DIGITAL LITERACY CURRICULUM

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1. Recent pattern of youth unemployment in the EU and its member states

Youth unemployment appears a crucial issue for contemporary societies as it might cause future unemployment during the adult life and a dramatic reduction in lifelong earnings (Görlich et al. 2013). Following the tragic consequences of the Great Recession, governments started perceiving youth unemployment as a severe threat to future growth and social cohesion, setting up measures to tackle the problem. As a result of significant transformations in the labour market, in the last decade, many economies have experienced improvements regarding youth employment conditions. However, as this issue is strongly connected to both economic growth and the quality of policies implemented, the achievement of the desired outcome has not characterized all the countries in the same degree (OECD 2016).

Focusing on Europe, last decade's statistics show that youth unemployment[1] plummeted from its peak reached in 2013 in the aftermath of the global financial crisis. **Figure 1** displays a decrease of more than 7% in the youth unemployment rate from 2013 to 2019. Notwithstanding this encouraging data, youth unemployment remains a central issue in European societies since its value still almost doubles the general one. Furthermore, following the COVID-19 pandemic, the EU as a whole has witnessed a reversed tendency by facing a slight increase in the rate. As unemployment is strongly affected by economic growth, the recent energy crisis could potentially worsen the future possibility of fully integrating youths into the labour market.

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[1]It is necessary to have a short methodological introduction to the data which will be displayed in this report:

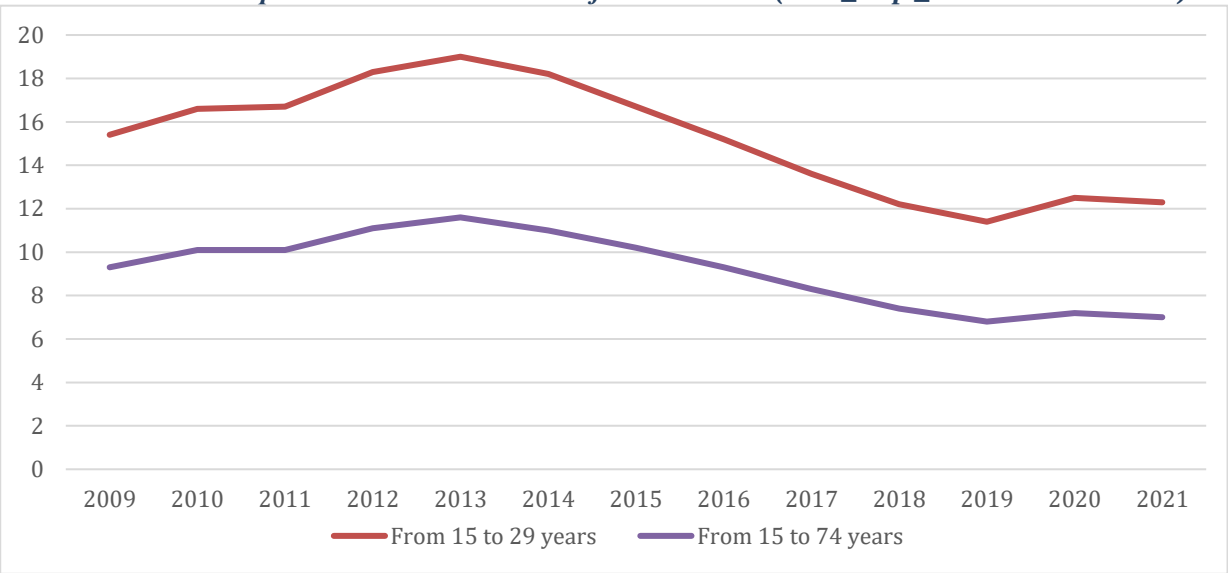
- According to Eurostat, **youth unemployment** includes people aged from 15 to 24 not employed and actively seeking work in the past 4 weeks. As European youth unemployment support policies target the 15 to 29 cohort, this report will display data referred to both.
- The **unemployment rate** is the number of people unemployed as a percentage of the labour force (employed + unemployed). As a consequence, statistics of unemployment exclude all the individuals outside the labour force: preschool children, school children, students, pensioners, and housewives. In the case of youth unemployment, this indicator can be particularly inflated because students are excluded from the labour force (the denominator).
- The **unemployment ratio** is the number of people unemployed as a percentage of the total population. As the population is higher than the labour force, unemployment ratios are always lower than the rates.
- The term **NEET** (young people neither in employment nor in education and training) refers to individuals who are not employed and not involved in education or training. Usually, this condition is detected via indicators which represent it as a percentage of the total population referred to the same cohort. In this regard, the data usually concern the age group from 15 to 29. Lastly, it is crucial to define the conceptual border between NEETs and unemployed people: as a NEET is neither employed nor in education nor in training, (s)he can be either inactive or unemployed. Thus, in this case, the distinction depends on participation in education or training programmes.

For more information see:

- Glossary:Youth unemployment - Statistics Explained (europa.eu)
- Glossary:Labour force - Statistics Explained (europa.eu)
- Glossary:People outside the labour force - Statistics Explained (europa.eu)
- Glossary:Young people neither in employment nor in education and training (NEET) - Statistics Explained (europa.eu)

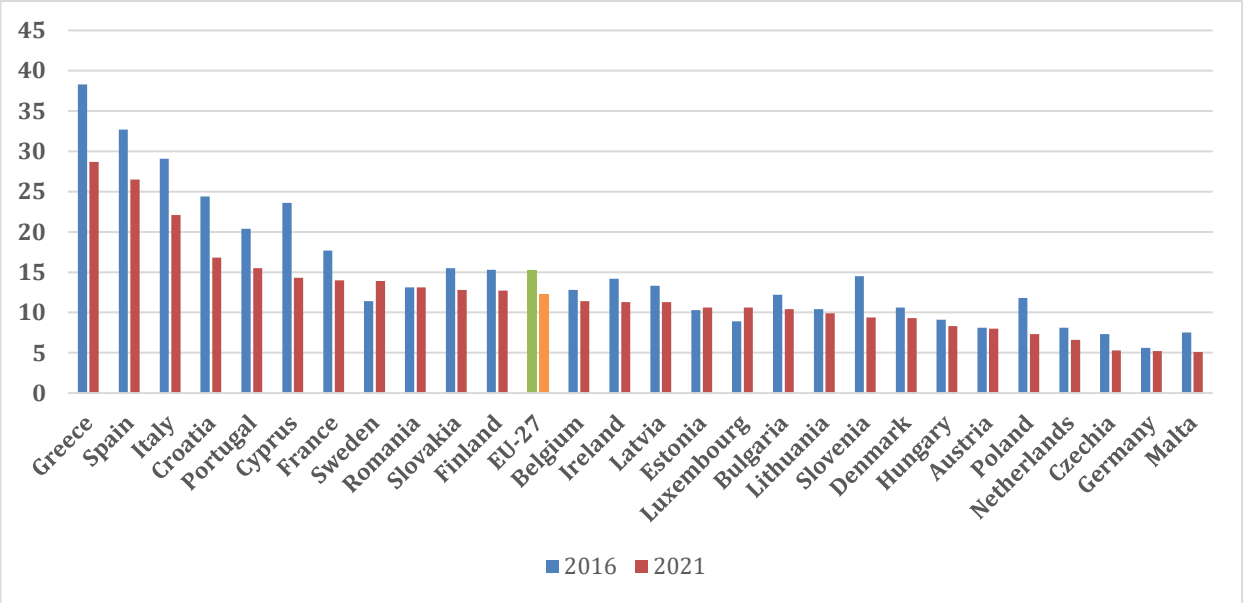
FIGURE 1. YOUTH UNEMPLOYMENT RATES BY AGE GROUP, 2009-2021 (% SHARE OF LABOUR FORCE FOR EACH AGE GROUP)

Source: Author's presentation based on data from Eurostat (YTH_empl_100 and TESEM120).



Although almost all the EU countries experienced similar trends throughout the period, statistics displays dramatic differences among Member States (Figure 2). In 2021 **Mediterranean Countries** still particularly **suffer from high unemployment rates**. The most elevated values were registered in Greece (28,7%), Spain (26,5%) and Italy (22,1%). Excluding the case of Malta as its size does not allow to make comparison with larger political entities, Eurostat data display that the **"best performers" were western and central European countries**. The lowest values were registered in Poland (7,3%), the Netherlands (6,6%), Czechia (5,3%) and Germany (5,2%).

FIGURE 2. YOUTH UNEMPLOYMENT RATE BY COUNTRY, EU-27, 2021 (SHARE OF LABOUR FORCE FOR EACH GROUP)



Source: Author's elaboration based on data from Eurostat (YTH_empl_100)

The heterogeneity in youth unemployment patterns among the Member States can be explained by several factors. Firstly, there is a strong correlation between unemployment and the **state of health of the national economy**. Changes in output growth, on average, explain around the 50% of the variation in youth employment rates. This values even reaches around 70% in relation to countries severely hit by the financial crisis (Banerji 2014). Thus, it should not surprise that the worst outcomes in terms of young people's integration in the labour market occurred in those contexts.

Another possible explanation relies on **cultural differences**. According to this thesis, the problematic conditions of Mediterranean states depend on the habit of becoming independent after being 30 (Mursa et al. 2018). This position is based on the existent correlation between unemployment rates and the age at which young people leave home. However, it is necessary to underline that the statistical association by itself cannot lead to this conclusion as it does not exclude the opposite relationship between variables: young people leave later home because of the condition of the labour market.

One of the most important factors outlined in the scientific literature concerns the structure of the **educational system**. According to the degree of flexibility and duality[2], European educational markets can be grouped into five typologies (Pastore e Giuliani 2015, 10-11):

- **The Scandinavian model** (Finland and Sweden). It is a sequential system with a moderate degree of flexibility. Agencies for employment play an important role in the labour market as ALMPs are implemented on large scale.
- **The Continental European model** (Germany, Austria, Denmark, the Netherlands, and France). It is a dual system able to offer both general education and vocational training. Thanks to these characteristics, young people are usually ready to find employment after their graduation.
- **The Anglo-Saxon model** (UK and Ireland) It is based on a high-quality education system which is flexible and sequential. Flexibility stems from low firing and hiring costs and the decreasing unionization.
- **The Mediterranean model** (Portugal, Spain, Greece, and Italy). It is the educational system historically linked to the highest unemployment rates. It is a sequential and inflexible model which is characterized by the importance of informal networks as employment channels.
- **New Member States' model** (Poland, Slovakia, Hungary, Estonia, and the Czech Republic). It is the system of the EU newcomers, formerly dominated by communist regimes. Although they represent a heterogeneous group, all these countries are experiencing an increase ALMPs expenditure and market flexibility. In recent years, most of them are characterized by low rates of youth unemployment as a result of economic growth.

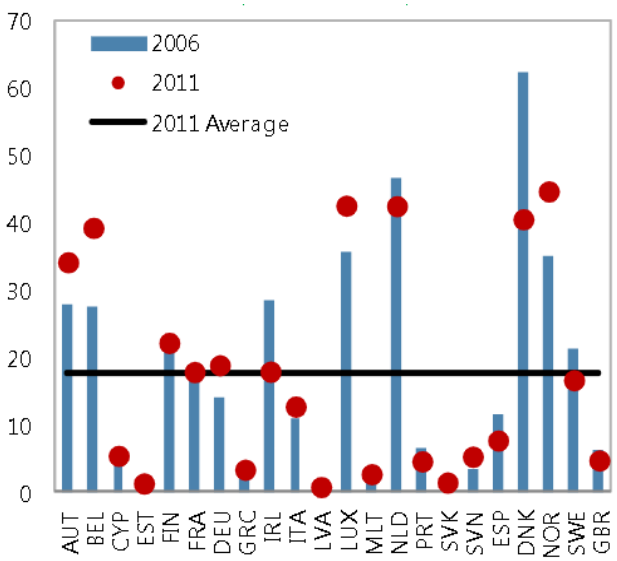
Lastly, the percentage of spending on **Active Labour Market Policies** (ALMPs) is seen as an important variable in explaining country differences (Banerji and IMF 2014). ALMPs aim at integrating individuals in the labour market by stabilizing their career entry, and/or by promoting vocational training as a fundamental step during this path. They can be distinguished from **Passive Labour Market Policies** (PASSLMPs) as the latter grant benefits to unemployed individuals without directly contributing to the creation or preservation of occupations. ALMPs are grouped into four categories of intervention: 1) Labour market training, 2) Job search assistance and monitoring, 3) Wage subsidies, and 4) Public sector work programmes (Caliendo and Schmidl 2016). Macro-economic studies conducted across several European countries have

[2] Pastore e Giuliani (2015) define the level of flexibility as made up of the extent to which students can easily pass from one curriculum to another and the time spent to obtain the final degree. On the other hand, duality concerns the possibility of simultaneously studying and working. Dual educational systems allow young people to do so, whilst in sequential ones, it is usually possible to enter the labour market only after graduation. Due to its own nature, dual systems pay usually particular attention to developing vocational education/ training.

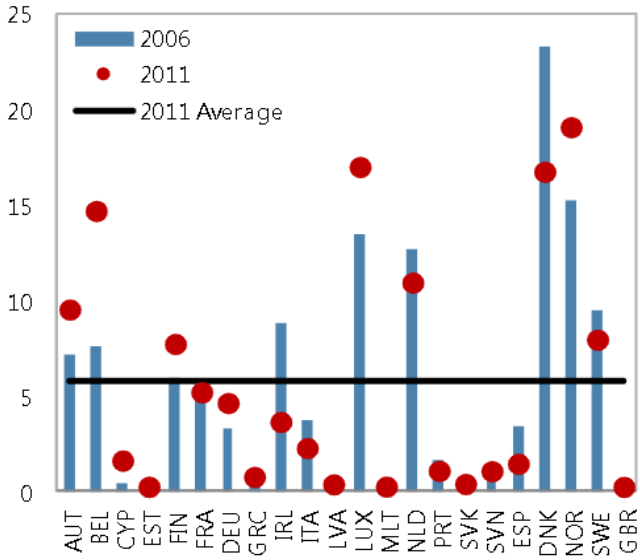
confirmed that an additional amount of 1000 euros spent on ALMPs reduces youth unemployment by around 0,3%. (Banerji and IMF 2014, 17 - 19). Against this context, it does not strike that the countries with low expenditure such as Greece and Italy have experienced high unemployment rates (**Figures 3 and 4**).

FIGURE 3. (ON THE LEFT) - TOTAL ALMP SPENDING PER UNEMPLOYED PERSON (THOUSANDS OF EUROS)

FIGURE 4. (ON THE RIGHT)- SPENDING ON ALMP MEASURES PER UNEMPLOYED PERSON (THOUSANDS OF EUROS)



Note: Total active labor market policy (ALMP) spending combines spending on training, support, and services.



Note: Active labor market policy (ALMP) measures include training as one of the main components.

Source: (Banerji and IMF 2014, 19)

It is worth reminding that not always the expenditure for ALMPs tackle unemployment. Microeconomic analysis showed that both the efficiency and the effectiveness of programmes can be subject to dramatic variation, depending on the nature of the measure and its policy environment. This finding leads to the necessity of correctly evaluating interventions and eventually selecting the ones with the best performance in terms of cost-benefit analysis (Ibidem).

2. Challenges for young people in the labour market

Although among the member states there have been strong differences in terms of youth unemployment rates, no country has not experienced strong difficulties in integrating young

people in the labour market, especially if compared with adults. Against this context, it is natural wondering what are the common obstacles that young Europeans face to be employed[3].

Excluding economic growth, whose importance has already been explained, the literature has outlined several interconnected obstacles which can explain this outcome. Coenjaerts et al. (2009) underline the role of the **employment protection legislation** (EPL) and **recessions** in generating unemployment patterns. Following the 1970s energy crisis, in the attempt to revive the economy, policymakers laid down measures to increase labour market flexibility, mostly by elaborating of a legislative framework favourable to temporary jobs. Given that this change has mainly affected the new contracts, young people have turned out to be the age cohort with the lower number of permanent jobs. With the advent of the Great Recession, as temporary occupations were the first to be cut, young workers paid the highest price in terms of employment conditions (O'Higgins 2012). Furthermore, since many countries have experienced a weak recovery from the crisis, they continue to face difficulties in obtaining new jobs[4].

Most authors consider **skill shortage** as a determinant in generating high youth unemployment rates[5] (Restrepo 2015, CEDEFOP 2018, EUROFUND 2021). In this case, employers are unable to hire workers because of the lack of applicants owning the required expertise. Although there is a consensus on the negative effect of such a factor, scholars do not always agree on the intrinsic nature of the phenomenon[6].

Some authors (Banerji and IMF 2014) tie skill shortages with **educational attainment**. In this regard, particular attention is paid to school leavers, believed to be the most endangered group (Cappelli 2015). Analysing the pattern of the unemployment rate in relation to educational attainment, the relationship between the two variables appears to be detectable. **Figure 3** clearly displays that groups with lower education suffer from higher unemployment rates. People aged from 25 to 29 with an education up to the lower secondary level have roughly three times the probability of becoming unemployed compared to those who obtained a tertiary degree. Although to a lesser extent, this tendency also characterizes the 15-24 cohort as the difference is almost double[7].

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[3] The content of this paragraph is complementary to the first one where causes that generate variability among European countries were analysed. However, the present part of the paper will be mainly focused on the transversal factors common to all the countries. It is worth anticipating that, when deemed useful, national differences will be also displayed.

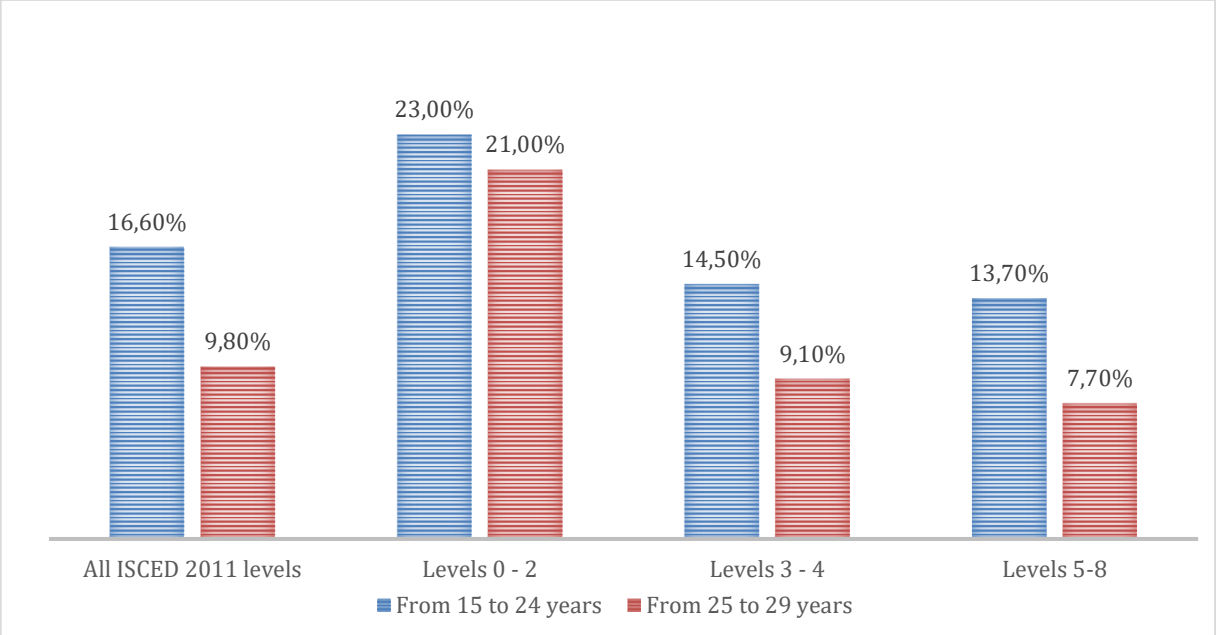
[4] See: Society at a Glance 2016: OECD Social Indicators (oecd-ilibrary.org)

[5] This factor affects unemployment in general and not only the youth one. Furthermore, it is important to underline that the relationship between skill mismatch and unemployment is not always detectable when comparing countries.

[6] The main focus of the paper concerns the supply side of the labour market. Thus, the discussion will be held on the characteristic of the labour force in relation to enterprises' needs. However, this phenomenon can also be generated by causes linked to the demand side of the market. In this regard, skill shortages are not present in the labour force, but only perceived by firms. Examples are unattractive job offers and poor companies' human resource practices (CEDEFOP 2018).

[7] The higher unemployment rate of the 15-24 cohort in comparison with the 25-29 one can be explained by main two factors. On the one hand, the 15-24 cohort is characterized by a larger number of students who are not included in the labour force. As

FIGURE 5. YOUTH UNEMPLOYMENT RATE BY EDUCATIONAL ATTAINMENT LEVEL (ISCED TAXONOMY), EU-27, 2021 (SHARE OF LABOUR FORCE FOR EACH GROUP)



Source: Author's presentation based on data from Eurostat (YTH_empl_100 and TESEM120).

Even though statistics displays a relationship between unemployment and low education attainment, several scholars (Pastore e Giuliani 2015, Restrepo 2015, Eurofund 2021) refer to skill shortages in the stricter sense, by considering the relevant work experience and capacities needed for a given occupation. In this regard, education is seen as questionable proxy to detect the quality of the labour force since employability issues also characterize individuals who obtain a tertiary degree. Pastore e Giuliani (2015, 6) define the problem as **"youth experience gap"**, namely the need of developing the human capital obtained through education. This negative gap leads young people to be less productive compared to the adult workforce, explaining why the latter might be more required by employers. Furthermore, this condition can be worsened by the legislative environment, as an increase in the cost of labour (i.e. wages of the tax wedge[8]) can further widen the preference of enterprises for experienced employees (Banerij and FMI 2014).

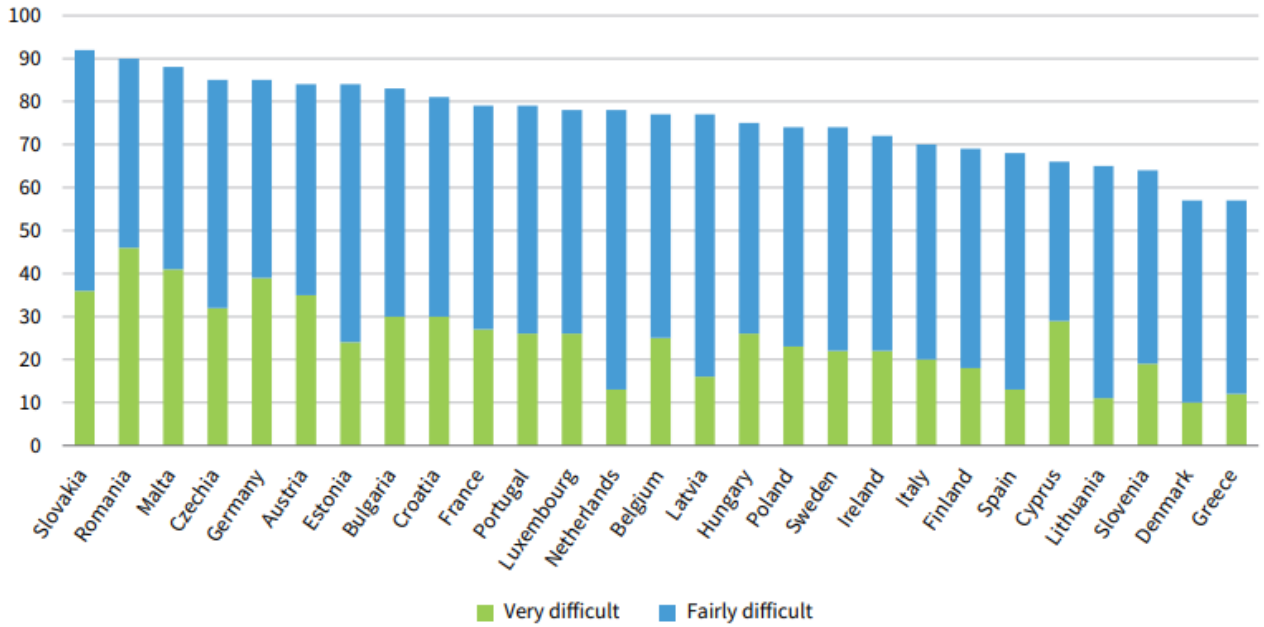
the latter is the denominator of the unemployment rate, it is possible to partly explain why the value is particularly high. On the other, the 15-25 suffer more from factors that affect the unemployment pattern. A classic example is the experience gap which will be presented in the following lines.

[8] Difference between the amount of money paid by the employer and the amount received by the employee.

It is worth noting that skill shortage is thought to be a phenomenon strictly connected to the transformation of the economy's structure. From this perspective, changes such as the **digital revolution** make existing jobs obsolescent and simultaneously create new opportunities based on innovative expertise. However, since most of the labour force does not own the set of skills required by novel occupations, unemployment tend to increase. This negative outcome can be further amplified by job creation externalities such as the decrease in the demand for labour due to the role of the skill mismatch in lowering enterprises' expectation to hire the right employee (Restrepo 2015).

It is crucial to underline that correlation between skill mismatch and unemployment is not always detectable when comparing European countries. **Figure 6** shows that, although this phenomenon is widespread and dangerous for all the member states, significant levels of skill mismatch are not associated with the highest unemployment rates (i.e. Mediterranean countries such as Greece, Spain, and Italy). According to the ILO (2013) this outcome can be explained by the effect of other variables, first of all, the economy's performance and its consequential effect on the demand for labour.

FIGURE 6. PROPORTION OF ESTABLISHMENTS WITH 10 OR MORE EMPLOYEES HAVING DIFFICULTIES IN RECRUITING EMPLOYEES WITH THE REQUIRED SKILLS, EU27, 2019 (%)



Source: Eurofound 2021, 19

As ALMPs set out by policymakers often underline the relevance of skill shortages in their intervention logic, it is crucial to understand how to build expertise able to fit the requests of enterprises. This appears to be crucial especially with regard to the implementation of **training**

measures and the design of **curricula**. In order to do so, paragraphs 4 and 5 will be dedicated to such analysis. But first, in order to have a complete picture of the current state of play, it will be necessary to describe the main EU programmes designed to tackle youth unemployment.

3. The EU supporting programmes for young people in order to promote labour activities

In relation to the current state of play, the most recent action aimed at improving young people's integration in the labour market is the **Youth Employment Support**[9]. Presented in 2020 as a "bridge to jobs for the next generation", this ambitious program is grounded on several interconnected strains.

Firstly, it relies on the "reinforced" **Youth Guarantee** (YG), a measure established in 2012 in the aftermath of the financial crisis and aimed at ensuring employment opportunity for every young person[10] through innovative educational paths, apprenticeships, and traineeship[11]. It is worth reminding that this programme is part of the structural funds, and it is implemented by the Member States in accordance with the needs of local communities. Against this context, the European Commission detains a policy guidance role through monitoring activities and fostering best practices exchanges[12]. In virtue of the YG, EU sources[13] report that over 24 million young people were enrolled in continued education, apprenticeships, traineeships, or were employed. It is worth describing the financial components which have allowed the implementation of the YG as it brought some extent of innovation. Traditionally, European unemployment interventions have been financed by the ESF. However, in order to effectively deal with the consequences of the crisis, the EU Institutions decided to launch a new supporting instrument, the **Youth Employment Initiative** (YEI). Importantly, this tool was complementary to the ESF as it served

[9] Commission launches Youth Employment Support (europa.eu)

[10] Under 25 Years.

[11] Even though the Member States have different definitions of Apprenticeship and Traineeship, it is possible to find common features. Apprenticeships are characterized by a mix of formal education and at the workplace and training is typically provided at the upper secondary level. Furthermore, this type of contract allows the individual to obtain the state of an employee and a salary. Finally, at the end of their experience, apprentices are awarded VET qualifications or certificates. There are often discrepancies in the concept of traineeship in the different national contexts. However, it is possible to distinguish two main families of contract which belong to the category: 1) Traineeship associated with educational programmes at the secondary or tertiary level and 2) Traineeships associated with ALMPs. This typology targets unemployed young people with the aim of increasing their expertise. In contrast with apprenticeships, they are usually less regulated and individuals might not receive any monetary compensation for their work (European Commission 2013)

[12] EU-level support for the implementation of the Youth Guarantee - Employment, Social Affairs & Inclusion - European Commission (europa.eu)

[13] The reinforced Youth Guarantee - Employment, Social Affairs & Inclusion - European Commission (europa.eu)

to fund projects helping NEETs, in regions with an unemployment rate higher than 25 % in 2012[14]. Considering the positive results of the YEI, for the period 2014-2020, the Commission increased its initial budget from the sum of €6.4 billion to €8.9 billion. In relation to the current programming, the YEI has been integrated into the **European Social Fund Plus** (ESF+), the updated version of the ESF. In this regard, all member states have pledged to continue supporting youth unemployment by investing in this cause around €99 billion of the overall budget. Moreover, countries with a NEETs rate above the EU average during the years 2017-2019 should earmark not less than 12,5% of their ESF+ resources to young people integration in the labour market[15].

Secondly, the YES focus on modernizing the **vocational education and training** (VET) system. In this regard, VET is considered a fundamental learning opportunity, being able to provide the adequate skills and competences to succeed in the labour market. The Commission has put VET and skills policies at the heart of its action through the **European Skills Agenda**, a five-year plan (2020 - 2025) aimed at supporting sustainable growth as outlined in the European Green Deal (EGD), defending rights and values set out in the European Pillar of Social Rights, and making the society more resilient to future crises. In order to achieve these three goals, the European Skills Agenda is made up of 12 actions grouped in 4 blocks: 1) Join forces in collective action, 2) ensure that people learn the appropriate skills for the labour market 3) Establish tools to support lifelong learning pathways, and 4) Unlock investments in skills[16]. Among all the actions, one of the most important flagships is the **Pact for Skills** (block 1), a partnership that involves enterprises, workers, and local authorities with the main objective of promoting the spreading skills demanded by the private sector. Even though not included in the European Skills Agenda, the **Digital Education Action Plan** is an innovative initiative contributing to the spreading of digital competences. Taking into account that less than 40% of educators across Europe feel ready to use digital tools, the main purpose of this multi-year plan is to transform the education ecosystem into a high-performing institution through mechanisms of adaptation to the technological transformation[17]. Lastly, considering the financial perspective, other than by the ESF, VET policies are also funded by the **Erasmus programme** which allows mobility for both

[14] This percentage could dive to 20 % if the territory experienced in that year an increase by more than 30 % on the same indicator.

[15] Youth Employment Initiative (YEI) - Employment, Social Affairs & Inclusion - European Commission (europa.eu)

[16] European Skills Agenda - Employment, Social Affairs & Inclusion - European Commission (europa.eu)

[17] Digital Education Action Plan (2021-2027) | European Education Area (europa.eu)

learners and VET staff. With regard to this programming period, almost €3 billion have assigned to this aim in virtue of **Erasmus+** actions[18].

Thirdly, it has been given a new impetus for **apprenticeships** through establishing two networking organization[19]. The **European Alliance for Apprenticeships** (EAfA) that assembles private stakeholders and European governments to strengthen quality of apprenticeship and promote the mobility of individuals[20]. The new EAfA, which emerged in 2020, has mainly focused on digital transition and climate-neutral sectors as this typology of expertise has become crucial to increase long term employability. Thus far, the European Alliance has made available more than 900 000 opportunities in member States, EFTA and Eu candidate Countries.[21]. The other newly established (2017) organization is the **European Apprentices Network**[22] (EAN) which constitutes an informal consultative body for the European Commission (DG Employ). It is formed by current and former apprentices and representatives of student structures and youth labour unions. Its main role is to foster discussion by promoting the exchange of best practices among stakeholders from beneficiaries' countries.

Apprenticeships are not the only tools implemented to increase youths' levels of work experience. In this regard, one of the most used contractual instruments is the **traineeship**. It is worth reminding that the European level has set out 2 types of actions in this field. On the one hand, it has created common standards in terms of educational outcomes and working conditions through the **Recommendation on a Quality Framework for Traineeships** (QFT)[23]. On the other, European institutions have directly funded opportunities through several initiatives. Other than the aforementioned YG, which is implemented as part of the structural funds, traineeships are also managed at the European level. Conceived as a "targeted mobility scheme", the **EURES**[24] portal lists traineeships for young people not only in the European Union but also in Liechtenstein, Norway and Iceland. Other interesting initiatives which support higher education students' mobility are funded by the Erasmus+[25]. One of the most innovative examples is the **Digital Opportunity Traineeship**[26], started in 2018 as a Horizon Pilot and then, as a result of

[18] The current version of the Erasmus programme.

[19] Apprenticeships - Employment, Social Affairs & Inclusion - European Commission (europa.eu)

[20] European Alliance for Apprenticeships - Employment, Social Affairs & Inclusion - European Commission (europa.eu)

[21] Commission launches Youth Employment Support (europa.eu)

[22] About – European Apprentices Network

[23] Council recommendation of 10 March 2014 on a Quality Framework for Traineeships (2014/C 88/01)

[24] EURES (europa.eu)

[25] Traineeships - Employment, Social Affairs & Inclusion - European Commission (europa.eu)

[26] Digital Opportunity Traineeships | Digital Skills and Jobs Platform (europa.eu)

17 000 activities successful implemented, made structural by being integrated into the Erasmus programme[27].

Finally, the last strain of measures to tackle youth unemployment contains a diversified set of tools, of which employment and start-up incentives in the short term, initiatives supporting entrepreneurship and **online training opportunities**. **Paragraph 5** will focus on the description of the latter. In the meantime, as understanding the content of training appears to be of transcendent importance, the next sections will analyze the most required skills on the labour market.

4. Most required skills for young employees: a conceptual framework

As shown in paragraph 2, skill mismatch is considered by the literature one of the most relevant variables which explain high unemployment rates[28]. In the following sections, the study will return the topic by focusing on the analysis of the demand for labour, a crucial step if the goal is to tackle shortages. But first, as the concept of "skill" is often poorly defined, it will be necessary to set up a theoretical framework to provide clear taxonomy.

According to the ESCO[29] (European Skills, Competences, Qualifications and Occupations), the general term of skill hides 4 different main conceptual dimensions, further divisible in skillsets containing a multitude of specific abilities[30]:

- **Knowledge** is the outcome of the assimilation of information through learning. It is worth noting that knowledge is strictly connected to a specific occupation. As a consequence, the taxonomy distinguishes as many knowledge skillsets as the number of sectors[31].
- **Skills** (in the strict sense) / **Competences**[32] consist of the ability to apply knowledge and use know-how to complete tasks and solve problems. Those are classifiable into 8 main

[27] Ibidem.

[28] As previously displayed, this is particularly true if economic growth, which is by far the first determinant, is not considered.

[29] ESCO is an EU initiative run by DG EMPLOY with the main purpose of providing a standardized multilingual classification of Skills, Competences, and Occupations to facilitate labour market integration. In this paper, the ESCO classification (version 1.1.) will be utilized as the main framework to group and define skills. However, as this work is at times complex or not exhaustive in terms of conceptual extension, it will be necessary to integrate it through other theoretical elaborations. For more information about ESCO, see What is ESCO? | Esco (europa.eu).

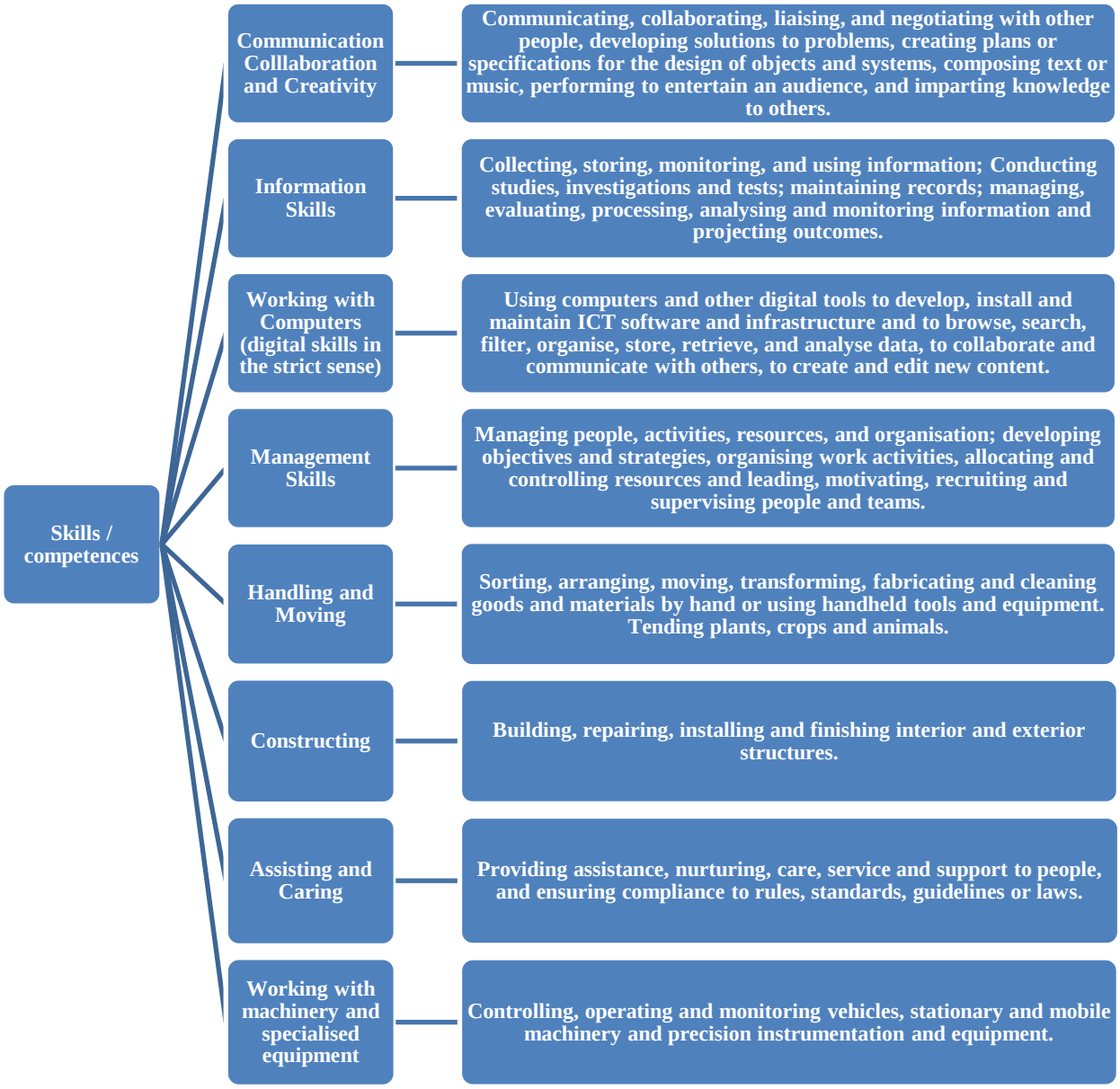
[30] | Esco (europa.eu)

[31] A first classification includes agriculture, forestry, fisheries, veterinary, arts and humanities, education, engineering, manufacturing, construction, ICTs, health and welfare, services, natural sciences, mathematics, statistics, social sciences, and journalism.

[32] Although often used as synonyms, skills, and competences have a slightly divergent meaning according to the ESCO classification. In this regard, skills refer to the use of a methods of an instrument to perform a given task, whilst competences concern the application of knowledge and skill to deal with new situations and unforeseen challenges. Notwithstanding this difference, in this context, the two terms are utilized as synonyms.

areas: 1) Communication, Collaboration and Creativity 2) Information Skills 3) Working with computers (digital skills in the strict sense) 4) Management skills 5) Handling and moving 6) Constructing 7) Assisting and Caring 8) Working with machinery and specialised equipment. In order to provide more detailed insight, **Figure 7** displays the definitions elaborated by the ESCO theoretical framework. It is worth noting that, although to a lesser extent, also skills and competence are job-specific.

FIGURE 7. SKILLS / COMPETENCES ACCORDING TO THE ESCO CLASSIFICATION (VERSION 1.1)



Source: Author's elaboration on the basis of the ESCO classification's labels and definitions.

- **Language skills and knowledge** concern communication in both the mother tongue and a foreign language. It consists of 4 specific abilities: reading, writing, speaking and listening.
- **Transversal skills and competences** (also referred as soft or basic skills) are relevant to a wide array of occupations and constitute the basis for the personal development of an individual. Their possession is considered a necessary condition to master "hard" skills and knowledge required by a given job position. Transversal skills and competences are grouped into six main groups according to ESCO: 1) **Core Skills and Competences** are the most basilar abilities to interact with other individuals and act in the working environment. They include literacy, numeracy and the most basilar use of digital devices and applications[33] 2) **Thinking skills** concern gathering, conceptualizing, analysing, synthesizing, and/or evaluating various types of data and information. They also comprise the capability of setting and achieving goals, as well as problem-solving. 3) **Self-management competences** allow individuals to understand and control their own capabilities (i.e. self-awareness) and effectively act in the working environment. Concrete examples are attention to detail, time management, flexibility[34], proactivity[35], willingness to learn, and maintaining a positive attitude 4) **Social interaction competences** consist of positively interacting with individuals through effective and emphatic communication. They comprise the abilities to negotiate, work in teams, solve conflicts, create networks and offer leadership. 5) **Physical skills** are utilized when performing manual tasks by hand or with equipment 6) **Life skills and competences** are associated concern a broad set of abilities, including civic engagement[36], entrepreneurial/financial skills, and applying general knowledge.

Following this theoretical elaboration, it is now possible to clarify the broad **concept of digital skill**. Within the framework of the ESCO taxonomy, this term refers to two specific sub-groups: ICT knowledge and digital skills in the strict sense. It is worth reminding that the difference between the two categories stems from the fact that competences allow individuals to concretely apply knowledge during the performance of a task. As a consequence, the same field of expertise (for instance programming) can concern both concepts.

[33] It is worth noting that linguistic and digital competences constitute both a broad skill area and a sub-group associated with transversal competences (the latter only in relation to the most basilar of them). This characteristic further underlines their importance to increase employability.

[34] The ability to adapt when changes occur.

[35] The attitude of accepting responsibilities, adopting solutions to tackle problems, as well as identifying opportunities.

[36] This concept includes the exercise of rights and responsibilities, the participation in civic life, and the promotion of democratic principles.

ICT knowledge consists of a broad range of dimensions from the simplest functions associated with the **use of a computer** (Microsoft Office and Access, Adobe illustrator and photoshop, Business ICT and e-commerce systems etc…), encompassing more complex expertise such as Databases, Networking design and Administration, as well as Software, Application Development and Analysis. **Database, Networking design and Administration** refer to the design, maintenance and integration of software applications. This category includes qualifications such as database development and management, online analytical processing[37], and knowledge concerning specific programs (SAP [38], Moodle, Canvas, etc…). **Software, Application Development and Analysis** regard the design and development of computer systems and computing environments. In this regard, this concept encompasses relevant fields, including Computer and Software programming, hardware components design and SQL[39].

As ICT knowledge, digital skills in the strict sense also cover a broad range of topics, starting from the most basilar abilities related to the use of a computer to complex competences, including **programming** and **managing data**. It comprises the use of **setting up**[40] **and protecting**[41] **ICT devices**. In this category are also included **Digital tools for collaborations**, as well as those for **content creation**. The latter category encompasses a wide range of instruments such as for instance **drawing software** (CAD, CAM and CAE[42]) and those for the **process of sound and images**. Lastly, the use of tools to **control machinery** (enter commands, instructions, or specifications) can be also traced back to digital skills in the stricter sense.

FIGURE 8. DIGITAL SKILLS ACCORDING TO THE ESCO CLASSIFICATION (VERSION 1.1)

[37] Online tools to analyze, elaborate and present data.

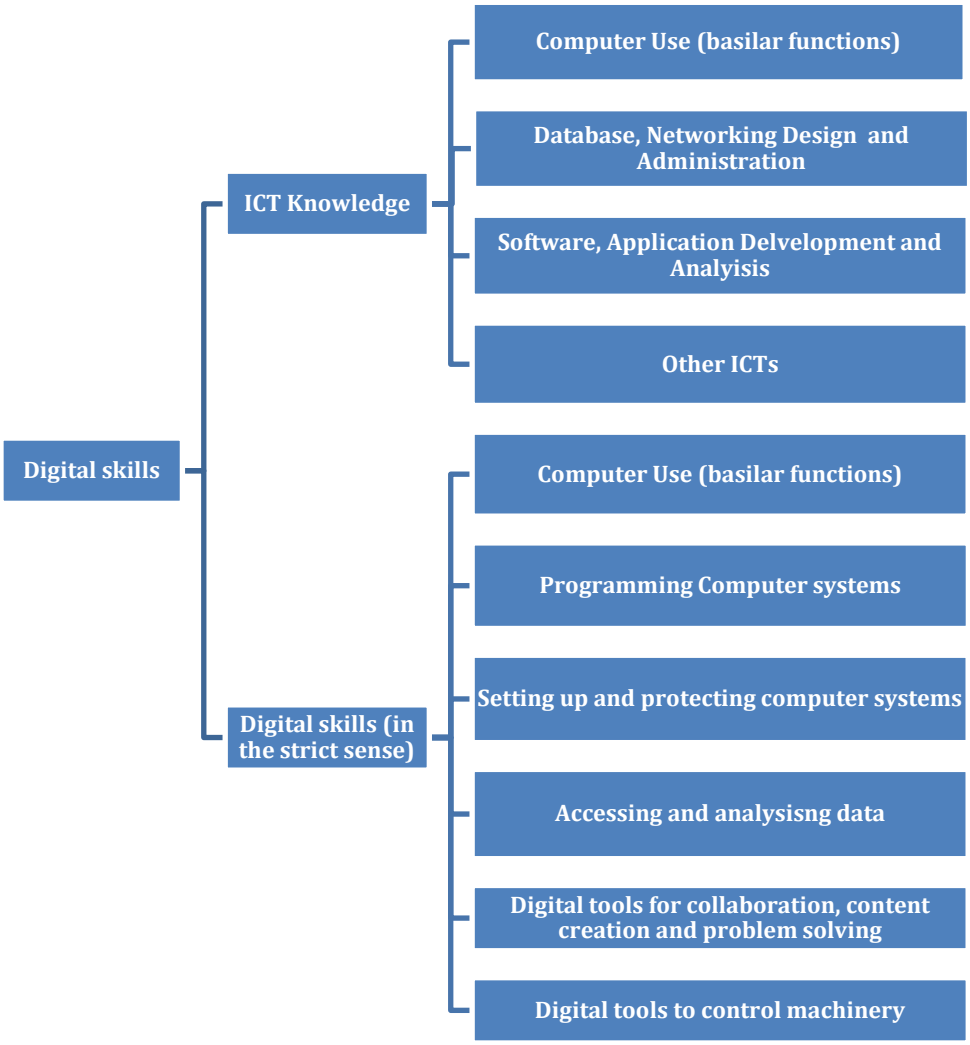
[38] SAP is a leading company in software development that produces centralized management devices. In virtue of this characteristic, employees from different geographical locations can easily access real-time data and information. For more information, see https://www.sqlshack.com/sql-definition/.

[39] SQL (Structured Query Language) is defined as the language utilized by databases. For further information see SQL Definition (sqlshack.com).

[40] Installing computer software and configuring computer networks.

[41] ICT protection can encompass a wide range of abilities, from the simple use of a password to cybersecurity. The latter can be defined as «the approach and actions associated with security risk management processes followed by organizations and states to protect confidentiality, integrity, and availability of data and assets used in cyber space. The concept includes guidelines, policies and collections of safeguards, technologies, tools, and training to provide the best protection for the state of the cyber environment and its users» (Schatz et al. 2017).

[42] CAD (Computer-aided Design) CAE (Computer-aided Engineering) CAM (Computer-aided Manufacturing).



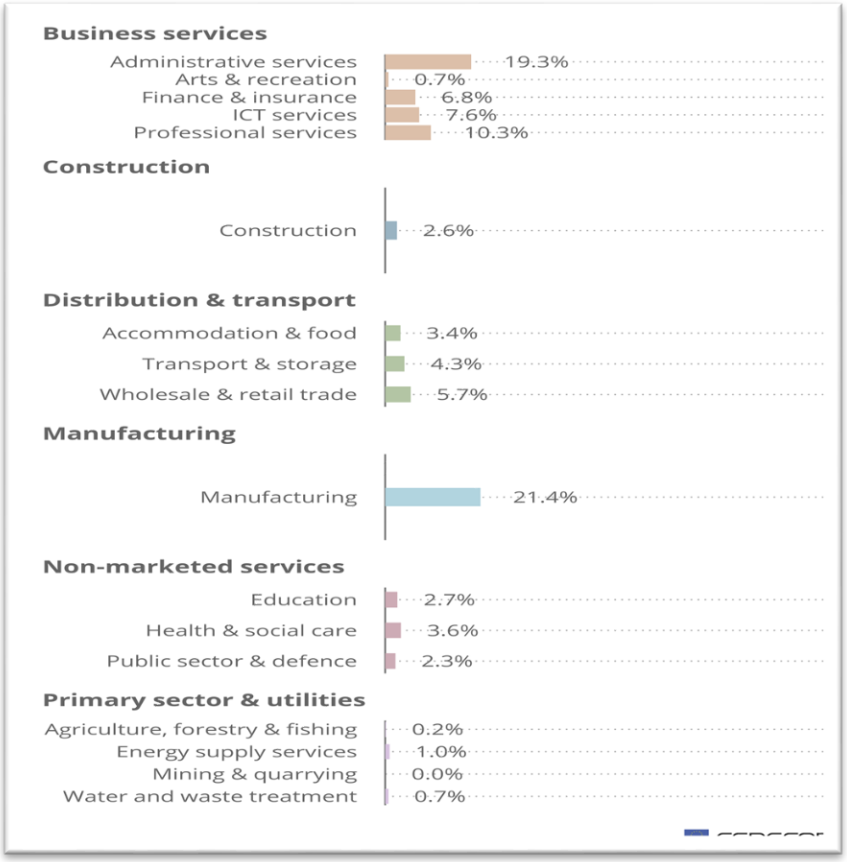
Source: Author's elaboration on the basis of the ESCO classification's labels and definitions.

4.1. Most required non-digital skills for young employees.

The demand for occupations is considered a valid starting point to comprehend which set of skills is the most demanded by the labour market[43]. **Figure 9** shows the percentage of jobs advertisements by sector in the European Union (27) in 2021. The most required sectors are in order Manufacturing (21,4%) Administrative services (19,3%) and Professional services (10,3%).

[43] It is worth reminding that the demand for occupations different from ICT services does not mean that those do not require the possession of digital skills, but rather it suggests the need to also possess other types of knowledge to succeed in the labour market.

FIGURE 9. ONLINE JOB ADS IN EU27 SECTORS IN 2021



Source: Cedefop Skills OVATE. Available at Skills in online job advertisements | CEDEFOP (europa.eu)

As **manufacturing** encompass a wide array of different occupations, ranging from machinery workers to engineers, the capabilities associated with this sector are also diversified. However, since the contemporary manufacturing less and less requires elementary occupations, attention must be particularly paid to skilled workers. Excluding digital skills, the most required job-specific competences for high-profile occupations are **engineering**, **data and mathematics**, **material/ resource-specific** skills, as well as **human resources** and **legal skills**. Transversal competences are also significantly required, and, in particular, those connected with the new technologies. Against this context, **thinking skills** are considered important due to innovations in terms of robotic automatization, whilst **social interaction and communication competences** are necessary to assess the impact of technological impact on workers' life, as well as to effectively act in environments which require high levels of collaboration (Eurofund 2019).

Regarding **administrative and service workers**, the Cedefop[44] analysis has shown the importance of a wide range of skills different from digital ones. Unsurprisingly, the most demanded competences are intellectual, including **creativity**, **gathering and evaluating information**, **literacy** and **numeracy**. Furthermore, those types of occupations often require social skills such as **managing and coordinating**, **teaching and training**, as well as **selling** capabilities. Finally, transversal skills such as the ability to **work in autonomy and in teamwork** are also significant demanded. It is worth mentioning that the set of competences associated with office workers is expected to change in future in response to various factors such as privatization of public organizations and the creation of supra-national regulatory bodies: An example of this adaptation is the increasing demand for **regulatory competences** in the financial sector following the creation of European Central Bank[45].

Lastly, following the advent of globalization, **multilingualism** has been increasingly perceived by enterprises as an essential characteristic of the contemporary employee. According to the European Commission[46] speaking a foreign language does not only improve candidates' chances of employment but is also associated with a higher salary and more job opportunities[47]. Considering the Polish labour market, Liwinski (2019) estimates[48] that workers with this characteristic are subjected to an increase in their wage by 11% on average. Surprisingly, advanced command of English and German only lead to an average earnings increase (respectively 11% and 12%). By contrast, the highest wages are associated with individuals proficient in Spanish (32%), French (22%) and Italian (15%). As the process of European integration is still ongoing, the importance of foreign languages in the labour market is expected to grow throughout time.

4.2 Most required digital skills in different sectors

In 2014, European Digital Skills Survey[49] had already shown that digital skill shortages play a primary role in affecting the labour market given that around 15 % of workplaces had suffered from this issue. As the requests for digital skills is growing over time, it has become

[44] Cedefop research refers to the wider category of office professional, that includes both administrative and service workers. For more information see Office professionals: skills opportunities and challenges (2019 update) | CEDEFOP (europa.eu)

[45] Office professionals: skills opportunities and challenges (2019 update) | CEDEFOP (europa.eu)

[46] Five reasons why learning a language can boost your employability (europa.eu)

[47] Ibidem

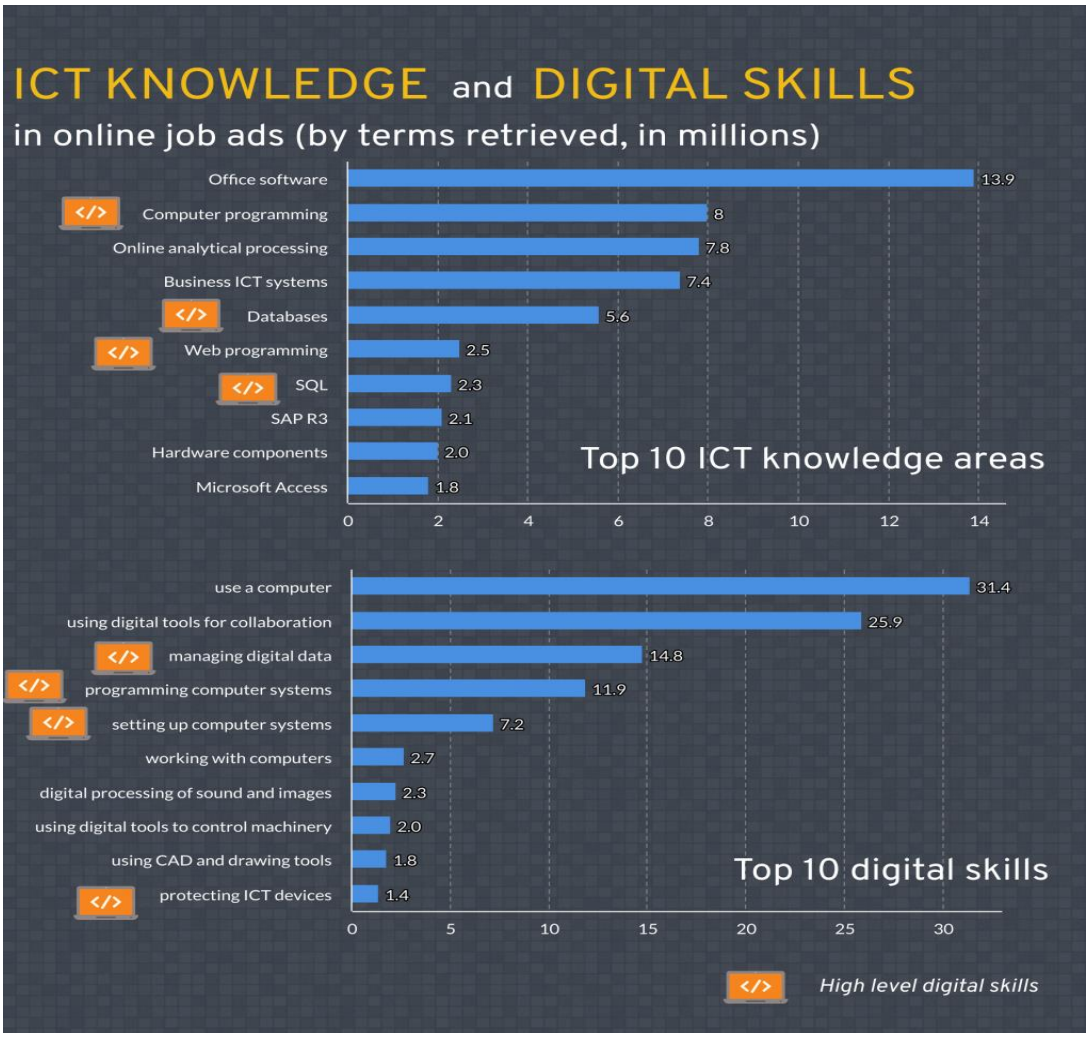
[48] The analysis is based on the Human Capital Balance (BKL) survey, conducted in the years 2010–2014 by the Polish Agency for Enterprise Development (PARP) in cooperation with Jagiellonian University.

[49] EU actions to address loss digital skills, European Court of Auditors, Review n. 02, 2021.

necessary for policymakers to monitor the labour demand setting up mechanisms to track specific needs. An example is given by the Skills OVATE project[50], an innovative tool launched by the CEDEFOP aimed at detecting skills required in online job vacancies.

The OVATE' research has shown that digital skills are generally more required than ICT knowledge. Unsurprisingly, for both categories, the most elementary abilities are also the most demanded by the labour market. **Figure 10** displays that more than 30 million job ads in the EU required the **use a computer** and around 25 million requested to master digital **tools for collaboration**. Analogously, the most demanded ICT knowledge is proficiency in utilizing the **Office Suite** (roughly 14 million). It is worth noting that although the highest need concern basilar competences, more complex skills are also required by the labour market. In this regard, both **managing data** and **programming computer system** were requested by more than 10 million of advertisements.

FIGURE 10. ICT KNOWLEDGE AREAS AND DIGITAL SKILLS MOST REQUESTED IN ONLINE JOB ADVERTISEMENTS



[50] Skills-OVATE | CEDEFOP (europa.eu)

Source: Cedefop Skills OVATE (data collected between July 2018 and September 2020). Available at Digital skills: Challenges and opportunities | CEDEFOP (europa.eu)

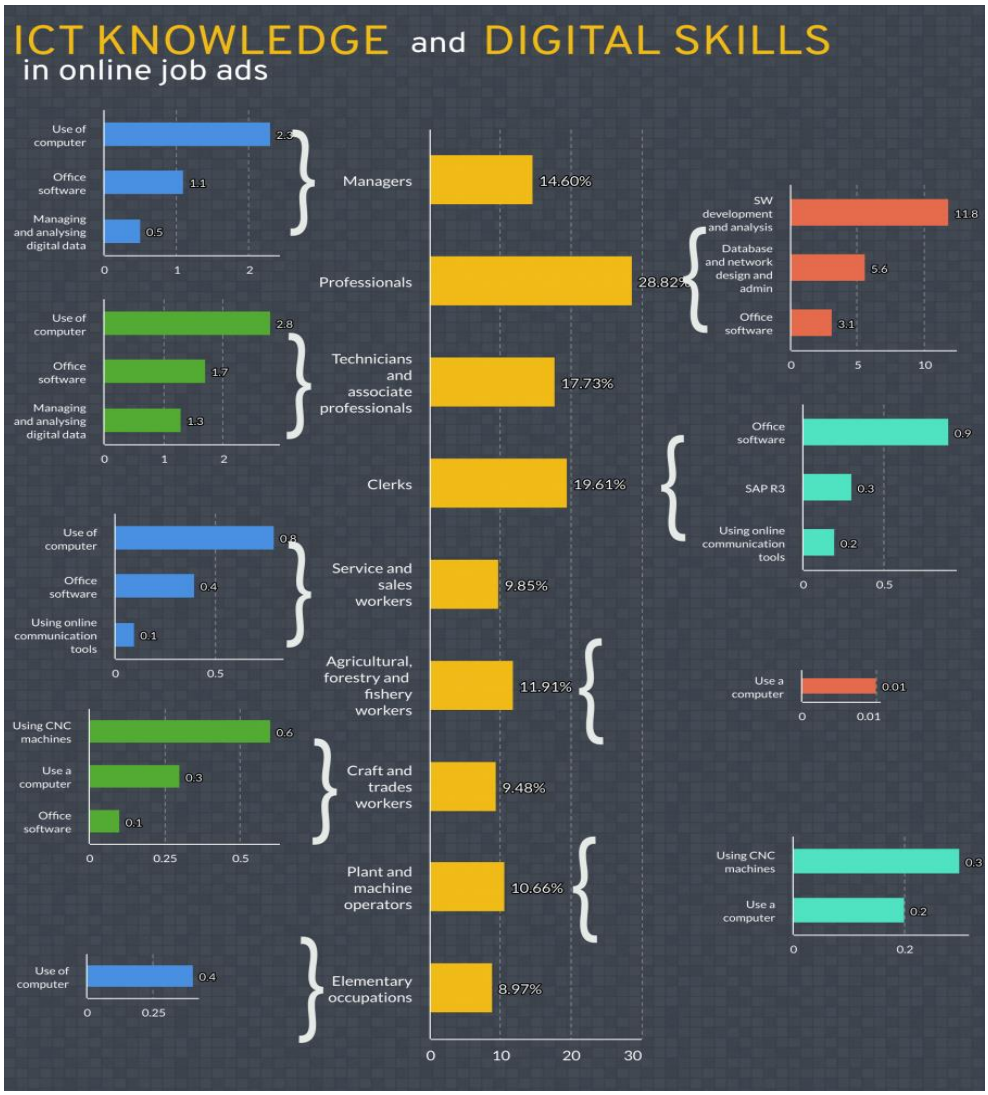
It is worth noting that the demand for digital skills is strictly connected to the type of occupation. In this regard, a 2017 report from the Commission showed that, although those competences are rather generally requested, the **need is significantly lower for jobs which require simple and routine tasks**. Whilst the 98% of workplaces require digital skills for managers and 90% for professionals[51], only 34% demand such abilities for plant machine operators and 27% for elementary occupations. Finally, the lowest request for digital skills comes from manual occupations such as craft workers, waiters and cooks.

With some discrepancies, this tendency has been also confirmed by the OVATE research, which has deepened the focus through an analysis of the relationship between occupations and the different areas of competence. **Figure 11** shows that the link between job and digital skills requests does not only concern their demand in a broad sense but is also related to specific digital skills. Unsurprisingly, qualified occupations are associated with higher levels of ability in both qualitative and quantitative terms. From this perspective, whilst basilar competencies such as the simple use of the computer and the Office Suite are rather transversal competence in the labour market, complex skills including data analysis, database management and network design are only requested for high professionals.

This evidence appears particularly useful to tackle skill shortages and youth unemployment with regard to two specific issues. On the one hand, the general need for basilar digital skills makes it necessary to set up educational systems which deliver those competences across the entire workforce. On the other, as specific occupations require particular competences, effective ALMPs targeting specific groups must be implemented only following analyses of the most required skills for a given occupation. As it will be shown in the next paragraph, the presence of several online platforms which provide both general and specific training is seen as one of the possible solutions to make young people meet those requirements.

[51] Engineers, doctors and nurses, teachers, accountants, software developers, lawyers and journalists

FIGURE 11. AVERAGE SHARE OF ICT KNOWLEDGE AND DIGITAL SKILLS IN THE TOTAL NUMBER OF SKILLS AND KNOWLEDGE AREAS REQUESTED IN ONLINE JOB ADS BY BROAD OCCUPATION (ISCO-1)



Source: Cedefop Skills OVATE (data collected between July 2018 and September 2020). Available at Digital skills: Challenges and opportunities | CEDEFOP (europa.eu)

5. Online training accessible for young people

As mentioned in paragraph 3, in response to the high unemployment rates, the European Union has paid particular attention in the last years in enhancing digital skills for young job seekers. Against this context, within the framework of the New Skills Agenda, several platforms aimed at delivering online training have been launched. The **Eu Academy**[52] is an online hub which contains educational material directly produced by EU institutions with the purpose of spreading expertise connected to European policies. In this regard, a broad range of fields is

[52] EU Academy (europa.eu)

covered, from energy and environmental issues[53] to digital technologies[54]. One of the most innovative initiatives is the **Digital Skills and Job Platform**[55], a multi-purpose tool dedicated to digital transformation which offers collaborative spaces, information and online courses[56] for a diversified target audience:

- **General Audience**[57]: this section is dedicated to beginners, collecting training opportunities which provide basic skills, from data literacy[58] to introductory courses on the most used software (Excel[59] and Python[60]) and technologies (AI[61], 5G[62] etc…). It is worth noting that this type of courses is also considered effective in reskilling and upskilling other target audience such as students, teachers and the labour force.
- **Students and Teachers**[63]: the peculiarity of this section is the presence of specific training dedicated to relevant stakeholders in education. In this regard, a wide range of opportunities have been designed, from MOOCs aimed at empowering teachers in tackling disinformation[64] to a course providing students with a cybersecurity consultant certification[65].
- **Labour Force**[66]: this audience receives online training to both inform on the disruptive impact of the digital transformation and deliver reskilling and upskilling[67] [68].

[53] Explore: energy, climate change & the environment (europa.eu)

[54] Explore: data, digital & technology (europa.eu)

[55] Home | Digital Skills and Jobs Platform (europa.eu)

[56] Training offers I Digital Skills and Jobs Platform (europa.eu)

[57] Training offers I Digital Skills and Jobs Platform (europa.eu)

[58] Data Literacy – What is it and why does it matter? | Digital Skills & Jobs Platform (europa.eu)

[59] Analysing and Visualising Data with Excel | Digital Skills & Jobs Platform (europa.eu)

[60] IBM Python and Data Science MOOC | Digital Skills & Jobs Platform (europa.eu)

[61] Artificial Intelligence: an overview | Digital Skills & Jobs Platform (europa.eu)

[62] Ultra-dense Networks for 5G and its Evolution | Digital Skills & Jobs Platform (europa.eu)

[63] Training offers I Digital Skills and Jobs Platform (europa.eu)

[64] Facts4All MOOC | Digital Skills & Jobs Platform (europa.eu)

[65] Cybersecurity Consultant Course | Digital Skills and Jobs Platform (europa.eu)

[66] Training offers I Digital Skills and Jobs Platform (europa.eu)

[67] Impact from Digital Transformation (full course) | Digital Skills & Jobs Platform (europa.eu)

[68] The Future of Work MOOC | Digital Skills & Jobs Platform (europa.eu)

- **ICT professionals and other digital experts**[69]: this section provides online training opportunities on the most advanced innovations such as robot operating system[70], machine learning[71], parallel programming[72], and blockchain[73].

Finally, designed as a complementary contribution to the Digital Skills and Job Platform, the **DigitalSkillUp initiative**[74] is an innovative learning tool that offers 3 learning modules in 10 languages[75]: 1) **Digital Revolution**[76] provides general competencies from the functioning of the internet to apps 2) **Emerging technologies**[77] is dedicated to the most recent innovations such as IoT, Robotics, and AR/VR/MR 3) **Cybersecurity**[78] offers a solid basis to enhance digital safety for both a personal and professional use.

Besides public interventions, e-learning has become an important tool to deliver skills also for private platforms such as **LinkedIn Learning**[79], **Udacity**[80], and **Udemy**[81]. Founded in 2012, **Coursera**[82] is one of the most utilized platforms, having delivered online training to 100 million learners through partnerships with around 275 leading universities and companies. This broad network allows to offer several typologies of learning opportunities (hand-on projects, courses and degree certificates) on a wide range of topics. In relation to digital transformation, the platform offers more than 1200 training activities from beginner to advanced levels. Among all learning activities, the most interesting ones are those provided by the top companies (Microsoft, Google and IBM) and which issue professional certificates. Examples are the courses in data

[69] Training offers I Digital Skills and Jobs Platform (europa.eu)

[70] Hello (Real) World with ROS – Robot Operating System | Digital Skills & Jobs Platform (europa.eu)

[71] Introduction to Applied Machine Learning MOOC | Digital Skills & Jobs Platform (europa.eu)

[72] Introduction to Parallel Programming MOOC | Digital Skills & Jobs Platform (europa.eu)

[73] BLISS MOOC | Digital Skills and Jobs Platform (europa.eu)

[74] Digital SkillUp - Home

[75] English, Dutch, French, German, Greek, Polish, Romanian, Spanish, Croatian, and Italian.

[76] Digital Revolution (minnalearn.com)

[77] Emerging Technologies (minnalearn.com)

[78] Cybersecurity (minnalearn.com)

[79] LinkedIn Learning: Product Overview | LinkedIn Learning Solutions

[80] About Us (udacity.com)

[81] Learn about Udemy culture, mission, and careers | About Us

[82] Coursera's Mission, Vision, and Commitment to Our Community | Coursera

analytics[83] [84], Microsoft 365[85], Microsoft Excel[86], digital marketing and e-commerce[87], Python[88], and Google Ads[89].

6. Future most required skills (up to 20 years ahead):

To design training measures and curricula tackling skills mismatch, policymakers must continuously map the set of competences that will be required in the future. In this regard, as economies experience rapid and significant structural changes, an exhaustive demand analysis must consider the two epochal changes which are currently affecting societies: the fourth industrial revolution and the green transition.

The World Economic Forum[90] has foreseen that 50% of all employees will need to reskill by 2025 due to the technological change. This trend is especially expected in relation to **soft skills**. In this regard, future workers will be required to increase resilience and flexibility, as well as develop **proactivity**, **creativity** and a **problem-solving** attitude. Unsurprisingly, significant attention will be also paid to the possession of transversal skills associated with digital transformation. The list includes competences such as technology **use and design**, **monitoring and controlling**, as well as **data analysis and interpretation**.

It is worth mentioning that reskilling is considered necessary not only in relation to transversal competences, but also in terms of job-specific skills. This condition leads to the necessity of analyzing how labour demand will be shaped in the following years. **Table 1** displays the projected change in employment in Europe (EU 28 + 3[91]) by broad occupations. The results show an expected **increase in employment levels for high-skilled workers**, and a consequent loss for those associated with manual tasks (for instance agriculture and shop employees) and clerks. Significant growth will concern professionals and technicians, occupations which traditionally require a high level of know-how in performing their duties. Surprisingly, elementary occupations will experience positive results in terms of employment. This tendency

[83] Google Data Analytics Professional Certificate | Coursera

[84] IBM Data Analyst Professional Certificate | Coursera

[85] Microsoft 365 Fundamentals | Coursera

[86] Work Smarter with Microsoft Excel | Coursera

[87] Google Digital Marketing & E-commerce Professional Certificate | Coursera

[88] Google IT Automation with Python Professional Certificate | Coursera

[89] Google Ads for Beginners (coursera.org)

[90] What are the top 10 job skills for the future? | World Economic Forum (weforum.org)

[91] Norway, Switzerland and Iceland.

suggests that the impact of technology will lead to a further **polarization of the labour market**, and as a consequence, the probability of generating more inequalities in the society.

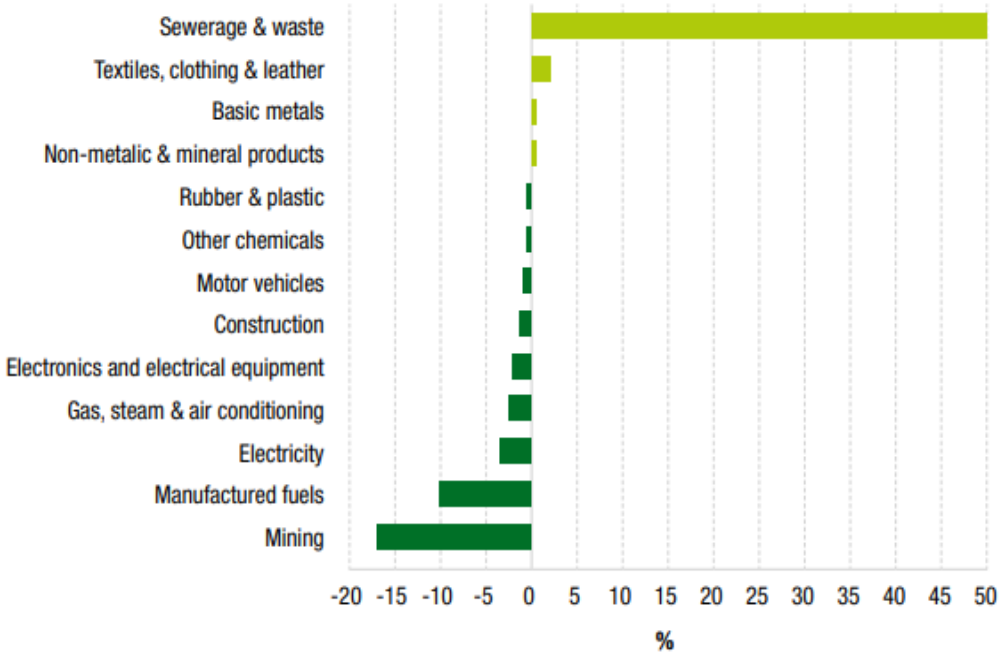
TABLE 1. PROJECTED CHANGE BY BROAD OCCUPATION, 2011-30 (EU-28+3)

Shares (per cent)	per cent				
	2011	2016	2021	2026	2030
Legislators, senior officials and managers	6.2	6.4	6.5	6.7	6.8
Professionals	17.0	17.8	18.1	18.4	18.7
Technicians and associate professionals	15.8	16.4	16.9	17.3	17.8
Clerks	10.7	10.3	10.0	9.7	9.4
Service workers and shop and market sales workers	17.0	17.1	17.1	17.0	16.8
Skilled agricultural and fishery workers	4.3	3.8	3.5	3.4	3.2
Craft and related trades workers	12.3	11.4	10.9	10.5	10.2
Plant and machine operators and assemblers	7.3	7.0	6.9	6.8	6.8
Elementary occupations	9.5	9.8	10.0	10.2	10.4
All occupations	100.0	100.0	100.0	100.0	100.0

Source: Cedefop 2018, 46

Finally, the transition toward a climate neutral society is the other epochal transformation that will impact labour demand is. In this regard, policies implemented through the **European Green Deal** (EGD) are expected to create and innovate a large number of occupations across the continent. **Figure 11** displays the EU 27 employment trends until 2030. The results stem from a comparison of the skills forecast connected to the EGD to a baseline scenario. The graphic clearly shows that only few sectors will be significantly impacted in terms of employment outcomes by the green transition. In this regard, the most affected occupations will be those associated with the energy and public utilities. Unsurprisingly, as the carbon neutrality is one of the main goals set out by the EGD, the expected tendency is a significant reduction in the demand for occupations in the mining (more than 15%) and manufactured (10%) sectors. Conversely, due to the growing importance of recycling and repair activities, jobs related to sewerage and waste will experience a 52% increase.

FIGURE 12. EU 27 EMPLOYMENT TRENDS UNTIL 2030: SKILLS FORECAST BASELINE VS GREEN SCENARIO



Source: Cedefop 2021, 28

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