work "in good harmony", which enables them to understand the expectations and criteria of the funder and to be "more effective in their counselling role". However, they also sometimes expressed difficulties due to the lack of a dedicated channel of communication between advisers from the two organisations.

While the relationship between the Transitions Pro associations and the CEP providers are valuable and should be maintained, it was said to be important not to "over-invest" in it, so as not to over-invest in the advice-financing continuum which would cause people to lose sight of the full range of interventions the CEP can support (for example, to benefit from counselling support in order to progress in one's existing profession rather than looking to enter a new one). From this point of view, the emphasis placed on reskilling may skew perceptions of CEP's role, including by the counsellors themselves.

The managers of the mandated CEP providers were increasingly involved in developing service awareness by promoting all its facets. This commitment can be seen, for example, in initiatives to work in synergy with the other CEP providers (for all target groups) to agree on how to present the service, or in initiatives to work as a "triptych" of CEP providers - Transitions pro association - OPCO. Closer ties with the OPCOs can be a way of reaching out to companies and professional branches,[61] of transmitting through them the fullest possible information on the CEP, but also of envisaging links with schemes for which the OPCOs are responsible. These alliances may make it possible to circumvent some of the constraints imposed by the new financial regulations introduced by the reform in 2018. The stakeholders pointed out that a significant reduction in the (financial) room for manoeuvre available to design and implement coherent initiatives to promote career progression and transitions and employee skills development (particularly for the less qualified). The budget envelopes available are proving to be both insufficient and difficult to interoperate. This leads to "silo" operations that are not conducive to the co-construction and financial support of projects that bring together the interests of various parties and respond to needs on the ground.

61 The occupational branches group together companies from the same sector of activity, covered by the same collective agreement concluded between the employers' representative and employees' trade unions. Providing companies with support on upskilling strategies has become part of the mission of the occupational branches.

12.4 The CEP is still defining its place in relation to companies' HR challenges and professional transitions towards "shortage" jobs.

The 2023 French economic situation, in particular the problem posed the high number of "shortage" jobs,[62] highlights the difficulties in achieving a balance between individual aspirations on one side, and the needs of companies and local labour market development on the other. This issue is most evident in the positioning of the CEP between these poles. In order to be a vital component, the CEP has to work with a wide range of stakeholders, including companies. According to the technical specifications for the contract relating to CEP delivery to workers in the private sector, providers are required to promote the CEP to companies and specify how it complements their HR management. Evidence shows that employers, in particular their HR managers, continue to provide their employees with little information about the CEP (Baraldi and Durieu, 2020). In addition to the lack of information, which affects a significant proportion of companies, particularly the smallest ones (Sigot and Vero, 2020), the perception of the CEP's objectives is partial, reduced to a tool to help employees quit a company. In a context where recruitment tensions and staff turnover are widespread, "companies are a little cautious about the CEP because they think it will lead to disruption".

The interviewed stakeholders agreed on the importance of investing energies in bringing about a less fragmented or partial understanding of the service and improve liaison with companies. They stressed the importance of intensifying local support to companies to "get them on board" and that they, in turn, "get their employees on board" (particularly the less qualified ones who often have difficulty thinking about upskilling and advantages the CEP may afford them). Stakeholders who possess the competence to support companies felt that they had become (after the reform in 2018) "operators in the strict sense of the term, applying top-down roadmaps" and that they do not have sufficient means, human resources, or time to reach out to companies to meet their demands and work with them to develop appropriate (financial) responses to their HR challenges. Stakeholders also advocated highlighting the points of compatibility between companies' HR strategies and the CEP's mission, particularly in terms of employee stabilisation and progression, in order to counter the idea that the CEP contributes to staff turnover. This effort needs to be encouraged by both companies and CEP professionals to ensure mutual understanding.

62 These are occupations where there is a shortage of people to work in them because they are less attractive to workers or, in certain cases ,because they require specific and emerging skills not (yet) mainstream in the labour market.

On the more specific topic of professional transitions towards "shortage" occupations, viewpoints varied, including among CEP professionals. Some emphasised that the CEP "is not a pool of candidates" and is not intended to guide people towards particular occupations or sectors. Others thought about ways of working more closely with the professional branches, which "face sourcing problems" and which could "professionalise" CEP counsellors by providing deep knowledge of specific sectors and the economic needs of the regions, in order to "provide a more appropriate response to the needs of the target public, without adopting a matching approach".

12.5 Conclusions

The positioning of the CEP still needs to be adjusted. The ways in which the different aspects of the service can be put into practice still need to be clarified, without over-investing in any one of them in response to a particular situation. With this in mind, it is important to guarantee the continuity of CEP provision. Those interviewed as part of the study, foremost among them the CEP providers, stressed the need to establish the service over a long period of time, so as "not to have to restart from scratch" when a new round of public procurement commenced so as not to wipe out the "phenomenal work" undertaken to "build it up, establish it, make it known and recognised". For the future, the stakeholders stressed the importance of working together to make up for the lack of awareness of the service and encourage its wider use. They would like to see support from the State in the form of: (i) a vast national communication campaign, similar to the one carried out for the CPF, which would back- up the regional initiatives of the operators "it's such a fundamental right that the State should also put some money into national communication"; and (ii) an increase in the budget allocated to the CEP to support private sector employees and independent workers which would be in line with the CEP's ambition to increase the number of service users.

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CHAPTER 13

Apprenticeships and the varieties of capitalism: the liberal market economy case of England

Peter Dickinson and Terence Hogarth

13.1 Introduction

In the varieties of capitalism literature, England is classified as a liberal market economy characterised by weak or absent collective bargaining and relatively weak employment protection regulation (Thelen, 2004). Employment policy pursued by successive governments since the late 1970s has sought to make it easier for firms to hire and fire and reduce the frictions which limit worker mobility between employers and jobs. In the absence of countervailing factors such as collective bargaining, the capacity of firms to appropriate the returns on training investments is reduced compared with co-ordinated market economies such as Germany's (Acemoglu and Pischke, 1999). Even in a liberal market economy, employers retain a degree of monopsony power which explains why they invest in training such as apprenticeships that accumulate a net cost at the end of the formal training period (Mühlemann et al., 2011). But this is likely to be less than that in co-ordinated market economies where institutional factors mitigate the risk attached to employer human capital investments (Kriechel, et al., 2014). It has been shown that where employment protection measures are relatively strong such that it is difficult to fire staff, adaption costs prove to be relatively high. Apprenticeships can help lower these costs by providing skilled workers who are able to adapt to change and reduce the need to recruit employees from the external labour market who will be less productive than existing ones. Long-term benefits accrue to firms that train. In contrast, were employment protection measures are relatively weak and adaption costs low, employers are disincentivised from accruing substantial net costs post training (Muehlemann, et al., 2010).

With the introduction of publicly funded apprenticeships in 1994, the UK government sought to introduce a form of training, common to many co-ordinated market economies with relatively high productivity levels. UK productivity growth would increase, it was surmised, if employers used apprenticeships to make medium- to long-

term investments in skills. These were likely to accrue net costs to the employer over the short-term but which could be recouped later. These were the investment type apprenticeships identified by Lindley (1975) as being associated with relatively high-skilled jobs. Recouping the net costs for these types of apprenticeship over the longer-term poses a number of problems. Without collective bargaining or something similar which would effectively prevent free-riders recruiting the training firm's apprentices upon completion of their training, employers were always likely to be disincentivised to invest in these kinds of apprenticeships compared with their counterparts in coordinated market economies. Policy makers in England attempted to solve this by giving employers (not the social partners in full) a high degree of influence over the structure and content of apprenticeship standards (i.e., the specification of the skills to be delivered), the means of delivery, and who could be an apprentice. Employers, policy makers reasoned, would concentrate on the delivery of skills which improved organisational performance and thereby the economic value in the external labour market of the skills apprentices acquired. And they could do this in a way which gave them a degree of monopsony power. Policy makers were looking to achieve a fine balance between increasing the monopsony power of employers (because there was scope for employers to tailor apprenticeships to their particular organisational needs at least at the margin) and increasing the labour market mobility of former apprentices (through independent assessment and certification of their skills).

Granting employers more influence over the content and structure of apprenticeships together with freeing up the eligibility criteria as to who can be apprentice, through a series of successive reforms spread over many years has transformed the characteristics of apprenticeships and apprentices in England. There has been an increasing number of apprenticeships delivered at EQF level 5+ to people who were already employees, sometimes longstanding ones, of firms (IFF Research, 2022). Accordingly, apprenticeships have become both a form of initial and continuing vocational education and training (VET). But the problem of creating a mass participation apprenticeship system has persisted in part because those exiting compulsory education preferred to enter higher education rather than VET, and because of employer reluctance to take on apprentices. The solution to the latter problem was the introduction of an apprenticeship levy in 2017 payable by all firms with a payroll over £3m which could be recouped by providing apprenticeships. Its introduction led to a fall in the number of apprenticeship starts.

This chapter explores how the introduction of an apprenticeship programme into a liberal market economy – in this case England – has played out in practice to reveal the tensions policy makers have needed to reconcile in doing so. Employers want to ap-

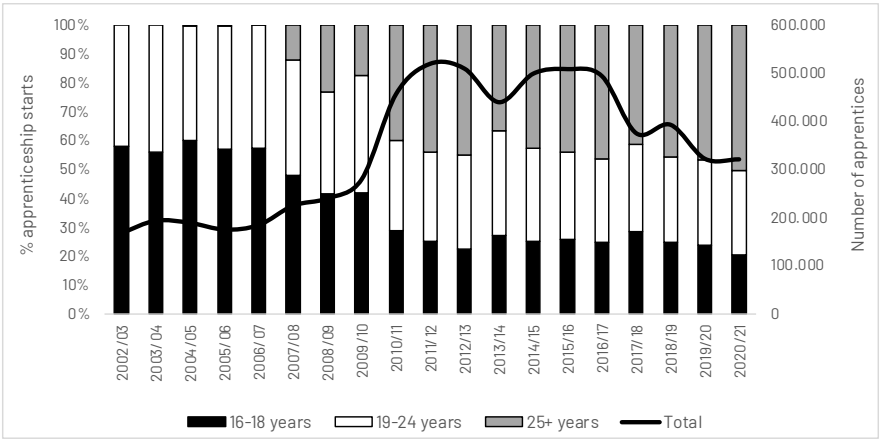
propriate the return on their training investments while policy makers (and, possibly, former apprentices) want to encourage labour market mobility. The decisions made in practice by employers, it will be shown, has resulted in the publicly-funded apprenticeship system looking very different in 2024 to how it was first envisaged in 1994. The chapter draws on a range of quantitative and qualitative evidence, concentrating on the more recent reforms to the apprenticeship system, to reveal how the forces within a liberal market economy have shaped its provision (Markowitsch and Wittig, 2020).

13.2. The development of the apprenticeship system in England

There has been a preference for apprenticeships over other forms of vocational education in England over recent decades. Publicly funded apprenticeships (Modern Apprenticeships) were first introduced in 1994 and had their roots, at least in part, in the relatively high levels of youth unemployment prevalent at the time and in the general acceptance that active labour market policies such as the Youth Opportunity Programme, Youth Training Scheme, and Youth Training failed to deliver something akin to the industry run apprenticeships available at the time but which were in steep decline (Gospel, 1995; Haxby, 1989). Publicly-funded apprenticeships also had their roots in policy concerns that Britain had little by the way of a system which delivered intermediate-level skills, which were seen as important drivers of productivity and competitiveness in countries such as Germany and the Netherlands (Broadberry and Wagner, 1996). Following the introduction of Modern Apprenticeships in 1994, the evidence suggests some initial success with respect to increasing the volume of apprentices and the quality of training provision (Hasluck et al., 1997; Riley and Metcalf, 2003; Economic Research Services, 2000).

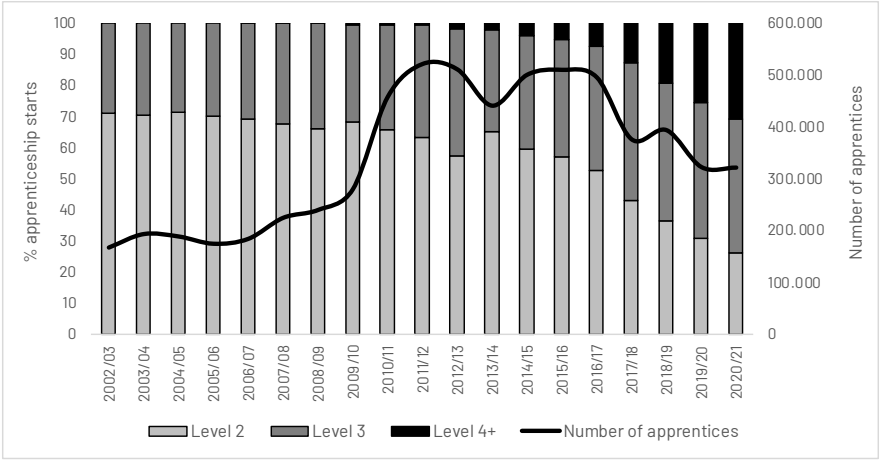
Despite initial positive outcomes from the introduction of Modern Apprenticeships in 1994, policy makers have had persistent concerns about the quality and volume of provision. Even the most cursory look back over the past two decades reveals a large number of official reviews with concomitant plans for reform. The data in Figures 13.1 and 13.2 indicate how increases in apprentice volumes has stalled at various times. It also reveals the impact of policy changes designed to increase the scope of apprenticeship training such as provision at higher levels (European Qualification Framework [EQF] levels 5 and above) and allowing apprenticeships to be used as a means of training existing, sometimes long-standing employees. The figures also show the sharp drop in apprenticeships starts following the introduction of the apprenticeship levy.

FIGURE 13.1: NUMBER OF APPRENTICESHIP STARTS BY LEVEL



Source: DfE Apprenticeship Programme Starts by Level and Age

FIGURE 13.2: NUMBER OF APPRENTICESHIP STARTS BY AGE



Source: DfE Apprenticeship Programme Starts by Level and Age

In 2012, getting on for 20 years since Modern Apprenticeships were first introduced, the Richard Review of Apprenticeships called for root and branch reform which involved some simplification of what constituted an apprenticeship, an increased empha-

sis on the role to be played by employers in establishing the content of an apprenticeship (hence the shift from frameworks to employer-led standards), and an increased emphasis on training at European Qualification Framework (EQF) levels 3 and above (Richard, 2013). The intended impact of these reforms was to make apprenticeships more attractive to employers (given their role in the design of standards) and shift the focus away from level 2 to higher levels of skills provision.

Alongside the reforms recommended in the Richard Review, changes have been made in the apprenticeship funding regime. In the period following the establishment of publicly-funded apprenticeship, policy was very much focused on increasing the volume of provision. Training providers were funded to deliver apprenticeships which might be used to accredit existing employees' skills or simply to train existing employees to the next level, rather than, for instance, training young people specifically recruited as apprentices. A recurring worry was that of insufficient provision of investment-type apprenticeships, available to those exiting compulsory education with a concomitant lack of investment in apprenticeships (and skills more generally) by employers. At the end of the 2010s the Banks Review drew attention to what it described as sub-optimal levels of investment in apprenticeships and the need to leverage more investment from employers (Banks, 2010). This was echoed in policy documents which mentioned that the costs of apprenticeships needed to be shared between their beneficiaries – i.e., the state, employers, and individual apprentices. In practice, this would require the employer to bear an increased share of the overall cost of training an apprentice. The principal cost borne by the state was that of paying for the training specified in an apprenticeship framework or standard to be delivered by training providers (i.e., vocational schools in the European discourse). Under the rubric of employer routed funding, employers were to pay a certain share of this cost – set at 10 per cent initially – but would be encouraged to negotiate with training providers about the cost of training and how it might be delivered to their apprentices. In this way, the employer might bear more of the overall cost but employer might also be able to drive down the overall cost of delivering the apprenticeship such that the costs were less than that previously borne. For example, if the training delivered by the training provider / vocational school was undertaken more efficiently at the employer's behest this might lower the costs borne by the employer (e.g., because the apprentice is able to spend more time engaged in productive activities). By contributing to the cost of training (the 10 per cent contribution) employers would be incentivised to obtain value for money from providers and ensure that training met their needs. Research at the time revealed little enthusiasm from employers for trade-off of meeting an increased share of apprenticeship training costs in return for more influence over its content (Hogarth et al., 2014). Before the policy had much chance to gain a footing, it was superseded by

the announcement, in 2015, to introduce an apprenticeship levy in 2017 together with some other changes.

13.3 The 2017 Apprenticeship reforms

In the Spring 2017 a further series of reforms were made to the apprenticeship system in England. These included the introduction of the apprenticeship levy, a minimum requirement that 20 per cent of training be undertaken off-the-job (not necessarily in a vocational school just a way from the production process), and a shift from frameworks to standards co-developed with employers. This latter reform was designed to further increase employer influence over the content of apprenticeships. The introduction of the levy marked a significant break with previous policy in this area. From the 1960s onwards government had systematically abolished the use of training levies with a few exceptions (such as in construction). Policy makers in England viewed levies as leading to training for which there was little or no demand. In others words, training for training's sake, whereas the stated aim of skills policy was to provide training for which there was a demonstrable demand and had economic value in the labour market. The 2017 apprenticeship levy was set at 0.5 per cent of an employer's payroll above £3m which could then be recouped to cover the costs of mandatory training specified in an apprenticeship standard. The levy was said to be necessary to stimulate employer investment in skill (Wolf, 2015). Government policy at the time was also focused on reducing public expenditure so this may also have had a role in the decision to introduce it.

Although policy was very much focussed on apprenticeships being demand-led, the levy might be seen to reinforce the supply-side approach. Given that employers are reclaiming their own money to train apprentices and there is sufficient flexibility in the system for apprenticeships to satisfy a wider range of employer requirements than hitherto with the move from frameworks to standards, then there is reason to believe that employers might well incentivised reclaim their funding and use it to meet a range of skill demands across their businesses. In a sense, the levy forces employers to assess their skill needs to avoid a potential loss of income and, in so doing, increase employer investments in skills. There is also an argument that in a system such as that in England, where there is a strong external training market which provides individuals with externally accredited qualifications in a labour market which encourages job mobility, then there is a need to protect employers who train from potential free-riders.

13.4 Employer behaviour post-Levy

In practice, the levy seems at first sight to have dampened the demand for apprenticeships. In 2016/17, before the Levy was introduced, there were 484,000 apprenticeship starts with around 12 per cent of employers reporting at least one apprentice on their payroll (Shury et al., 2017). Following the introduction of the levy in 2017, the number of apprenticeship starts fell to 375,000 (i.e., three quarters of what they were prior to its introduction) with 11 per cent of employers reporting that they had an apprentice.[63] As Figures13.1 and 13.2 above reveal, the number of apprenticeship starts has remained stubbornly below pre-levels. So what went wrong if anything?

Dickinson and Hogarth (2020) undertook a series of employer case studies to explore how employers had responded to the introduction of the levy. In particular, they addressed the transitional and structural factors which likely to have accounted for the fall in apprenticeship starts. In general, employers said the introduction of the levy had concentrated minds within organisations with respect to how their levy payments might be recouped to deliver the skills their organisations required. In this way, it provided a fillip to those within organisations responsible for apprenticeship training. But turning this positive into actual apprenticeship starts has faced a number of challenge. Some of these were transitional and likely to disappear over time, including:

- administrative issues related to recruiting apprentices and reclaiming levy payments;
- co-ordination failures within large companies. Where budgets are centrally held within organisations because of the way the levy has to be paid, it was not always apparent to specific departments or branches within large organisations that funding was potentially available from the employer's unused levy contributions which could be drawn down to meet a specific department's training needs;
- the COVID-19 pandemic, which followed the introduction of the levy may well have reduced further the number of apprenticeship starts by an estimated 14 per cent.

Transitional impacts would appear to have had a marked impact in the first year following the introduction of the levy. For the most part these problems were quickly resolved, especially where employers were recurrent recruiters of apprentices and delivering investment-type apprenticeships. The experience of the employers described below – one which tended to take apprentices onto longer duration, higher level apprentices, and one looking to recover its costs relatively quickly – was relatively common.

63 As recorded in the Employer Skills Survey 2019

"We're committed to taking on more apprentices. It's recognised that apprenticeships are an investment, but it is one that pays off if the sufficient effort is made in the recruitment process."

(Source: Levy paying, large employer in the education and training sector providing advanced and higher level apprenticeships)

"It was a case of just get as many as we can. The levy was just a bit of a hump in the road for us. We've always been involved in apprenticeships. The levy was just a bit of a challenge and, if anything, it gave us more drive to get apprenticeships".

(Source: Levy paying, large employer in the other service sector providing mostly intermediate level apprenticeships)

In general, employers providing relatively long duration, investment type apprenticeships tended to be up to speed with the introduction of the levy and were relatively well prepared to deal with its introduction as the case below reveals.

"We were working on some of the trailblazer standards so knew what it meant for us. Not such a massive shift because we were already training people up. So, we were not apprehensive about the reforms. We are an employer provider so the initial hardest work was in developing standards."

(Levy paying, large employer in the utilities sector providing advanced and higher level apprenticeships)

There were some co-ordination problems. One large education provider mentioned that the levy pot was held centrally with the result that individual departments were not aware of potential funds which could be drawn down to fund taking on an apprentice. This was seen as transitional but was something which emerged over time in the organisation.

"We do not use all of our levy funds but we would like to change this. At the moment there is no centrally planned process; each department decides its own requirement. This means that there a certain departments that are not as aware as others about the potential to take on apprentices and the funds we have available to train apprentices. For some, an apprenticeship is still associated with a certain type of training (mainly for young people) when it has in fact moved well away from this."

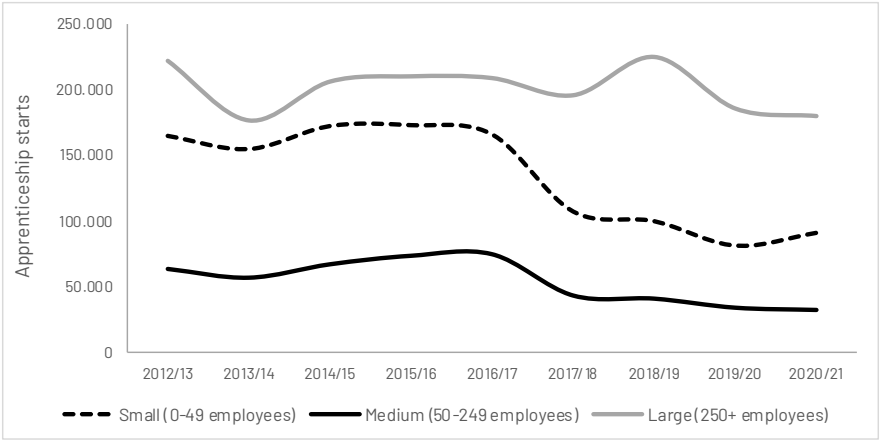
(Levy paying, large employer in the education and training sector providing advanced and higher level apprenticeships).

These were transitional problems which employers expected to, or had to, resolve in the years immediately after the introduction of the levy. There were, however, more structural problems at play which may explain more about the levy's persistent impact on training volumes. These are:

- a sharp fall in the number of apprentice starts amongst non-levy payers;
- concerns about meeting the costs of apprenticeships under the levy;
- an increased preference from employers for people working towards higher level apprenticeships who were often existing employees.

The statistical evidence clearly demonstrates how, post-levy, the number of apprenticeship starts amongst non-levy payers dropped-off (see Figure 13.3). While it has recovered slightly it is still well below the level at which the Levy was introduced. Size of enterprise can be used as a proxy measure of whether or not an employer falls in scope of the levy. Small employers – those with less than 50 employees – are much more likely to be levy payers compared with their larger counterparts. Prior to the levy's introduction, the number of apprentice starts at enterprises with less than 50 employees was more or less stable over time (between 2012/13 and 2015/16 starts increased by one per cent). With the introduction of the levy, the overall number of apprenticeship starts fell away (between 2015/16 and 2018/19 starts decreased by 40 per cent). The evidence clearly points to smaller enterprises and / or non-levy payers being less likely to take on apprentices in the post-levy period.

FIGURE 13.3: NUMBER OF APPRENTICESHIP STARTS BY SIZE OF ENTERPRISE



Source: DfE Apprenticeship Programme Starts by Level and Age

In the case of small enterprises, a consequence of the need to contribute to training costs was to concentrate attention on the cost-benefit of taking on an apprentice. The fact that non-levy payers had to make a 10 per cent contribution to meeting the costs of the training provider delivering the apprenticeship is likely to have increased the reluctance of non-levy payers to invest in apprenticeships. Prior to the introduction of the levy, the costs incurred by the training provider in delivering the mandatory training and assessment were met by the state. The examples provided below show how non-levy paying employers responded to the 10 per cent contribution.

> *"It was pretty grim. A 10 per cent fee was mooted before but it was not enforced so we didn't use to pay anything".*

(Non-levy, small employer in the other service sector providing intermediate level apprenticeships)

> *"It was another added cost so we had to think hard about it [i.e. whether to recruit apprentices]."*

(Non-levy, small care employer providing advanced level apprenticeships)

Research undertaken at the time of the levy's introduction found that, over the medium term, levy payers planned to increase their apprenticeship recruitment (by 18 per cent driven by the need to spend the levy) and non-levy payers to reduce theirs (by -14 per cent) (Dickinson, 2017a). Later in 2017, a survey of 229 employers for the Department of Education (DfE) also found that over the medium term levy payers were more likely to increase apprentice starts whilst non-levy players were more likely to reduce them (Dickinson 2017b). The evidence in Figure 13.3 shows that apprenticeship starts amongst levy payers has increased since the levy's introduction, but not to a level sufficient to offset the fall amongst non-levy payers. Other evidence suggests a more nuanced picture The ex-ante evaluation of apprenticeships revealed that it would have little impact on the provision of investment type apprenticeships (i.e., those that tend to accrue a relatively high net cost to the employer at the end of the formal training period) (Gambin and Hogarth, 2020). This was because the overall net cost to the employer was far in excess of any levy payment. Employers, in effect, would net out the levy payment when considering whether or not take on an apprentice (much as they had done prior to the introduction of the levy). If delivery of an apprenticeship produced a net cost to the employer of around £40,000 at the end of the formal training period, the opportunity to reclaim, say, £16,000 of their levy payment, was unlikely to have a major impact on their decision to train or not. For them the impact of the levy would have no impact.

Since the levy's introduction there has also been a large rise in starts of higher level apprenticeships. In order to recoup their often substantial levy contributions, levy payers increasingly delivered apprenticeships at higher levels sometimes as a form of continuing professional development and training but not always. The example below provides an insight into this development where an employer decided to use its levy contribution to develop a degree level apprenticeships.

> *"We had an internal programme at this level [EQF level 6] but it didn't seem to work. It was difficult to recruit people on to it and there were problems with retention. So, we had an internal review, looked at the standards and saw that they aligned with what we wanted. The degree apprenticeship is more attractive and appealing to people rather than an internal training programme. It gives people a portable, widely recognised qualification. But it also helps to keep hold of people because it's a strong programme that gets them into engineering roles and this will increase retention. It is for new recruits not internal."*

(Levy paying, large utility employer providing advanced and higher level apprenticeships)

The evidence clearly points to an increasing preference for employers to make use of higher level apprenticeships, especially those at EQF level 5+. As noted above, some employers indicated that this was the direction of travel within their sectors – i.e., the increased demand for people with higher level skills which apprenticeships are now able to deliver. By and large, these are relatively costly ones to both employers and the State. The funding bands for Level 4+ Apprenticeships tend to be substantially higher on average than those at levels 2 or 3 (though not in every case). By selecting these kinds of apprenticeships, employers are reclaiming relatively more of their apprenticeship levy payment per apprentice. Economic theory also points to training at higher levels having the highest returns.

There are implications for the above for the overall provision of apprenticeships. The amount of funding raised by the levy is meant to pay for the apprenticeships of levy and non-levy payers. If employers increasingly select apprenticeships which have a relatively high training provider tariff attached to them, then in aggregate, there will be fewer apprentices that before the levy (other things being equal). For example, an EQF level 6 apprenticeship in Building Services Site Management has a training cost of £18,000 which will be paid by the state to the training provider / vocational school. This compares with a level 2 in bricklaying at £9,000. In other words, if all apprentices are at EQF level 6, the employer will be able to take on half the number of apprenti-

ces it could than if they were at Level 2. Although there is room for the employer to negotiate a price lower than the maximum available, the evidence seems to suggest that providers charge the maximum allowed which employers are reconciled to paying (Dickinson, 2017a; IFF, 2020).

The government initially assumed that around half of all employers would draw down their levy funding, but in practice it has been much lower than this with the result that there is a substantial surplus available available for recycling for use by other employers such as non-levy payers (Marsh, 2020). Accordingly, the overall amount of funding available would not appear to be a constraint on participation levels (Drayton et al., 2022).

13.5 Conclusions

In conclusion, there is evidence that suggests the levy has had limited impact on the delivery of investment type of apprenticeships to young people who have recently exited compulsory education because it does little to affect the costs and benefits faced by employers. Employers might be able to recoup their levy payment for, say, an electrical engineering apprenticeship at Level 3 (around £16,000) but the overall cost of delivery such as apprenticeship far exceeds this. So, where employers are worried about appropriating the return on their investment, the introduction of the levy does little to alter their decision making. Where it has had more influence – i.e., where it may have had some marginal impact – is in relation to the characteristics of employers and apprentices. Employers looking to recoup their levy payment seem increasingly inclined to use it for delivering relatively high-level apprenticeships (typically at EQF levels 5+) to existing employees. In his way, the employer obtains a relatively high return (because the apprenticeship is being delivered to someone who is already relatively highly qualified) and are less likely to lose the apprentice at the end of their training because they are established employees within the firm. This implies that the state's budget will fund fewer apprentices. Where there is a relatively marked impact of the levy is on the provision of apprenticeships by non-levy payers (i.e., smaller firms). There may well be co-ordination failures here if the levy results in less attention than before being focused on supporting this group of employers take on apprentices than before the levy's introduction.

An interesting feature of the changes observed over recent years, which the levy may have exacerbated, is the declining provision to young people working towards completion of an intermediate level apprenticeship. This seems to exceed changes in the age profile of the population with the result that the opportunities for young people to

pursue an apprenticeship at EQF levels 3 and 4 has declined.

The case of England demonstrates the difficulties of establishing a mass partnership apprenticeship system in a liberal market economy. There are less institutional supports in place compared with co-ordinated market economies where there is a broad range of stakeholders supporting the take-up of apprenticeship training by both employers and individuals. The institutional regulation of the labour market in co-ordinated market economies can also reduce the free-rider problem. One might speculate that all of this contributes to a form of social contract that helps sustain mass participation in apprenticeships. It may also make employers more willing to contribute to the general pool of skills if there is sufficient trust that everyone will contribute to skills development. This stands in marked contract to case of the liberal market economy.

The new government, elected in July 2024, plans to replace the apprenticeship levy with a 'Growth and Skills Levy'. This will allow firms to use up to half of their levy contributions on non-apprenticeship training. This might persuade more employers to train, though there are concerns are about deadweight, and there is a risk that it will reduce the number of apprenticeship starts. Time will tell.

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CHAPTER 14

Fair Outcomes for All: Diversity and Gender Equality as key competence to understand complexity and promote sustainable solutions.

Barbara De Micheli

14.1 Introduction

Based on over 20 years of experience of the author as research manager, trainer and consultant in the promotion and development of inclusive working environments, this chapter introduces a short selection of arguments on why diversity and gender equality is the key to sustainable employment in the future. It presents two examples which have sought to define inclusive competences - (i) the OECD global competence; and (ii) the European Institute for Gender Equality (EIGE) gender competence – and presents lessons learnt from three different kinds of empirical experience: (a) the research undertaken to support the implementation of Gender Equality Plans; (b) the consulting activity developed in order to support the definition and implementation of Gender Equality Plan in private organisations; and (c) the design and implementation of over 15 editions of Fondazione Giacomo Brodolini's Master's course on Gender Equality Diversity and Inclusion. In doing so, it demonstrates how diversity and gender equality are central to the creation of sustainable employment.

14.2 Why a focus on diversity and inclusion is needed?

We live in increasingly diverse societies. As the OECD stated in its 2021 report on promoting inclusive education in diverse societies, inequality and an increasing gap between rural and urban areas have led many citizens to take to the streets to voice their concerns and demands (Cerna et al., 2021). Moreover, digitalisation has made it easier to disseminate inaccuracies and outright lies (cf. fake news), and there is growing concern about the algorithms and echo chambers that serve only to confirm the prior beliefs of individuals. Social media, however, offers activists from different

interest groups a powerful and cheap means to campaign against discrimination and raise awareness about those parts of society which have historically faced exclusion from participation in mainstream political debates, possibly because of their gender, immigration background, or because they are part of an ethnic minority group.[64]

The right to equality and anti-discrimination as stated in EU Law,[65] and in the Members States' constitutional laws, has the power to reduce inequality gaps[66] and intrinsically transform the way policies are made so that they better reflect and serve today's diverse societies. Historically, gender equality has been the starting point of interest for inclusion policies. The European Commission (EC) has defined and implemented gender equality strategies since the early 1970s. The most recent, covering the period 2020-2025, presents policy objectives and actions designed to make significant progress towards a gender-equal Europe by 2025. The goal is a European Union (EU) where women and men, girls and boys, in all their diversity, are free to pursue their chosen path in life, have equal opportunities to thrive, and can equally participate in and lead European society.[67]

Gender equality is not the only focus. For the period 2020-2025, the EC has adopted several policies to strengthen Europe's commitment to equality, such as the anti-raci-

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64 See, as an example, the global effects of the #metoo campaign on gender based violence as well as the #blacklivesmatter campaign https://blacklivesmatter.com/*. The movement began in July 2013, with the use of the hashtag #BlackLivesMatter on social media after the acquittal of George Zimmerman in the shooting death of African American teenager Trayvon Martin 17 months earlier in February 2012. It became nationally recognised for street demonstrations following the 2014 deaths of two more African Americans, Michael Brown—resulting in protests and unrest in Ferguson, Missouri, a city near St. Louis—and Eric Garner in New York City. The movement returned to national headlines and gained further international attention during the global George Floyd protests in 2020 following his murder by Minneapolis police officer Derek Chauvin. An estimated 15 to 26 million people participated in the 2020 Black Lives Matter protests in the United States, making it one of the largest movements in the country's history.*

65 A key milestone in the EU legal framework is article 3 of the EU Charter for fundamental rights https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:12012P/TXT, more information on EU antidiscrimination law can be found here https://commission.europa.eu/aid-development-cooperation-fundamental-rights/your-rights-eu/know-your-rights/equality/non-discrimination_en.

66 See as an example the EIGE Gender Equality Index https://eige.europa.eu/gender-equality-index/2023/IT

67 For a detailed presentation see https://commission.europa.eu/strategy-and-policy/policies/justice-and-fundamental-rights/gender-equality/gender-equality-strategy_en

sm action plan,[68] the Roma strategic framework,[69] the strategy for the rights of LGBTIQ persons,[70] and the strategy for the rights of persons with disabilities.[71] From a wider perspective, the United Nations' Sustainable Development Goals – a call for action by all countries to promote prosperity while protecting the planet – dedicated Goal 5 to gender equality, which is described as "not only a fundamental human right, but a necessary foundation for a peaceful, prosperous and sustainable world".[72]

Companies too recognise the need for more inclusive working environments. Since 2015, McKinsey has published on a more or less an annual basis its Diversity Matters Report, which demonstrates the increasing importance companies from around the world attach to diversity, equity and inclusion (DEI). The focus on diversity and inequalities, and the need to build pathways towards a more inclusive landscape, both in workplaces and in the wider social and economic environment, is increasingly recognised as something of urgent concern. In her recent book *Invisible Women* the journalist Caroline Criado-Perez, building on the work of feminist and other activist groups over the years, presents to the wider public a set of arguments that show how inequalities and gaps in society have a tendency to grow because society is designed (mainly) by men with men in mind (Criado Perez, 2019). Criado-Perez presents evidence from the work Londa Schiebinger and her team have carried out over the last ten years with the Gender Innovation project.[73] Studies have been collated which demonstrate the dangers of neglecting the diversity dimension when undertaking research and the costs this may well impose on society as a whole. As Schiebinger puts it: "doing research wrong costs lives and money. For example, between 1997 and 2000, 10 drugs were withdrawn from the U.S. market because of life-threatening health effects. Eight of these posed "greater health risks for women than for men" (U.S. Government Accountability Office, 2001). On the Gendered Innovation website, other examples of missed market opportunities are reported, which include how considering short people "out-of-position"

68 https://commission.europa.eu/strategy-and-policy/policies/justice-and-fundamental-rights/combatting-discrimination/racism-and-xenophobia/eu-anti-racism-action-plan-2020-2025_en

69 https://commission.europa.eu/publications/new-eu-roma-strategic-framework-equality-inclusion-and-participation-full-package_en

70 https://commission.europa.eu/system/files/2020-11/lgbtiq_strategy_2020-2025_en.pdf

71 https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12603-Disability-rights-strategy-for-2021-30_en

72 *For a detailed presentation see* https://www.un.org/sustainabledevelopment/gender-equality/

73 https://genderedinnovations.stanford.edu

drivers[74] leads to greater injury in automobile accidents, and how facial recognition trained on biased datasets may not recognise women as well as men or darker skinned persons, as well as those with lighter skin[75]." It is evident that making research inclusive can save lives and money and contribute to design a fairer society for all.

14.3 The competences needed to build a fairer society for all?

Implementing an inclusive approach to research, policy, education and business is not only a matter of sensitivity, but also of knowledge. In the Gender Innovation project, Schiebinger and her team have defined the methods and tools for sex, gender, and intersectional[76] analysis, having in mind that including these add valuable dimensions to research[77]. However, they are not the only ones reflecting on the kind of knowledge needed to make a world fairer place for all. Moving away from the consideration that "multicultural societies are a reality almost everywhere and complex forms of citizenship have emerged at multiple levels (national, regional, municipal and local), as have new forms of belonging", and recognising that individuals must interact with distant regions, people and ideas while also deepening their understanding of their local environment and the diversity within their own communities, the OECD recognised the need to teach young people the "importance of challenging cultural biases and stereotypes in multicultural societies", since "professional success in the 21st century requires skills that go beyond disciplinary knowledge. In today's world, it is essential to operationalise knowledge across disciplines, to understand different perspectives and to communicate with others who may not share the same worldview or speak the same language" (OECD, 2020). The OECD developed the Global Competence Assessment to gauge the extent to which individuals possess these kinds of skills.

74 *See the full case study on Inclusive cash tests at* https://genderedinnovations.stanford.edu/case-studies/crash.html#tabs-2

75 *See the full case on Facial Recognition: Analyzing Gender and Intersectionality in Machine Learning at* https://genderedinnovations.stanford.edu/case-studies/facial.html

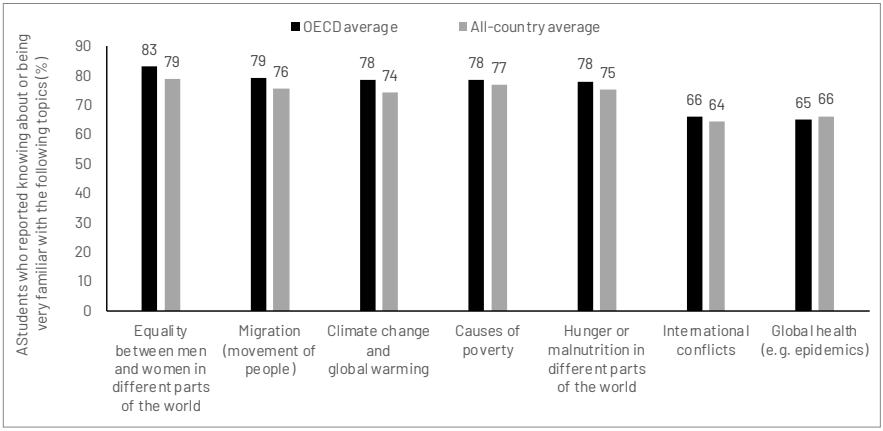
76 *.Intersectionality is a feminist analytical framework for understanding how a group's and individual's social and political identities result in unique combinations of discrimination and privilege. Examples of these factors include gender, caste, sex, race, ethnicity, class, sexuality, religion, disability, weight, species and physical appearance. The term intersectionality was coined by Kimberlé Crenshaw in 1989 (see Crenshaw, 1991). She describes how interlocking systems of power affect those who are most marginalised in society*

77 *See* http://genderedinnovations.stanford.edu/methods-sex-and-gender-analysis.html

The OECD Programme for International Student Assessment (PISA) – which measures 15-year-olds' ability to use their reading, mathematics and science knowledge and skills to meet real-life challenges – included the Global Competence Assessment in its 2018 roll-out (OCED, 2020). The Global Competence Assessment is composed of four interdependent dimensions: (i) the capacity to examine issues and situations of local, global and cultural significance (e.g., poverty, economic interdependence, migration, inequality, environmental risks, conflicts, cultural differences and stereotypes); (ii) the capacity to understand and appreciate different perspectives and worldviews; (iii) the ability to establish positive interactions with people of different national, ethnic, religious, social or cultural backgrounds or gender; and (iv) the capacity and disposition to take constructive action towards sustainable development and collective well-being.[78] Global competence is considered important because, amongst other things, it can help (young) people to develop cultural awareness and respectful interactions in increasingly diverse societies.

Figure 14.1 below shows that, on average, across OECD countries students are familiar with the key topics of global issues. They are most familiar with issues related to gender equality, but also with migration, climate change, causes of poverty and hunger and malnutrition in different parts of the world; the two topics with which students were the least familiar were global health issues, such as pandemics, and international conflicts.

FIGURE 14.1: STUDENTS' AWARENESS OF GLOBAL ISSUES BY TOPIC



Source: OECD (2020) Table IV.2.2 p.73

78 *See* https://www.oecd.org/pisa/innovation/global-competence/

Along similar lines the European Institute for Gender Equality (EIGE) has developed its indicator of gender equality competence.[79] This is a combination of skills, attributes and behaviours needed in order to mainstream gender concerns effectively into policies and plans and help build gender equality. It includes commitment, methodological expertise and specialist knowledge, defined as follows:

- *commitment* means taking responsibility for the implementation of gender mainstreaming within one's own area of operation;
- *methodological skills* refers to the ability to implement gender mainstreaming using the appropriate methods and tools. It also includes the ability to identify and procure the required gender-disaggregated data and to utilise this in one's own work;
- *specialist knowledge* comprises both the theoretical understanding of gender as a social construct and an in-depth knowledge of gender relations as social structures. It also covers knowledge of empirical facts about gender aspects within the organisation's policy area and sphere of activities as well as the ability to correctly classify and interpret gender disaggregated facts and data.

These attempts to define *inclusivity competences* from a theoretical perspective answer to the increasing demand for inclusivity knowledge expressed by different kind of organisations: profit organisations, research organisations, and civil society organisations.

14.4 The demand for inclusivity competences

Over the last 12 years, Fondazione Giacomo Brodolini (FGB) has been involved in several initiatives which offered the opportunity to assess the demand for inclusivity competences. Presented below are some of the key findings that emerged from the research.

The development of Gender Equality Plan: methodology and tools

The EU's Horizon Europe programme affirms its commitment to gender equality in research and innovation by making it a cross-cutting priority and introducing strengthened provisions. The goal is to improve the European research and innovation system, create gender-equal working environments where all talents can thrive, and better in-

79 https://eige.europa.eu/publications-resources/thesaurus/terms/1303?language_content_entity=en

tegrate the gender dimension in projects to improve research quality and its relevance to society. Starting in 2022, applications for funding need to include a Gender Equality Plan (GEP) for certain categories of legal entities from EU and non-EU countries associated to Horizon Europe.[80] The integration of a gender dimension is evaluated under the excellence criterion unless explicitly specified otherwise.

In 2012, GENIS LAB addressed the participation of women in research. The project can be considered a pioneering one since it was one of the first of its kind, focusing on piloting methodologies and tools for organisational change (see Genova, et al., 2014). At the time, gender development plans were described in various ways. In the GENIS LAB they were called TAP (Tailored Action Plans) and focused on specific organisational dimensions: (i) human resources and gender; (ii) organisational culture and stereotypes, and (iii) financial dimensions of the organisation and gender budgeting. The general objective of the project was the introduction of structural changes aimed at overcoming the factors hindering the participation of women in the world of research. Even in the absence of a systematic approach to promote institutional change or developing an adequate intervention monitoring system, the project had the merit of defining tools which have subsequently been refined for general use by organisations. For example, the development of a gender budgeting methodology of a type usually applied to the budgets of public institutions and local authorities to make an assessment from a gender perspective of resource use, laid the foundations for the development of more sophisticated gender assessment tools used by a wider range of organisations. Interestingly, the definition of resources included also "space" and "time", which are crucial assets in research environments, and in workplaces in general. Monitoring from a gender perspective *access to laboratories and suitably equipped meeting rooms* as well as the *time dedicated to care* (ensure that everything worked in the laboratory – e.g., planning, cleaning, preparing tests, etc.) showed clearly unbalanced powers dynamics. Men had easier access while dedicating less time to care.

A few years later, the TARGET project which had a decidedly more mature theoretical foundation proposed a system which made it possible to develop a reflective approach to the definition and implementation of GEPs. [81] The methodology developed by TAR-

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80 https://research-and-innovation.ec.europa.eu/strategy/strategy-2020-2024/democracy-and-rights/gender-equality-research-and-innovation_en#gender-equality-plans-as-an-eligibility-criterion-in-horizon-europe

81 www.gendertarget.eu. *Examples of specific GEPs include:*

- *Toscana Lifescience Foundation – Gender Equality Plan* https://www.toscanalifesciences.org/wp-content/uploads/2023/01/TLS_Gender-Equality-Plan_2022-24_DEF.pdf

GET went beyond the formal adoption of an equal opportunities policy by promoting an interactive and reflective process that leads the institution as a whole promoting gender equality through the establishment of communities of practice within large institutions and at the regional level in the case of smaller institutions (Wroblewski, 2021). The maturity of the vision, and of the tools prepared by the partners to be put into practice, consisted of wanting to create the conditions for the change process to mature and grow autonomously within an organisation and in the environment with which the organisation is linked (e.g., regional, national and / or international research communities). Therefore, it is not only a question of defining a plan and implementing it, but also of starting a process of continuous assessment through structured moments of reflection on power and privileges, the resistance that a plan encounters, on possible allies, and on the critical issues on how to share and exploit the results. In these first attempts the focus was mainly on a binary vision of gender, with the main objective of the process of institutional transformation remaining that of removing barriers to gender equality and thus increasing women's participation in all levels of the organisation and in research teams. Criticising systems and questioning privileges and organisational power dynamics opened the doors to the reflection on marginalisation and discrimination. More recent projects on GEPs funded by Horizon Europe introduce the concept of *inclusive gender equality* in research and innovation and focus on relevant indicators for inclusive GEP development, filling key knowledge gaps on intersectionality. [82]

Having developed a suite of methodologies and associated tools, the next step was to put theory into practice.

- *Università Vita Salute – Gender Equality Plan* https://www.unisr.it/attachments/Gender-Equality-Plan/c5261a0a-62ea-45c7-a77d-003b08fd50bd/9136c370-4c6a-4264-91cd-e2c4432625e8.pdf
- *Institut Pasteur – Gender Equality Plan* https://www.pasteur.fr/en/file/41917/download
- *Ospedale San Raffaele – Gender Equality Plan* https://www.hsr.it/mediaObject/ospedali/documents/HSR/documenti/HSR-Gender-Equality-Plan-rev.1/original/HSR+Gender+Equality+Plan+rev.1.pdf

82 *See the Inspire project* https://inspirequality.eu/about

Supporting organisations to develop and implement their Gender Equality Plans

The normative push factor of Horizon Europe – which asks for GEPs as a mandatory requirement for research organizations submitting proposals for funding – has generated a request for support and tailored consultancy in research organisations, different from universities, which cannot rely on dedicated guidelines. This request had the immediate effect of activating or increasing the search for *gender competences* (internally or externally) and the *recognition of gender competences* as valuable competences (suitable to invest in, since they allow a return on the investment) in different types of research organisations.

Activities undertaken by FGB have sought to build upon the findings from the Horizon Europe studies by assisting different types of research-performing organisations (RPOs), including businesses, to develop GEPs. Each plan lasts at least 24 months and provides for the identification of a gender agent, a reference figure for the implementation of the plan, and a gender team that supports its activity at all levels, the preparation of initiatives for the growth of awareness and training to combat gender stereotypes, as well as intervention measures to improve women's careers, initiatives to support the development of greater attention to the issue of gender in research projects, and initiatives to combat micro-aggressions and gender-based violence in the workplace. In most cases, the team has been asked not only to help develop the GEPs but also to assist with their implementation and monitoring of progress. This is important to ensure that GEPs are strategic interventions and not *window-dressing* initiatives. A seminar hosted in March 2023 by the Directorate General for Research revealed that pilots to introduce GEPs demonstrated that they do not always live up to expectations.[83] There were numerous cases where the GEP was nothing more than a formal document detached from any real commitment to bring about change. This tends to reinforce the need for monitoring progress against the goals set out in the GEP.

In practice, GEPs need to provide open spaces for reflection and raise awareness of the need for inclusive working environments within organisations. For this to be realised, there are two areas where action is required. The first is to realise the potential afforded by the collection and analysis of gender disaggregated data to drive change. Secondly, there is the need to recognise the importance of a transformative institutional process, that is beneficial not only in terms of highlighting gender inequalities but also of clarifying internal processes and power dynamics to bring about a working environment fairer for all. It is interesting to note that meritocracy and excellence are

83 https://research-innovation-community.ec.europa.eu/events/30jx4x09PWZni0QK9RReB/overview

often used as a defence for existing practices when promoting people in RPOs. Yet, when processes are made transparent, the use of discretion can become all too apparent with all the biases that implies.

Forced by the legislative framework to commit to the definition and implementation of GEPs, research funding and research performing organisations have (finally) dedicated resources to build a *gender assessment* and to open up spaces for *reflection on it*, involving the most prominent organisational leaders. Defining and implementing a system for collecting gender-disaggregated data and making as transparent as possible gender dynamics in the organisation is of critical importance. In all the GEPs this is an essential step, without which it is difficult not only to identify areas for improvement, but also to monitor the impact of any proposed actions. In complex organisations the challenge is not so much the lack of data but rather the lack of connectiveness, which prevents a holistic view being provided of the workforce's socio-demographic characteristics, their skills and career paths, along with information about organisation's recruitment policies and remuneration practices. Once these type of data are integrated into a single database, the subsequent phase of presenting an analysis of an organisation's performance vis-à-vis being an inclusive workplace, first within the GEP team and then with senior management at Board level, can prove transformative. It can be a moment of epiphany, where the need for change is recognised. Board members, senior managers, and human resources personnel are presented with stark facts about gender equality and equality more generally across the organisation. This includes providing information on, for instance, the jobs where women are absent, relative pay levels, speed of career progression, and such like (De Micheli and Vingelli, 2002).

Data leads to action. Once a gender assessment is conducted and its findings shared, it is exceedingly difficult for an organisation to deny the need for action when gender inequalities are demonstrably evident. An example can be used to demonstrate this point. In one organisation 90 per cent of employees below the Head of Unit level were women, while all the Heads of Unit were men. A deeper analysis of the processes which led to the appointment of people to jobs in the organisation revealed the absence of transparent procedures and criteria, as well as the lack of a peer review process. In other areas of the same organisation, where the internal process of selection for the Head of Units was complemented by the inclusion of external experts ranking the CVs of applicants, the result of the process was more balanced but not wholly fair. This was because the final decision about who to appoint was left to the Head of Department, a man acting on his own with a clear preference for persons "he trusted". Despite collecting and initially assessing applicants according to their competences, skills and experience, what emerged from deeper interviews was the importance given to the

subjective element of "trust" by the Head of Department which inevitably lead him to choose someone with whom he shared similar characteristics, experiences, and cultural reference points. The GEP led to the introduction of an external experts who independently ranked applicants' CVs; not a perfect solution, but an important first step to making career pathways more transparent (De Micheli and Vingelli, 2002).

In the example above, as in others, questions about the process and trying to make it more transparent contributed to the creation of fairer conditions to improve "access to power" for women and also for persons belonging to groups not immediately linked with the "in power" groups in the organisation. This demonstrates how "institutional change" – as required by the GEP – can open spaces for reflection on the organisation, its processes and power dynamics.[84] The participatory meetings needed for the development and implementation of GEPs offer organisations valuable opportunities to obtain reflections from diverse groups on its functioning. Thinking about the origins of discrimination – which are often the result of unconscious bias or blindness towards systematic bias and stereotypes and carelessness – allows the entire organisation to reflect on: (a) whether the values formally expressed by the organisation (e.g., meritocracy, impartiality, and excellence) are supported by impartial processes and procedures; (b) if the operating methods in place are consistent with achieving the best outcomes for the organisation; and (c) how unconscious bias concerning gender (and other characteristics of the workforce in the organisation) have an impact on organisational functioning (and the well-being of all team members).

It is clear that designing and implementing a GEP requires competencies, resources and commitment. The process can be activated with the support of external consultants, but the organisation needs to identify a GEP team and one or more *gender agents* whose will facilitate the process of implementation and monitoring. In summary, this requires people who can: (i) manage the GEP (taking care that actions are implemented according to time schedule and collecting data for indicators); (ii) communicate and promote the GEP internally (to all employees, not only research staff); (iii) ease relations among different departments; and (iv) provide information as required on GEP objectives and the benefits for all and organise dedicated training initiatives when needed. The role of training is addressed next.

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84 The institutional change approach proposed by DG Research clearly refers to the "theory of change" (Weiss, 1995). This is an explicit process of thinking through and documenting how a programme or intervention is supposed to work, why it will work, who it will benefit (and in what way), and the conditions required for success. It does this by first identifying the desired long-term goals and then works back from these to identify all the conditions (outcomes) that must be in place (and how these related to one another causally) for the goals to occur.

Training people to be diversity aware

Since 2012, the Master's course in Gender Equality and Diversity Management of Fondazione Giacomo Brodolini (FGB) has assisted an audience of mainly Italian post-graduate trainees to develop the competences to promote equality and tackle discrimination. The Master's course involves teachers from the academic, non-academic research, and entrepreneurial worlds. It has been run by different Italian Universities that have changed over time.[85] The training pathway was developed by FGB to fill a void in Italy. At the time it was introduced, there were relatively few organisations that actively promoted equality and inclusion in the workplace. From having been ahead of its time, the last decade has seen enrolment in the Master's course grow as organisations have progressively acquired awareness of the need to create inclusive work environments.

Since it was first introduced, the course has been structured in such a way as to integrate theoretical training with testimonies and experiences directly from the world of work. The degree has always adopted an intersectional approach in which gender equity is the common thread for the analysis of the various dimensions of diversity. Starting from the assumption that organisations are complex systems and that it is necessary to intervene at various levels to generate more equitable impacts, the Master's degree combines the presentation of models and tools for organisational change with a vertical in-depth analysis of the various dimensions of diversity, including: gender equity, sexual orientations, disabilities, multi-ethnic integration, multicultural complexities, and relations between generations.

The training course initially required attending in-person lectures scheduled over the weekend in order to welcome professionals and people already working in an organisation, with a strong predominance of people working in human resources departments. The course was transformed into an online one in response to the COVID-19 pandemic, allowing for greater participation (enrolments almost tripled and the number of editions each year doubled). It is now a blended course involving online and in-person learning. The qualification offers models and tools to promote organisational change with a view to greater inclusion and allows those who participate to come into contact with over 50 teachers. Students are encouraged to undertake a project where they put into practice the knowledge they have acquired on the course in order to complete their studies.

85 *More information can be found at:* www.mastergedm.it

In the last few years, training courses focusing on diversity and inclusion have proliferated. Several universities in Italy have developed specialised courses in part reflecting the fact that most medium and large organisation in both the public and private sectors have Diversity Equity and Inclusion (DEI) managers.

14.5 Conclusions and lessons learnt

As already mentioned, global socio-economic factors in conjunction with legislative initiatives have increasingly pushed work environments to become more inclusive. In 2021 the International Standards Organisation (ISO) issued a standard for DEI.[86] This specified a set dimensions related to diversity and inclusion included in the SA8000 certification focusing on corporate social responsibility first issued in 1997. In some countries, recent legislatives measures have introduced gender equality certification for companies. In Italy, for instance, the implementation of the National Recovery and Resilience Plan (NRRP) introduced a national "Gender Equality Certification System" that guides and incentivises companies to adopt policies designed to reduce the gender gap across all business areas (see https://certificazione.pariopportunita.gov.it/public/certificazione). Increasingly, certification and compliance with standards are seen by companies as useful tools with respect to reputation with clients and gaining access to public procurements. According to UN Women (2017), the United Nations agency for gender equality, gender-responsive procurement in the selection of services, goods and civil works can have a positive impact on gender equality and women's empowerment. While certification measures are sometimes perceived as merely formal commitments, there is evidence that organisations are increasingly interested in promoting change to become inclusive workplaces.

86 ISO 30415:2021(en) Human resource management — Diversity and inclusion. The standard provides guidance on D&I for organisations, including their governance body, leaders, workforce and recognized representatives, and other stakeholders. It is intended to be scalable to the needs of all types of organizations in different sectors, whether in public, private, government or non-governmental organizations (NGO), regardless of size, type, activity, industry or sector, growth phase, external influences and country-specific requirements. The document presents fundamental prerequisites for diversity and inclusion (D&I), associated accountabilities and responsibilities, recommended actions, suggested measures and potential outcomes. It recognizes that each organization is different and that decision makers need to determine the most appropriate approach to embedding D&I in their organization, based on the organization's context and any disruptive challenges that emerge.

Both for organisations truly committed to the promotion of more inclusive work environments, as well as those more interested with formal compliance, the procedures which need to be in place to obtain certification necessarily activate data collection analysis of gender-related issues. Legislative push factors accordingly contribute to a shift from DEI competences being 'nice to have' to ones that provide crucial competitive knowledge. From this perspective, DEI becomes a lifelong learning competence, which needs to be updated as society changes. Experience suggests that DEI competence needs to include the following:

- *the capacity to analyse from a DEI perspective the context*, including the capacity to collect and analyse quantitative and qualitative DEI data starting from gender disaggregated data and trying to expand from there to include other dimensions of potential employment disadvantage;
- *knowledge of international standards and EU legislative framework on fundamental rights and anti-discrimination,* or at least the basic references, to ensure that there is awareness of the fact that discrimination is not allowed in the EU or any member state;
- *knowledge of the theory of change.* In order to promote institutional change from discriminatory to non-discriminatory working environments using methodologies and tools to produce inclusive GEPs;
- *knowledge of feminist and anti-discrimination history.* A vast volume of research, case studies and action proposals have been produced over the last 60 years. Not learning lessons from this evidence base represents a waste of energy in the process of finding the best way to promote more inclusive environments for all;
- *advocacy and communication skills.* A key part of the work of promoting change is providing arguments for DEI policies and practices to counter resistance to change);
- *capacity to build alliances and networking.* In order to contrast the resistance to change of the groups benefitting from the status quo alliances should be created among groups facing exclusion and discrimination, trying to overcome the differences among them.

Diversity equity and inclusion, as a combined competence, provides an asset for future workers and future citizens to be able to navigate an increasingly diverse world. It will be increasingly needed to support social justice and to help each, and everyone, build a world where a sense of belonging wins out against feelings of being excluded.

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