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A journey into troubled waters?

Mapping the occupational trends of young workers in Europe

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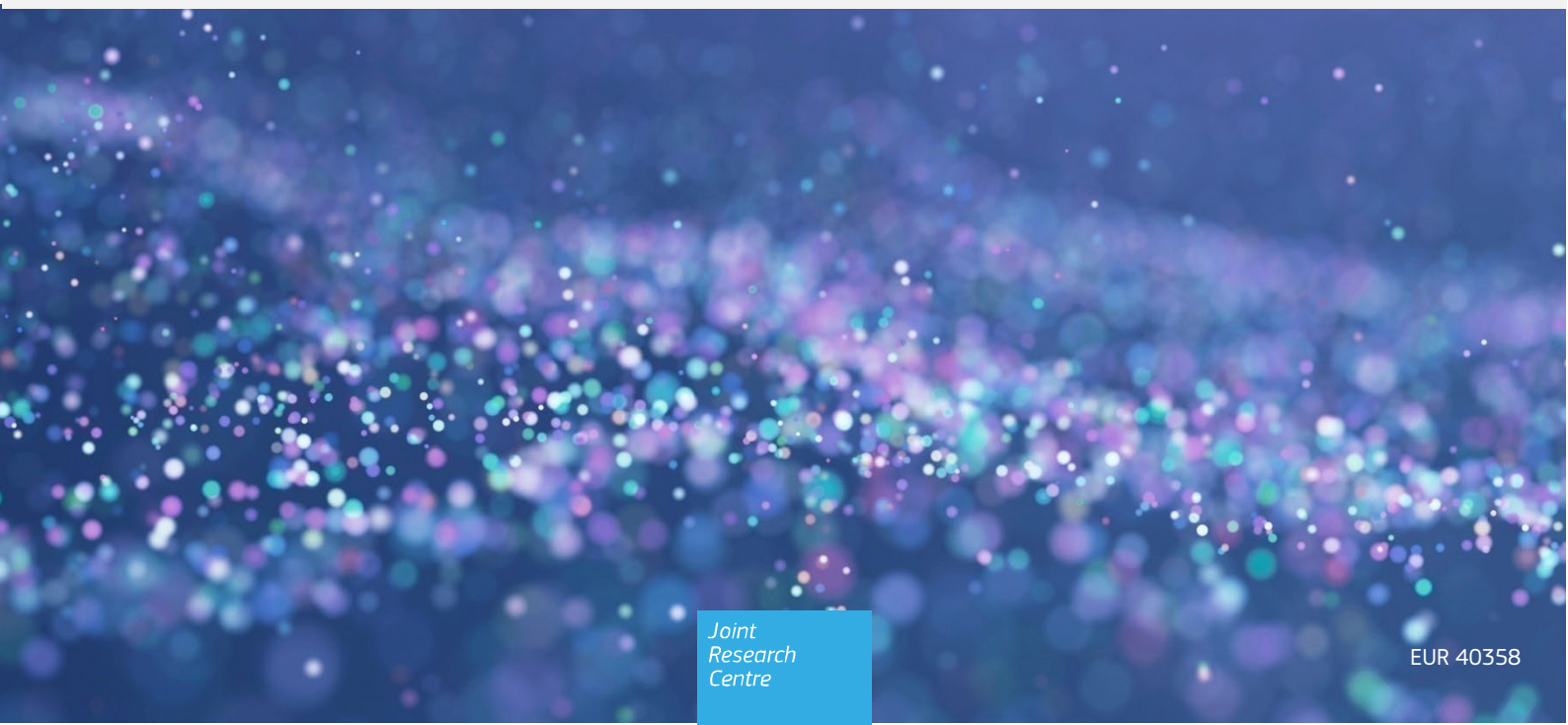

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Contents

Abstract

This report investigates the evolving occupational outcomes among young cohorts in Europe from 1995 to 2020. Using data from the European Labour Force Survey (EU-LFS), we evaluate how the likelihood of being employed in a cognitive occupation and receiving a temporary job has changed over time for young workers with different levels of education. Results reveal diverging fortunes. On the one hand, the probability of obtaining cognitive jobs has remained steady for tertiary-educated workers, but it has declined significantly for young workers who have only attained upper secondary education, especially in Southern and Northern Europe. On the other hand, the likelihood of receiving a temporary contract has increased substantially for more recent cohorts of young workers in all European areas, particularly for those with only upper secondary education. These findings call for a reflection on the future of jobs that have a large cognitive component (and for which higher education is generally a necessary requirement), especially in light of the recent development of artificial intelligence. On the other hand, the increased use of temporary contracts among young workers, especially in some EU areas, raises concerns on the long-term sustainability of the socio-economic (and demographic) situation of the EU, considering that educational and parenting choices tend to be concentrated in the earlier stages of the life-cycle.

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Executive summary

Transformations in the employment structure have far-reaching implications from both an economic and social perspective. On the one hand, occupational changes reflect labour market dynamics, and hence the interaction between labour demand and supply. On the other hand, they may provide meaningful insights about skills that are in growing (or shrinking) demand, which is a relevant information for the development of proper education and training policies.

In this report, we try to provide an answer to the following questions: are young workers with upper secondary or tertiary levels of education likely to be employed in cognitive occupations? How has this changed across European countries over the period 1995-2020? Are young workers experiencing increases in the probability of receiving temporary contracts?

Over the past two decades, there has been a proliferation of empirical studies that have attempted to evaluate the impact that some demand-side factors, such as technology and computerisation, may have on occupational structures and the nature of the tasks involved. At the beginning of this century the main explanation proposed was that of the "Skill-Biased Technical Change" (SBTC, hereafter) hypothesis, which posits that technological advances show a bias towards favouring workers with higher levels of skills, while concurrently diminishing the demand for low-skilled labour. The SBTC hypothesis has been widely supported by economic research, highlighting its effectiveness in explaining some of the employment patterns observed in the US and other advanced economies during the twentieth century (Berman et al., 1994; Autor et al., 1998; Berman et al.; 1998). However, the SBTC hypothesis has not been able to account for some of the changes in the employment and wage structure that happened in the last twenty years, one of them being job polarization. Autor et al. (2003) have made a substantial contribution by introducing the "Routine-Biased Technical Change" (RBTC, hereafter) hypothesis, which shifts the focus from the skills possessed by workers to the tasks that they actually perform on the job. The underlying idea is that recent technological changes, mainly driven by ICT, have increased the labour demand for high-skilled workers who usually perform non-routine tasks, while decreasing the labour demand for middle-skilled workers, typically engaged in routine work. As routine tasks are located in the middle of the wage distribution and non-routine tasks at the extremes, the authors conclude that the RBTC hypothesis may provide an exhaustive explanation for the ongoing shift of employment from middle-wage jobs towards both low- and high-wage occupations, a phenomenon commonly referred to as "job polarisation".

While the aforementioned studies primarily focus on the demand-side factors that may impact employment, supply-side elements are equally relevant when seeking to understand occupational trends. From an economic standpoint, changes in employment structures are indeed determined by the complex interaction between shifts in firms' labour demand and shifts in workers' labour supply.

This study looks at a specific age group (the young) and analysies how the occupational experience of young cohorts have changed over 25 years in the EU, with a special focus on cognitive occupations (defined as occupations relatively rich in cognitive tasks). Essentially, we consider whether cohorts of recent graduates from higher and upper secondary education are more or less likely (relative to cohorts of older workers) to be employed in cognitive jobs (under the reasonable assumption that higher education and, to a lesser extent, upper secondary educations "should" open the doors to jobs whose cognitive dimension is relatively high). We also look at the quality of employment for young workers of different cohorts, under the assumption that job quality is one of the dimensions that affects investment in education. Low quality of employment (i.e. low wages, poor working conditions, excessive use of temporary contract) tend to discourage human capital accumulation, and hence can jeopardise the achievement of some of the educational targets of the

European Education Area. As a proxy for quality of job, in this work we use the existence of a temporary contract.

Our main source of data is the individual-level European Labour Force Survey (EU-LFS) for the 25-year period 1995–2020. The EU-LFS provides information on a wide range of aspects relating to the European population, including employment status, occupation, industry, type of employment contract, educational attainment, and demographic characteristics of individuals. One true advantage of the EU-LFS is that it relies on a harmonised methodology for collecting data, which ensures consistency and cross-country comparability.

Due to limited data availability, our analysis focuses on 15 European countries over the period 1995–2020. More specifically, we study occupational trends in the following countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom. For explanatory purposes, we group them into three main categories based on geographical areas: Western Europe (Austria, Belgium, France, Germany Luxembourg, and the Netherlands), Southern Europe (Greece, Italy, Portugal, and Spain), and Northern Europe (Denmark, Finland, Ireland, Sweden, and the United Kingdom). Moreover, we further restrict our sample to individuals aged 20–59 who are full-time employed since we want to focus on workers who have a strong attachment to the labour market. For consistency, we also employ crosswalks to facilitate the conversion of ISCO-88 to ISCO-08, ensuring a uniform classification of occupations throughout the time interval here considered.

The data consists of repeated cross-sections that we employ to construct synthetic cohorts of young workers aged 20–29 years old (when analysing young individuals with upper secondary education) and 25–34 years old (when analysing young individuals with tertiary education). This method proves to be useful to cope with data limitations and simulate longitudinal employment trends. In our analysis, we construct distinct cohort groups based on specific age and year combinations.

The overall picture emerging from the analysis is that in all areas of Europe, the likelihood that young workers with tertiary education obtaine cognitive jobs has remained relatively stable across different cohort groups, while it has significantly decreased for more recent cohorts of young individuals with upper secondary education in Southern and Northern Europe. This finding is surprising, as we would have expected an upturn in the probability of obtaining a cognitive job for more recent cohorts of young workers with tertiary education. This divergence suggests that the expansion of higher education has enabled young graduates to maintain access to high-skilled cognitive occupations. However, young workers with only upper secondary education face greater challenges in obtaining such jobs. This finding reveals the crucial role of education in shaping employment opportunities.

As for temporary contracts, the probability of receiving a temporary job has increased in all European areas for more recent cohorts of young workers with both upper secondary and tertiary education. In particular, in Western and Northern Europe, young workers with upper secondary education are more likely to be employed in temporary occupations than those with tertiary education, indicating that tertiary education may provide some protection against precarious work. On the other hand, concerning the Southern areas of Europe, results are far less straightforward: this is the only area in which the share of temporary contracts has been higher among tertiary graduates (until 2015), casting some doubts on the attractiveness of tertiary education in the period 1995-2015. In essence, for Southern Europe we observe that the share of cognitive employment among young tertiary graduates has remained fairly stable across the years, but its

quality (proxied by the share of temporary contracts) has declined in absolute terms (but not in relative terms, when compared to the experience of upper secondary graduates).

These results may have different policy implications. First, to increase access to well-paid cognitive occupations, it is important to guarantee strong basic skills, a well-functioning upper secondary education system (including in its VET component) and a continued tertiary educational expansion in fields that are in growing demand, hence aligning education with labour market needs. This may involve promoting fields such as STEM, expected to experience high demand, and enhancing resources for career guidance to help students make informed decisions. Relatedly, apprenticeship programs may represent another promising approach to provide alternative pathways to well-paying careers. These are the aims of past and current policy initiatives by the European Commission, such as the European Education Area, the New Skills Agenda, the Youth Guarantee, the "Aim, Learn, Master, Achieve" (ALMA) initiative, and the recently launched Union of Skills (following the 2023 European Year of Skills).

Second, it appears also necessary to reflect (and design policies accordingly) on the profound and complex relationship between industrial strategy, competitiveness and human capital development. The fact that, especially in some areas, tertiary graduates' employment in cognitive occupations is not rising as expected signals that, perhaps, in such areas, the demand for cognitive jobs has not grown (yet). This calls for integrated policies at the national as well as local/regional level, considering the comparative advantages of regions/local areas when developing educational programs.

Third, temporary employment has risen considerably among young cohorts in the period 1995-2000, but more so in Southern and Western areas. We also notice that in Northern and Western areas, temporary employment has been consistently higher among upper secondary graduates. The opposite is observed in the South, at least until recent years. This casts doubts on the quality dimension of the "returns to tertiary education" in Southern Europe (and might account for some of the low tertiary educational attainment observed in some Member States located in the South). While temporary employment offers job opportunities for young workers who enter the labour market, the fact that, in some countries, temporary employment is still prevalent among workers who have been in the labour market for a considerable amount of time is an indication that a sequence of temporary contracts does not consistently lead to a permanent contract. The resulting uncertainly about the employment status of many young (and not so young) workers is likely to rise job un-satisfaction and, more generally, push to delay important choices that affect individual and societal well-being (such as parenting or the purchase of a house or apartment). Regulating temporary work arrangements might be an option to dampen precarious employment, though it likely requires nuanced approaches tailored to national contexts.

On the whole, this report provides valuable evidence and a conceptual discussion regarding the shifting occupational landscape facing young workers in Europe. It highlights the need for policy and research attention to support educational expansion and foster future job opportunities for young Europeans to navigate ongoing work transformation.

The main limitation of this report is the lack of wage data that could provide an additional metric for job satisfaction and for the overall functioning of the labour market. Considering together prices (i.e. wages) and quantities (i.e. employment) would allow us to better understand the supply vs demand drivers of the observed patters. We hope to overcome such limitations in further studies.

A second limitation is the impossibility to use longitudinal data over such a long period. However, this is a limit of EU-LFS data and cannot be easily overcome. This is also the reason why we have

opted for an approach that mimics longitudinal data by using repeated cross-sections and focusing on groups of individuals who share some basic characteristics (e.g. age, gender and education).

1. Introduction

Transformations in the employment structure have far-reaching implications from both an economic and social perspective. On the one hand, occupational changes reflect labour market dynamics, and hence the interaction between labour demand and supply. On the other hand, they may provide meaningful insights about skills that are in growing (or shrinking) demand, which is a relevant information for the development of proper education and training policies.

Are the changes in the employment structure favouring well-compensated cognitive occupations or are they favouring low-wage auxiliary positions? Is this leading to higher wage inequality and higher job polarization? Is technology changing more rapidly than education? These are some of the questions that have been high on the research and policy agenda of the last decade.

In this report, we try to provide an answer to the following slightly different but related question: are young workers with upper secondary or tertiary levels of education likely to be employed in cognitive occupations? How has this changed across European countries over the period 1995-2020? We then further develop the analysis by evaluating whether young workers experience a high probability of receiving temporary contracts and whether this has evolved over time.

Before diving into our main research question, it is useful to provide a synthetic summary of the main factors that can explain employment dynamics. One of them points to technology as the driving factor (i.e. it is labour-demand driven), while the other one stresses the importance of educational upgrading and skills (i.e. it is supply-driven).

Demand-side factors: technology

Over the past two decades, there has been a proliferation of empirical studies that have attempted to evaluate the impact that some demand-side factors, such as technology and computerisation, may have on occupational structures and the nature of the tasks involved. At the beginning of this century the main explanation proposed was that of the "Skill-Biased Technical Change" (SBTC, hereafter) hypothesis, which posits that technological advances show a bias towards favouring workers with higher levels of skills, while concurrently diminishing the demand for low-skilled labour. The SBTC hypothesis has been widely supported by economic research, highlighting its effectiveness in explaining some of the employment patterns observed in the US and other advanced economies during the twentieth century (Berman et al., 1994; Autor et al., 1998; Berman et al.; 1998).

However, the SBTC hypothesis has not been able to account for some of the changes in the employment and wage structure that happened in the last twenty years, one of them being job polarization. Autor et al. (2003) have made a substantial contribution by introducing the "Routine-Biased Technical Change" (RBTC, hereafter) hypothesis, which shifts the focus from the skills possessed by workers to the tasks that they actually perform on the job. The underlying idea is that recent technological changes, mainly driven by ICT, have increased the labour demand for high-skilled workers who usually perform non-routine tasks, while decreasing the labour demand for middle-skilled workers typically engaged in routine work. Their findings reveal a consistent decline in labour input for both routine manual and routine cognitive tasks in the US starting from the 1970s, as opposed to a concurrent increase in labour input for non-routine tasks. As routine tasks are located in the middle of the wage distribution and non-routine tasks at the extremes, the authors conclude that the RBTC hypothesis may provide an exhaustive explanation for the ongoing shift of employment from middle-wage jobs towards both low- and high-wage occupations, a phenomenon commonly referred to as "job polarisation".

Drawing on the framework developed by Autor et al. (2003), numerous empirical analyses have attempted to gather evidence of a polarising shift in employment structures[1]. Concerning Europe, Goos et al. (2014) make a pioneering effort in documenting the ubiquity of job polarisation in 16 Western European countries over the period 1993–2010. By relying on the system of task classification constructed by Autor et al. (2003), the authors find that job polarisation is pervasive across Europe and conclude that recent technological changes are biased towards replacing workers performing routine tasks, which explains the decrease in demand for middle-skilled jobs relative to high- and low-skilled labour. Interestingly, the authors provide some evidence that task offshoring may also contribute to the polarising trend observed in European occupational structures.

The growing interest in the RBTC hypothesis and job polarisation has prompted economists and academics to further develop and refine the task classification system first introduced by Autor et al. (2003) and expanded upon by Autor et al. (2006) (see Biagi and Sebastian, 2018 for a more comprehensive review). For instance, Fernández-Maciás and Hurley (2016) analyse the phenomenon of job polarisation in 23 European countries in 1995–2007 using their own classification of tasks. More specifically, they categorise tasks according to their cognitive and routine content, consistent with the RBTC hypothesis, but also based on their "social interaction" component (i.e., whether the current job requires direct interaction with non-colleagues). Their main findings suggest that ICT diffusion may indeed reduce the demand for routine jobs, but to a lesser extent than what has been observed in previous studies, and that computerisation does not seem to contribute to job polarisation but to upgrading.

In a more recent study, Bisello et al. (2019) analyse the task-structure dynamics of occupations during 1995–2015 in 15 European countries and examine the relationship between computerisation and job tasks. To carry out their research, the authors use a new comprehensive and detailed taxonomy of tasks (first developed by Bisello and Fernández-Maciás, 2016) that is based on the distinction between the substantive content of tasks and the ways in which they are carried out by workers. Concerning the former dimension, tasks are defined as physical, intellectual (i.e. cognitive), and social, whereas the latter dimension is more related to the methods and tools used by workers in performing their jobs. Results indicate conflicting patterns: an expansion in jobs with more social tasks but a decline in the amount of social tasks that workers actually perform in those positions; a reduction in occupations involving more routine tasks but an increase in the actual amount of routine tasks carried out by workers in those jobs. The authors suggest that these findings are consistent with the RBTC hypothesis, which posits that computers primarily substitute routine tasks, while complementing or having minimal impact on cognitive and social tasks.

Supply-side factors: education

While the aforementioned studies primarily focus on the demand-side factors that may impact employment, supply-side elements are equally relevant when seeking to understand occupational trends. From an economic standpoint, changes in employment structures are indeed determined by the complex interaction between shifts in firms' labour demand and shifts in workers' labour supply.

The fundamental principle underlying a supply-side explanation of occupational changes suggests that firms tend to determine their production techniques and their employment levels based on the

[1] An example is the study conducted by Autor et al. (2006), which first introduces a revised system of task classification, which defines tasks as abstract, routine, and manual, and then investigates the phenomenon of polarisation in the US labour market during the 1990s..

presence of different input factors, such as the availability of new technologies but also the supply of skills. Drawing on this, if firms observe a rapid increase in educational attainment and thus a reduction in the cost of skills, they may respond by investing in new (and unskilled-labour saving) technologies and generating more employment opportunities for highly qualified and skilled workers. On the other hand, in labour markets with a high number of low-skilled workers, firms may opt for a labour-intensive production process and create jobs that require minimal skills. Relatedly, in contexts where hiring low-wage workers is more challenging, firms are expected to invest in production techniques that may be implemented alongside more qualified employees (Oesch, 2013).

The presumption that transformations in a country's employment structures are intrinsically influenced by the evolution of skill supply highlights the crucial role of educational expansion in explaining occupational trends. Over the past years, education has indeed experienced a remarkable and unprecedented growth, characterised by a significant increase in both participation rates and attainment levels (OECD, 2022). As a consequence, the composition of the workforce has been progressively defined by an increasing prevalence of well-educated individuals, with a rising proportion holding academic qualifications. While the rate of educational expansion may obviously vary across different countries, the overall trend inevitably leads to an increased availability of skills, as evidenced by the educational achievements of workers (Oesch, 2013).

Based on this conceptualisation, some economists and researchers have explored the dynamics of occupational changes focusing on the importance of education, as well as that of technological change. An example is the study by Oesch and Rodríguez-Menés (2011), which aims to ascertain whether changes in employment structures in four Western European countries over the period 1990–2008 are primarily driven by job polarization or by the occupational upgrading induced by educational expansion. Their analysis focuses on Germany, Spain, Switzerland, and the UK. Results indicate that all four European countries have undergone occupational upgrading, albeit to a relatively lesser extent in the case of Spain and the UK. The authors conclude that this outcome is fully consistent with both the evolution of skills driven by educational expansion and a skill-biased version of technological progress. Salvatori (2015) examines the phenomenon of job polarisation in the UK in 1979–2012 and shows that educational expansion has significantly contributed to the polarising pattern observed in the UK through the reallocation of employment from middle- to high-skilled jobs. His findings indicate that the growth observed at the top of the occupational skill distribution may be fully attributed to the increase in the proportion of graduates, whereas the decline in middle-skilled jobs may be linked to the decrease in the share of non-graduates who have transitioned into low-skilled occupations. In light of this evidence, the author concludes that transformations in employment structures cannot be solely explained by the RBTC hypothesis and emphasises the necessity of adopting a wider perspective when assessing the complex interplay between technology and labour.

More recently, Oesch and Piccitto (2019) analyse occupational changes in Germany, Spain, Sweden, and the UK in 1992–2015 and demonstrate that the polarisation theory is not supported by empirical evidence. Using data from the EU-LFS, they find that Germany, Spain, and Sweden have undergone an employment expansion at the top of the occupational skill distribution, consistent with the occupational upgrading thesis. Based on these results, the authors conclude that educational expansion may have played a significant role in facilitating occupational upgrading by creating more jobs that require higher skills and thus higher levels of education.

These empirical studies challenge the conventional wisdom that technological progress (and thus shifts in labour demand) is the primary driver of changes in employment structures. On the

contrary, they provide some evidence that the evolution of workers' skills (and thus shifts in labour supply) represents a relevant element that may potentially influence occupational trends. Taking into account the results of these analyses, an overarching conclusion may be reached: when analysing employment profiles, it is fundamental to adopt a comprehensive approach that takes into account both the demand-side and supply-side perspectives in order to gain a complete understanding of the factors influencing occupational changes.

One could interpret our effort as an attempt to look at a specific age group (the young) and see how the occupational experience of young cohorts have changed over 25 years in the EU, with a special focus on cognitive occupations. Essentially, we want to consider whether cohorts of recent graduates from higher and upper secondary education are more or less likely (relative to cohorts of older workers) to be employed in cognitive jobs (under the reasonable assumption that higher education and, to a lesser extent, upper secondary educations "should" open the doors to jobs whose cognitive dimension is relatively high). We also want to look at the quality of employment for young workers of different cohorts, under the assumption that job quality is one of the dimensions that affects investment in education. Low quality of employment (i.e. low wages, poor working conditions, excessive use of temporary contract) tend to discourage human capital accumulation, and hence can jeopardise the achievement of some of the educational targets of the European Education Area. As a proxy for quality of job, in this work we use the existence of a temporary contract.

2. The fortunes of the young

Our analysis focuses on a specific demographic group among the European population, namely young people. In this regard, we have drawn inspiration from two noteworthy studies that investigate the relationship between occupational changes and the "fortunes" of the young. Their findings and ideas have provided valuable insights and we briefly review them in order to provide a contextual understanding of their contributions.

The first is the study by Beaudry et al. (2014), which examines employment trends among young graduates in the US during the period 1990–2012. The authors employ data from the Current Population Survey (CPS) and organise them by entry cohorts of young graduates to determine whether post-2000 entry cohorts experience an increase or a decrease in the probability of obtaining a cognitive job. Following the approach of the extensive literature on job polarisation, they categorise occupations into four main groups: cognitive, routine production, routine clerical, and services. Their findings indicate that successive cohorts of young graduates face a higher likelihood of being employed in a cognitive occupation during the 1990s, but that this probability decreases in the 2000s. Since they observe a similar pattern also in the wage profiles, they conclude that the labour demand for cognitive occupations is decreasing.

In the same vein, Dabla-Norris et al. (2019) analyse changes in the likelihood of being employed in a certain type of occupation among different cohorts of young graduates in the UK during 2000–2018. They use data from the EU-LFS and classify occupations as abstract[2], manual, and routine based on their task content. Consistent with the findings of Beaudry et al. (2014), they demonstrate that, starting from the Great Recession, more recent cohorts of young graduates face a lower probability of obtaining abstract jobs.

In sum, the studies conducted by Beaudry et al. (2014) and Dabla-Norris et al. (2019) shed light on the changing employment landscape for young people in the US and the UK. Both analyses reveal a decrease in the likelihood for young graduates to be employed in cognitive occupations in recent years. These findings raise important concerns about the shifting labour demand and its potential impact on career prospects and job opportunities for young people. Inspired by these contributions, our research aims at investigating occupational trends in Europe, with a specific focus on young individuals with different levels of educational attainment.

[2] Abstract jobs essentially coincide with cognitive jobs.

3. Data and tools

3.1. The European Labour Force Survey (EU-LFS)

Our main source of data is the individual-level European Labour Force Survey (EU-LFS) for the 25-year period 1995–2020. The EU-LFS provides information on a wide range of aspects relating to the European population, including employment status, occupation, industry, type of employment contract, educational attainment, and demographic characteristics of individuals. One true advantage of the EU-LFS is that it relies on a harmonised methodology for collecting data, which ensures consistency and cross-country comparability. This source of information is widely used by policy-makers, researchers, and analysts to monitor and study labour market trends, assess employment policies, and track socio-economic developments within the European context.

Due to limited data availability, our analysis focuses on 15 European countries over the period 1995–2020. More specifically, we study occupational trends in the following countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom. For explanatory purposes, we group them into three main categories based on geographical areas: Western Europe (Austria, Belgium, France, Germany Luxembourg, and the Netherlands), Southern Europe (Greece, Italy, Portugal, and Spain), and Northern Europe (Denmark, Finland, Ireland, Sweden, and the United Kingdom). Moreover, we further restrict our sample to individuals aged 20–59 who are full-time employed since we want to focus on workers who have a strong attachment to the labour market. For consistency, we also employ crosswalks to facilitate the conversion of ISCO-88 to ISCO-08, ensuring a uniform classification of occupations throughout the time interval here considered.

The data consists of repeated cross-sections that we employ to construct synthetic cohorts of young workers aged 20–29 years old (when analysing young individuals with upper secondary education) and 25–34 years old (when analysing young individuals with tertiary education). Synthetic cohorts are usually employed to analyse successive observations within the same group of individuals, also considering the age distribution of the population as cohorts progress through time. This method proves to be useful to cope with data limitations and simulate longitudinal employment trends. In our analysis, we construct distinct cohort groups based on specific age and year combinations. For instance, with respect to tertiary graduates, “cohort 1” includes individuals aged 25–29 in 1995 and 30–34 in 2000, “cohort 2” encompasses individuals aged 25–29 in 2000 and 30–34 in 2005, and so forth. Similarly, for upper secondary graduates, “cohort 1” comprises individuals aged 20–24 in 1995 and 25–29 in 2000, “cohort 2” includes individuals aged 20–24 in 2000 and 25–29 in 2005, and so forth. By organising LFS data based on cohort groups, we are able to assess whether younger cohorts are more likely to be employed in cognitive (and temporary) occupations, compared to older cohorts. This approach enables us to investigate the evolving trends in occupational outcomes for young workers over time.

3.2. The European database of task indices

In order to define occupations as cognitive, physical, and social, we employ the enriched version of the European database of task indices created by Bisello et al. (2021). This database is built upon the detailed taxonomy of task contents, methods, and tools developed by Bisello and Fernández-

Maciás (2020), which allows us to delve into the complexity of work activities characterising single jobs[3].

Table 1. Taxonomy of tasks according to the content of work

Typologies	Cognitive tasks, physical tasks, social tasks
Definitions	Cognitive tasks: tasks aimed at manipulating and transforming information as well as actively resolving complex problems. They are further divided into information processing, which encompasses literacy (handling verbal information) and numeracy (manipulating numeric information), and problem-solving, which comprises gathering and evaluating information, creativity, and resolution. Physical tasks: tasks that mainly require the exertion of energy (strength) and tasks that primarily need a fine physical skill and coordination (dexterity) Social tasks: tasks that generally consist of interacting with other people. They can be differentiated between serving or attending to customers, training and coaching others, persuading and influencing others, and supervising and coordinating others.
Data used	European Working Conditions Survey (EWCS), Indagine Campionaria sulle Professioni (ICP), Programme for International Assessment of Adult Competencies (PIAAC)

Source: Bisello and Fernández-Maciás (2020)

The primary dimension of the taxonomy (shown in Table 1), which is the most relevant for our analysis, focuses on task contents. Notably, this dimension considers work as a transformative activity that operates on objects, with tasks being discrete units within this framework. Hence, tasks are differentiated into three main categories based on the type of object being transformed: cognitive tasks (operated upon ideas or information), physical tasks (operated upon objects), and social tasks (operated upon social relations). Notably, within each of these groups, there are additional classifications that further indicate the type of transformation and the specific skills typically required to carry out different tasks.

Table 2. Distribution of task scores by occupations at the ISCO-08 two-digit level

Occupation (ISCO-08, 2 digits)	Cognitive	Physical	Social
11. Chief executives, senior officials and legislators	0.79	0.15	0.67
12. Administrative and commercial managers	0.79	0.10	0.57
13. Production and specialised services managers	0.82	0.22	0.64
14. Hospitality, retail and other services managers	0.58	0.32	0.56
21. Science and engineering professionals	0.79	0.26	0.44
22. Health professionals	0.62	0.37	0.67
23. Teaching professionals	0.64	0.29	0.59
24. Business and administration professionals	0.77	0.12	0.53
25. Information and communications technology professionals	0.75	0.10	0.41
26. Legal, social and cultural professionals	0.62	0.13	0.51
31. Science and engineering associate professionals	0.66	0.33	0.37
32. Health associate professionals	0.53	0.45	0.58
33. Business and administration associate professionals	0.70	0.14	0.50
34. Legal, social, cultural and related associate professionals	0.51	0.42	0.52
35. Information and communications technicians	0.68	0.21	0.35
41. General and keyboard clerks	0.65	0.14	0.37

[3] Bisello and Fernández-Maciás (2020) use the term "Intellectual tasks" for the first category. To be consistent with most of the literature in this area that uses the term "cognitive tasks", and to avoid raising confusion in the reader, we have renamed "cognitive tasks" the "intellectual tasks" developed and classified by Bisello and Fernández-Maciás (2020).

42. Customer services clerks	0.49	0.14	0.46
43. Numerical and material recording clerks	0.61	0.22	0.29
44. Other clerical support workers	0.48	0.22	0.35
51. Personal service workers	0.36	0.42	0.46
52. Sales workers	0.35	0.30	0.41
53. Personal care workers	0.29	0.44	0.39
54. Protective services workers	0.47	0.52	0.46
61. Market-oriented skilled agricultural workers	0.45	0.56	0.25
62. Market-oriented skilled forestry, fishery and hunting workers	0.37	0.88	0.29
63. Subsistence farmers, fishers, hunters and gatherers	0.33	0.65	0.10
71. Building and related trades workers, excluding electricians	0.37	0.62	0.20
72. Metal, machinery and related trades workers	0.44	0.49	0.25
73. Handicraft and printing workers	0.46	0.47	0.27
74. Electrical and electronic trades workers	0.55	0.50	0.35
75. Food processing, wood working, garment and other craft and related trades workers	0.43	0.46	0.30
81. Stationary plant and machine operators	0.30	0.44	0.13
82. Assemblers	0.30	0.40	0.11
83. Drivers and mobile plant operators	0.25	0.64	0.18
91. Cleaners and helpers	0.10	0.40	0.20
92. Agricultural, forestry and fishery labourers	0.28	0.62	0.15
93. Labourers in mining, construction, manufacturing and transport	0.26	0.51	0.10
94. Food preparation assistants	0.15	0.44	0.20
95. Street and related sales and service workers	0.22	0.36	0.28
96. Refuse workers and other elementary workers	0.20	0.52	0.25

Source: Bisello et al. (2021)

Following this conceptual framework and using data from the EWCS, the Italian Indagine Campionaria sulle Professioni (ICP) by INAPP-ISTAT, and the Programme for International Assessment of Adult Competencies (PIAAC) by the OECD, Bisello et al. (2021) define task indices through the computation of their average scores for all jobs at the ISCO-08 two-digit level. For the purpose of our analysis, we focus on cognitive, physical, and social task scores. Table 2 displays the task indices developed by the authors.

To facilitate the classification of occupations as cognitive, social, and physical, we aggregate the corresponding task scores and normalise them to a scale ranging from 0 to 1. Hence, we classify an occupation as (mostly) cognitive if its normalised intellectual task score is greater than its physical and social task scores. Likewise, an occupation is defined as (mostly) physical if its normalised physical task score exceeds both its intellectual and social task scores. Table 3 shows the results of our classification procedure.

Table 3. Classification of occupations as cognitive, physical and social

Occupation (ISCO-08, 2 digits)	Cognitive	Physical	Social
11. Chief executives, senior officials and legislators	X		
12. Administrative and commercial managers	X		
13. Production and specialised services managers	X		
14. Hospitality, retail and other services managers	X		
21. Science and engineering professionals	X		
22. Health professionals			X
23. Teaching professionals	X		
24. Business and administration professionals	X		
25. Information and communications technology professionals	X		
26. Legal, social and cultural professionals	X		

31. Science and engineering associate professionals	X		
32. Health associate professionals			X
33. Business and administration associate professionals	X		
34. Legal, social, cultural and related associate professionals			X
35. Information and communications technicians	X		
41. General and keyboard clerks	X		
42. Customer services clerks	X		
43. Numerical and material recording clerks	X		
44. Other clerical support workers	X		
51. Personal service workers			X
52. Sales workers			X
53. Personal care workers		X	
54. Protective services workers		X	
61. Market-oriented skilled agricultural workers		X	
62. Market-oriented skilled forestry, fishery and hunting workers		X	
63. Subsistence farmers, fishers, hunters and gatherers		X	
71. Building and related trades workers, excluding electricians		X	
72. Metal, machinery and related trades workers		X	
73. Handicraft and printing workers		X	
74. Electrical and electronic trades workers	X		
75. Food processing, wood working, garment and other craft and related trades workers		X	
81. Stationary plant and machine operators		X	
82. Assemblers		X	
83. Drivers and mobile plant operators		X	
91. Cleaners and helpers		X	
92. Agricultural, forestry and fishery labourers		X	
93. Labourers in mining, construction, manufacturing and transport		X	
94. Food preparation assistants		X	
95. Street and related sales and service workers		X	
96. Refuse workers and other elementary workers		X	

Source: Authors' elaboration using data from Bisello et al. (2021)

4. Descriptive evidence

In this section, we present and discuss descriptive evidence regarding some of the most relevant dimensions characterising young workers in Europe over the period 1995–2020, including educational attainment and employment profiles[4]. By conducting this descriptive analysis, we aim to provide a comprehensive overview of the evolving landscape within the European context, shedding light on the dynamics and transformations that have occurred during this 25-year time horizon, with a specific focus on young workers with different levels of education.

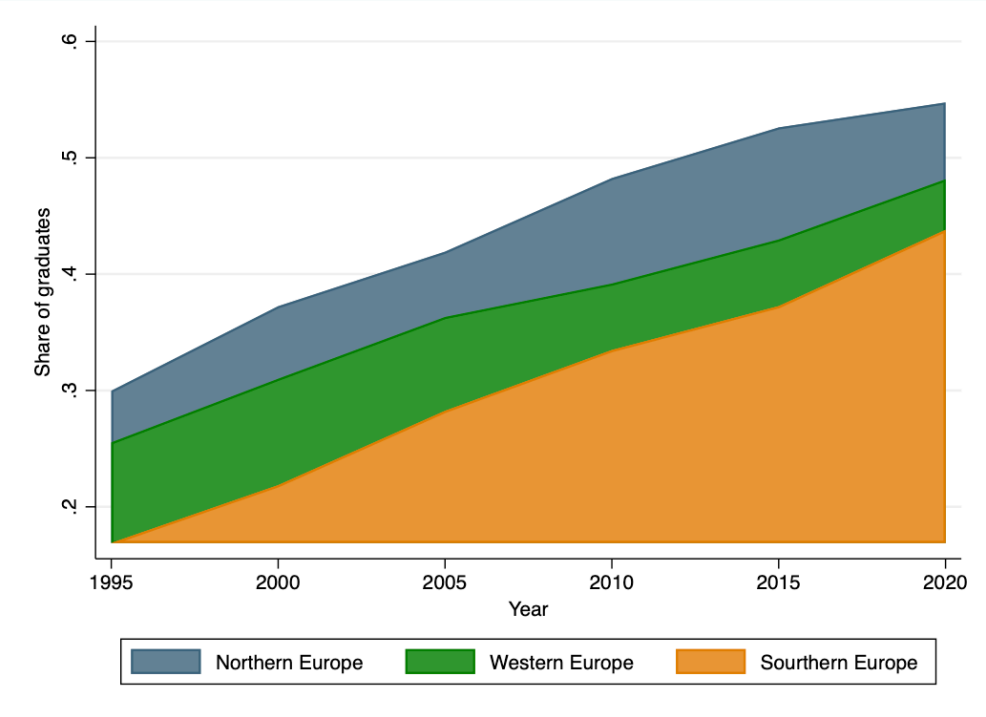
For the sake of clarity, it may be appropriate to specify that the presented results are primarily descriptive, providing a brief overview of the analysed data. However, it is crucial to acknowledge that these findings may be subject to potential influences from factors and variables that are usually not accounted for in a simple descriptive analysis. For instance, business cycle movements may introduce fluctuations and variations in the economic conditions affecting the observed trends. Additionally, significant transformations in regional labour markets may also play a role in shaping the outcomes, as localised shifts in employment opportunities and demographics may lead to distinct patterns. While these factors emphasise the need for a more comprehensive analysis, it is important to recognise that these descriptive results offer valuable insights into emerging trends and may thus serve as a starting point for further exploration, facilitating future deeper investigations.

4.1. Education expansion

During the past few decades, there has been a rapid and remarkable surge in the number of people pursuing higher education, especially in Europe. This phenomenon, known as educational expansion, is characterised by a widespread and significant growth in completion of tertiary education. This substantial shift in educational attainment has been driven by several factors, including the recognition of education as a fundamental right (which led to improved educational opportunities), the increasing demand for skilled workers within a dynamic and fast-changing economy, and the advent of recent technological advances that have made the acquisition of high-level skills far more crucial. Notably, our data reveals compelling evidence of this upward trend in educational attainment across all areas of Europe.

[4] Our analysis uses weighted observations from the EU-LFS for full-time workers in the EU-15 area (1995–2020). The complete dataset contains approximately 2.9 billion weighted observations (1.9 billion males, 1 billion females), with yearly samples ranging from 86 to 119.5 million individuals. Regional distribution: 1.3 billion in Western Europe, 995 million in Southern Europe, and 635 million in Northern Europe. For the cohort analysis, we use four specific subsamples: (1) Tertiary graduates for job type analysis: 55.5 million observations; (2) Upper secondary graduates for job type analysis: 72.8 million observations; (3) Tertiary graduates for temporary employment analysis: 50.4 million observations; (4) Upper secondary graduates for temporary employment analysis: 67.8 million observations. All figures reflect observations weighted using LFS coefficients to ensure population representativeness.

Figure 1. Education expansion in Europe: shares of young individuals aged 25–34 with tertiary education across European areas in 1995–2020



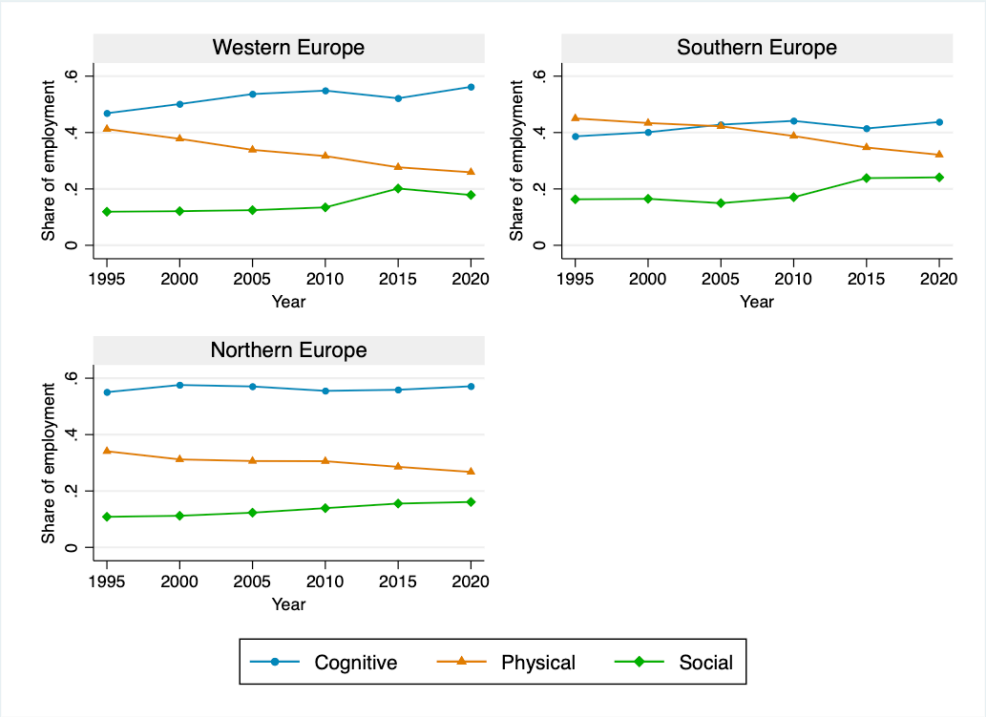
Source: European Labour Force Survey (EU-LFS), 1995-2020

As shown in Figure 1, there has been a significant rise in the share of individuals aged 25–34 who have obtained tertiary educational qualifications over the period 1995–2020. More specifically, between 1995 and 2020, the proportion of young graduates in Western Europe has increased from slightly over 25% to 48%; in Northern Europe, it has risen from approximately 30% to 55%; and in Southern Europe, it has grown from roughly 17% to 44%. Interestingly, compared to other European areas, Southern Europe has experienced the greatest educational expansion in 1995–2020, with an impressive increase of approximately 27 percentage points (p.p.) in the share of young graduates. When comparing different areas, it becomes evident that the gap in the proportion of young graduates between Western and Southern Europe has significantly narrowed, halving from 8 p.p. in 1995 to 4 p.p. in 2020. On the other hand, the gap between Northern and Southern Europe has remained quite constant over time, with a slight catching up observed from 2017 onwards. Finally, the gap between Northern and Western Europe has shown a slight increase over time, with Northern Europe maintaining a much higher proportion of young graduates compared to Western Europe.

4.2. Broad occupational trends

In parallel with this substantial increase in educational attainment, there have been significant transformations in employment structures during the last few decades. Several countries have indeed witnessed a progressive increase in the number of workers employed in occupations primarily characterised by cognitive tasks and a concurrent decline in the number of individuals carrying out manual jobs. These occupational changes, as discussed in Section 1, may be the result of the complex interaction between demand- and supply-side factors, including technological progress and educational expansion. Based on the classification of occupations of Table 3, we study how employment profiles have evolved over time for young European workers.

Figure 2. Occupational trends in Europe: shares of young individuals aged 25–34 employed in cognitive, physical, and social occupations across European areas in 1995–2020



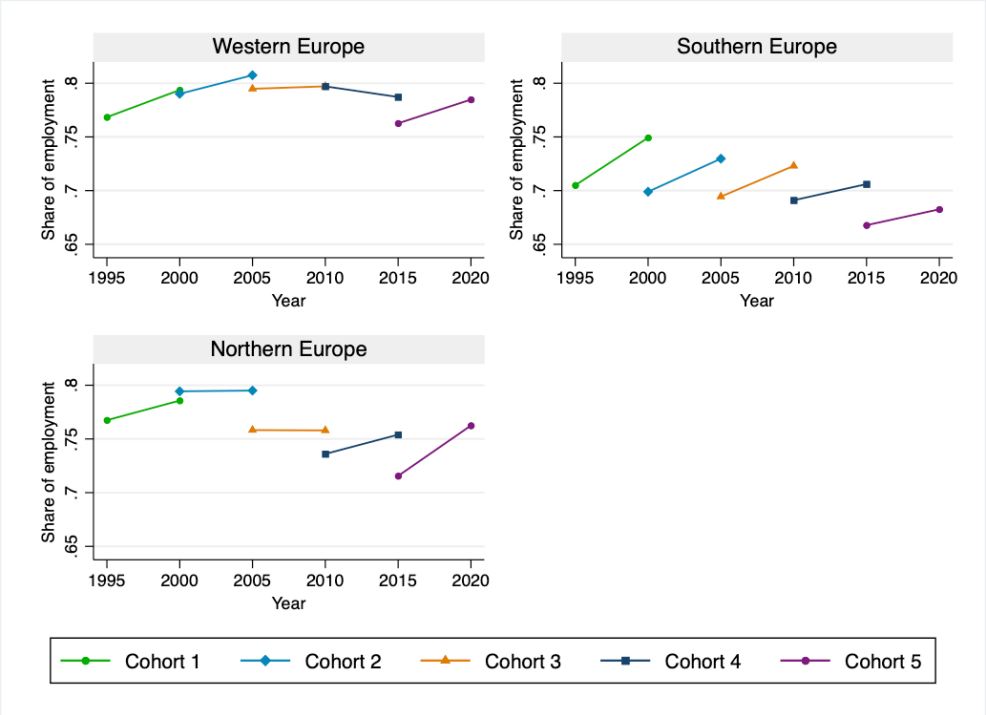
Source: European Labour Force Survey (EU-LFS), 1995-2020

Figure 2 presents an overview of the occupational changes experienced by young workers in Europe between 1995 and 2020. At first glance, it is clear that the proportion of workers employed in cognitive occupations has increased in all areas of Europe, albeit to a different extent depending on the region considered. At the same time, the share of young workers with a physical job has decreased, but always to a varying degree depending on the European area taken into account. More specifically, between 1995 and 2020, the proportion of young people employed in cognitive occupations has risen by 9 p.p. in Western Europe, 5 p.p. in Southern Europe, and 2 p.p. in Northern Europe. Conversely, the percentage of young workers in physical occupations has declined by 15 p.p. in Western Europe, 13 p.p. in Southern Europe, and 7 p.p. in Northern Europe. However, it should be considered that the share of young people with a cognitive occupation in 1995 was already high in Northern Europe, reaching almost 55%, whereas the proportion of workers with a physical job was much lower in comparison to the other areas of Europe, at around 34%. This may explain why Northern Europe has witnessed a more modest and limited variation in terms of young people employed in cognitive and physical occupations, in contrast to Western and Southern Europe. Notably, in Southern Europe, between 1995 and 2004, the proportion of young workers with a physical occupation exceeded the share of young workers in cognitive jobs. Conversely, in all other areas of Europe, the proportion of young workers employed in cognitive jobs has always been higher than the share of workers in physical occupations. Considering 2020, it is interesting to notice that Southern Europe displays a higher percentage of workers employed in physical occupations, approximately 32%, and a relatively lower proportion of workers in cognitive jobs, around 44%, compared to Western and Northern Europe. Finally, concerning social jobs, it is noteworthy that all European areas have witnessed a modest growth in the share of young workers engaged in such occupations. Southern Europe stands out as the region that has experienced the biggest increase in the proportion of young workers with a social job (around 8 p.p.).

4.3. Cognitive employment profiles by birth cohort, education and age

One of the main purposes of our analysis is to evaluate whether recent cohorts of young workers experience a higher probability of being employed in cognitive jobs, compared to previous cohorts. We restrict the analysis to individuals who have either graduated from upper secondary school or have obtained a tertiary education diploma. This approach allows us to explore changes in cognitive employment profiles over time for workers with different levels of "medium to high" education. In this section we also add the age variable to birth cohort. Individuals are identified by the birth cohort (which does not change in time) and by the age they have in a given year. For higher education graduates, we consider two age categories within the broad 25-34 group: the 25-29 category and the 30-34 one. By doing this we are able to track the age profile for a given birth cohort (at least until age 34) since for each cohort we have two observations[5].

Figure 3. Cognitive employment profiles in Europe: cohort analysis of young individuals aged 25–34 with tertiary education and employed in a cognitive occupation across European areas in 1995–2020



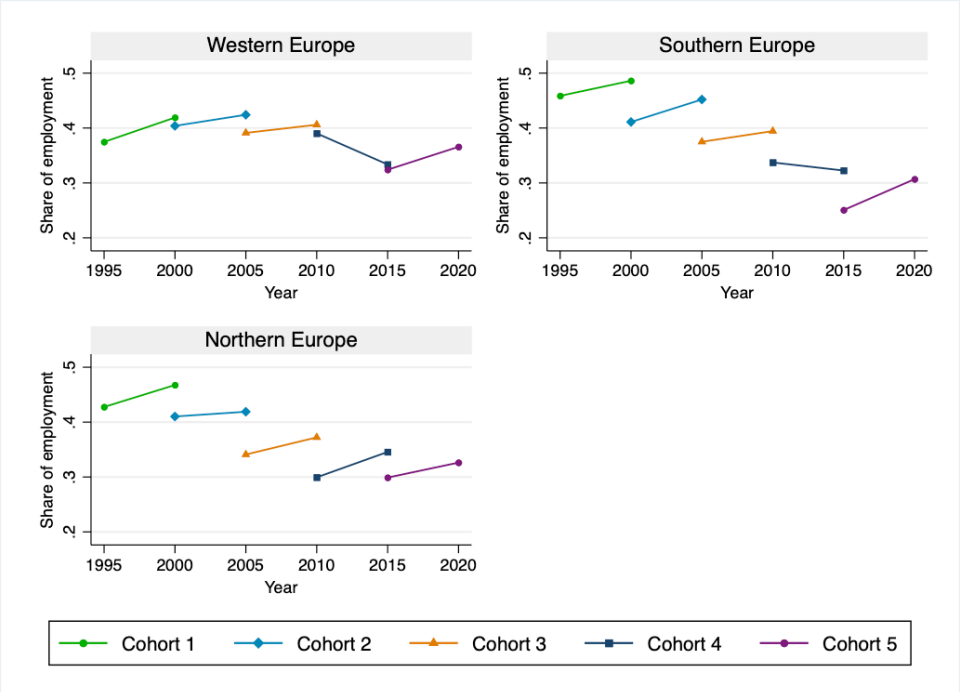
Source: European Labour Force Survey (EU-LFS), 1995-2020

Figure 3 depicts the evolution of the cognitive employment profiles of different cohorts of young workers with tertiary education. Considering Western Europe, between 1995 and 2015, each new

[5] For instance, individuals with higher education between the ages of 25 and 29 in 1995 (birth cohort 1) are between the ages of 30 and 34 in year 2000. Hence for birth cohort 1 we have two observations, one in 1995 and one in 2000. After 2000 individuals belonging to birth cohort 1 are older than age 30 and hence fall outside our sample. At the same time, in year 2000 we also have the first observation for cohort 2 (those who are between the age of 25 and 29 in year 2000), which is also observed in year 2005. Similar reasoning apply for individuals with upper secondary education (the difference being that in this case the relevant age intervals are 20-24 and 25-29: see Figure 4).

cohort of tertiary graduates entering the workforce shows a slight increase in the share of young workers employed in cognitive occupations at the very beginning of their working lives. However, the data indicate a clear reversal in this trend during 2015, with the employment share at entry for the last cohort falling by around 4 p.p.. Notably, for each cohort group, with the exception of cohort 4, the proportion of workers employed in a cognitive occupation increases as they progress through their working lives. If we then look at Southern Europe, each successive entry cohort has a lower share of employment in cognitive occupations at the outset of workers' careers, with this proportion decreasing by approximately 4 p.p. over the analysed time period. Similar to Western Europe, for each cohort in the South, the share of workers employed in a cognitive occupation grows during their working lives, albeit always to a lesser extent. Finally, concerning Northern Europe, we can observe that the trend in the cognitive employment profiles is not so clearly defined. However, it is worth noticing that, from 2005 to 2015, each subsequent cohort shows a decline in the share of employment in cognitive occupations, with a decrease of 4 p.p. over this period. Furthermore, analysing differences across European areas, it appears that, on average, Western Europe exhibits the highest share of workers employed in a cognitive job (approximately 79%), followed by Northern Europe (around 76%). On the other hand, Southern Europe is characterised by the lowest proportion of employment in cognitive occupations (with an average share of employment of 71%). Based on this descriptive evidence, we can conclude that, in contrast to what we would have expected, more recent cohorts of young workers with tertiary education are not always more likely to obtain cognitive jobs. Indeed, particularly for Southern Europe, the share of workers aged 25–34 with tertiary education who are employed in a cognitive occupation seems to have reduced between 1995 and 2020. Broadly speaking, this suggests that pursuing tertiary education today does not necessarily guarantee young workers entering the labour market a cognitive occupation (and more so in the South).

Figure 4. Cognitive employment profiles in Europe: cohort analysis of young individuals aged 20–29 with upper secondary education and employed in a cognitive occupation across European areas in 1995–2020



Source: European Labour Force Survey (EU-LFS), 1995-2020

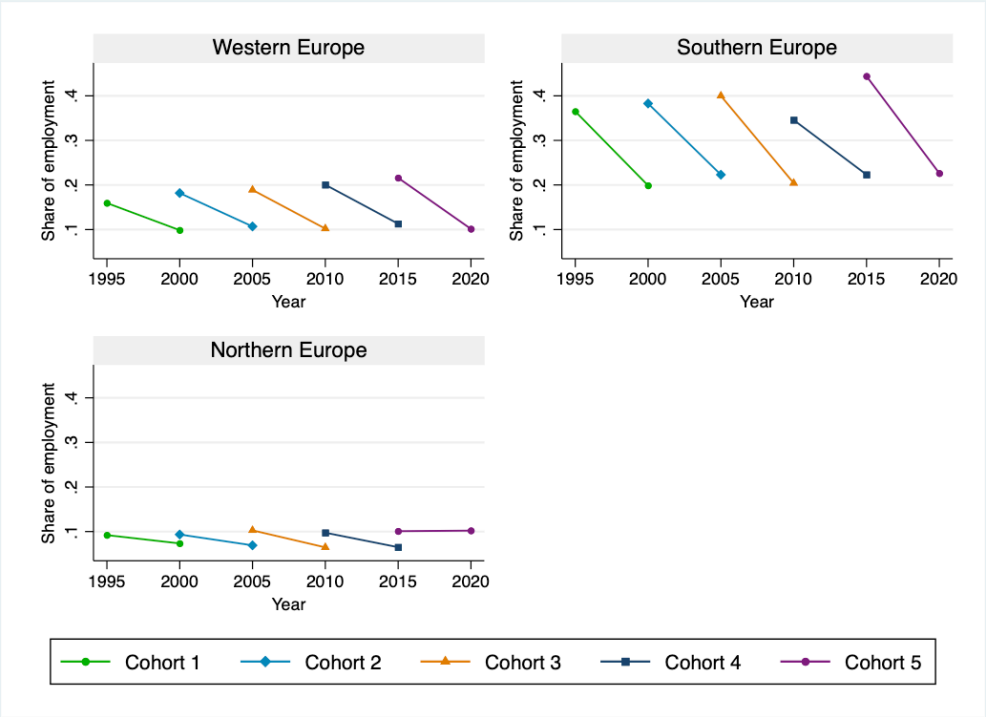
Figure 4 displays the evolution of the cognitive employment profiles of different cohorts of young workers with upper secondary education. While Western Europe may not exhibit a clearly defined trend, a more distinct pattern emerges when analysing the Southern and Northern areas of Europe. Indeed, starting from 1995 onwards, it is evident that successive cohorts of young workers with upper secondary education are characterised by a declining proportion of employment in cognitive occupations at the early stages of their professional careers, with an approximate decrease of 21 p.p. in Southern Europe and of 13 p.p. in Northern Europe. Moreover, considering both European areas, the proportion of workers with a cognitive job grows as individuals advance throughout their working lives (except for cohort 4 in Southern Europe), but this effect tends to decrease over time. Furthermore, looking at differences across areas, it is interesting to note that Southern Europe, compared to other areas of Europe, faces a much steeper and more rapid decline in the share of workers with upper secondary education employed in a cognitive occupation, with the proportion falling from around 48% to approximately 28%. In general, these descriptive results suggest that young workers who have only pursued upper secondary education are less and less frequently employed in cognitive occupations, especially when compared to their counterparts who have obtained higher educational qualifications.

4.4. Temporary employment profiles by birth cohort, education and age

Another dimension that we aim to explore through our analysis concerns the types of contracts that are offered to young workers. More specifically, we are interested in assessing whether young workers belonging to more recent cohorts experience a higher likelihood of having a temporary occupation compared to those from older cohort groups. As for cognitive employment profiles, we conduct the descriptive analysis separately for young workers with upper secondary and tertiary education, to outline the evolution of temporary employment profiles within these two different educational groups[6].

[6] See Footnote 5 for the explanation of how these graphs are constructed.

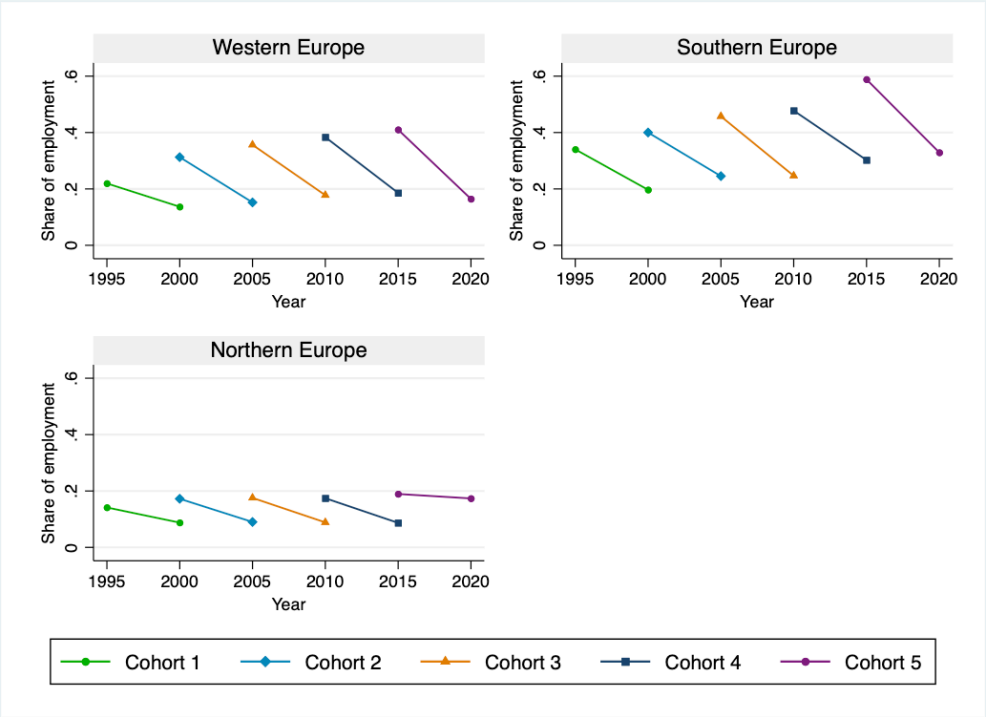
Figure 5. Temporary employment profiles in Europe: cohort analysis of young individuals aged 25–34 with tertiary education and employed in a temporary occupation across European areas in 1995–2020



Source: European Labour Force Survey (EU-LFS), 1995-2020

Figure 5 illustrates the evolution of the temporary employment profiles of different cohorts of young workers who have pursued higher education. Looking at the graph related to Western Europe, we can note that, between 1995 and 2020, each successive entry cohort has a slightly higher employment share in temporary occupations at the beginning of workers' careers, with the proportion of temporary employment increasing by 6 p.p. over the time period taken into consideration. As can be expected, for each cohort group, the share of workers who have a temporary occupation tends to decrease as individuals grow up and advance throughout their professional lives. Concerning the Southern areas of Europe, we can observe a trend similar to the one for Western Europe. Indeed, it is clear that, between 1995 and 2020, with the exception of cohort 4, more recent cohorts are characterised by an increasing proportion of employment in temporary occupations at the early stages of workers' careers. Notably, as workers progress during their working lives, the share of employment in temporary occupations falls substantially and settles around 20%. Concerning Northern Europe, we can notice a similar but far more stable pattern, with the share of temporary employment increasing just by 1 p.p. across cohort groups from 1995 to 2020. We can also observe that, except for cohort 5, the proportion of employment in temporary occupations decreases as workers progress throughout their professional career path. Moreover, it is worth highlighting that, when comparing various areas in Europe, a distinct pattern emerges. Remarkably, Southern Europe stands out as the European region with the highest share of employment in temporary occupations, approximately 30%. On the other hand, Northern Europe exhibits the lowest percentage of workers with a temporary job, around 9%. Western Europe is placed in the middle, with a share of employment in temporary occupations standing at 15%.

Figure 6. Temporary employment profiles in Europe: cohort analysis of young individuals aged 20–29 with upper secondary education and employed in a temporary occupation across European areas in 1995–2020



Source: European Labour Force Survey (EU-LFS), 1995-2020

Finally, Figure 6 displays the temporary employment profiles associated with the different cohorts of young workers who have completed upper secondary education. We can clearly notice that in all areas of Europe, each successive entry cohort exhibits a higher share of employment in temporary occupations at the start of workers' career paths. This trend is most pronounced in Southern Europe, where the proportion of workers who have a temporary job grows from 34% to almost 60% over the period 1995–2020. However, Western Europe also exhibits a significant rise in the temporary employment share during the analysed time period, with an approximate increase of 19 p.p. Northern Europe shows the most stable pattern, with the proportion of workers employed in a temporary occupation increasing just by 5 p.p. between 1995 and 2020. Notably, in all these areas, the percentage of temporary employment declines as individuals grow up and gain more working experience. Even in this context, Southern Europe maintains its position as the region with the highest share of employment in temporary occupations, followed by Western Europe and ultimately Northern Europe. Lastly, it is noteworthy that, even if the trends evolve in a similar way, cohorts of young workers with higher education have a lower proportion of employment in temporary occupations compared to cohorts of young workers with only upper secondary education.

5. Empirical analysis

The main purpose of our empirical analysis is twofold. In the first place, we attempt to evaluate the impact of educational attainment on the employment prospects of young workers in cognitive occupations. Specifically, we explore how the probability of securing cognitive employment changes for cohorts of young individuals who have pursued tertiary education compared to cohorts of young workers who have only attained upper secondary education. In the second place, we analyse the relationship between educational background and the probability of cohorts of young workers obtaining a temporary job. In particular, we evaluate how cohorts of young individuals with tertiary or upper secondary education differ in their likelihood of being employed in a temporary occupation. This section briefly presents the empirical methodology used to conduct our study.

5.1. Employment in cognitive occupations

We start our empirical analysis by estimating a simple linear probability model that relates a dependent binary variable, which takes a value of 1 if the individual is employed in a cognitive occupation and 0 otherwise, to a set of control variables. These controls include (birth) cohort dummies (consisting of five distinct groups), gender (coded as 0 for females and 1 for males), age (grouped into two classes: 20–24 and 25–29 when analysing individuals with upper secondary education, 25–29 and 30–34 when analysing those with tertiary education), sectors (defined based on the NACE 1-digit level classification), and calendar years. We thus obtain the following model specification:

$$\begin{aligned} Pr\,(Cognitive\ occupation)_{icgasy} &= \beta(Cohort)_{ic} + \delta(Gender)_{ig} + \xi(Age)_{ia} + \theta(Sector)_{is} + \sigma(Year)_{iy} \\ &+ \varepsilon_{icjasy} \end{aligned} \tag{1}$$

Where *c* indexes the birth cohort of individual *i*, *g* indexes gender (males vs females), *a* indexes age (two age groups), *s* indexes the sector in which individual *i* is employed and *y* refers to the year in which the individual is observed. As for the coefficients, β is a vector of coefficients on birth-cohort dummies, δ is the coefficient on the gender dummy, ξ is the coefficient on the age-group dummy, θ is a vector of coefficients on the sector dummies and σ is vector of coefficients on the year dummies. We estimate this model using alternative data samples and considering separately different European areas (i.e., Western Europe, Southern Europe, and Northern Europe[7]). Also, we consider separately the two educational groups: the first one consists exclusively of young workers aged 20–29 with upper secondary education, while the second one comprises only young workers aged 25–34 who have attained tertiary education. This approach recognises that young individuals with different levels of education enter the labour market at different ages. Indeed, those pursuing tertiary education usually start working at around 25, whereas those with upper secondary education join the labour market around the age of 20. Consistently, cohort groups have different definitions based on the specific sample considered (i.e., cohort 1 refers to those between the age

[7] The sample used in the empirical analysis is identical to that used for the descriptive cohort analysis; see footnote (4) for further details.

of 20 and 24 for upper secondary graduates and to those between 25-29 for tertiary graduates in year 1995[8]).

5.2. Temporary employment

We then employ a similar approach to examine how the probability associated with different cohorts of young workers obtaining a temporary occupation varies for individuals with different levels of educational attainment. We thus build up an empirical model that relates a dependent binary variable, which takes a value of 1 if the individual has a temporary job and 0 otherwise, to the same series of control variables included in equation (1). We then obtain the following model specification:

$$Pr\,(Temporary\ occupation)_{icgasy} = \beta(Cohort)_{ic} + \delta(Gender)_{ig} + \xi(Age)_{ia} + \theta(Sector)_{is} + \sigma(Year)_{iy} + \varepsilon_{icjasy} \quad (2)$$

Also in this case, we estimate the regression model for different areas of Europe (i.e., Western Europe, Southern Europe, and Northern Europe) relying on distinct data samples based on the age and educational background of individuals. As in the previous model, cohort groups are sample-specific.

5.3. Estimation remarks

Both equations (1) and (2) are estimated using the Ordinary Least Squares (OLS) method. However, it is good to specify that the linear probability model has certain limitations when dealing with binary outcome variables. One major shortcoming is that it may compute predicted probabilities outside the 0–1 range, which contradicts the constraint that probabilities should fall within the (0-1) interval. Moreover, the linear probability model relies on the assumption that the relationship between the independent variables and the probability of the outcome is linear, which may not always hold true. This may thus result in biased estimates and inaccurate predictions. For this very reason, it is important to interpret and discuss the results with caution.

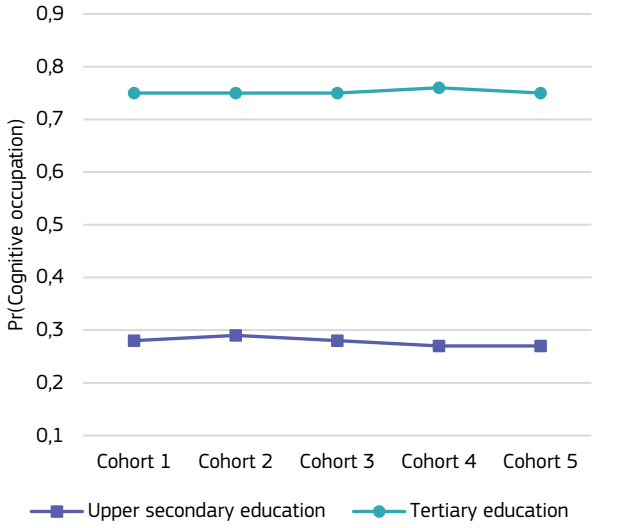
[8] The idea is that for both type of graduates, it might take about 2 years (from the time graduation) to obtain a meaningful occupation. Hence, for an upper secondary graduate who completed secondary education at the age of 18, we start considering her/him in our empirical analysis starting from the age of 20. Analogous reasoning applies to tertiary graduates (who tend to complete their tertiary education at the age of 23)

6. Results and discussion

In this section, we present and discuss the main findings of our empirical analysis. We start by displaying the results on cognitive employment and show how the likelihood of being employed in a cognitive occupation has evolved over time for cohorts of young workers with upper secondary and higher education. We then illustrate the findings on temporary employment and demonstrate how the probability of receiving a temporary contract has changed over time for cohorts of young individuals who have obtained different educational qualifications. Notably, we present our results by comparing the outcomes for the two educational groups (i.e., young workers with upper secondary education and young workers with tertiary education), to highlight the impact of pursuing different levels of education.

6.1. Employment in cognitive occupations

Figure 7. Cognitive employment trends in Western Europe: changes in the probability of obtaining cognitive jobs for young workers with upper secondary and tertiary education across different cohort groups

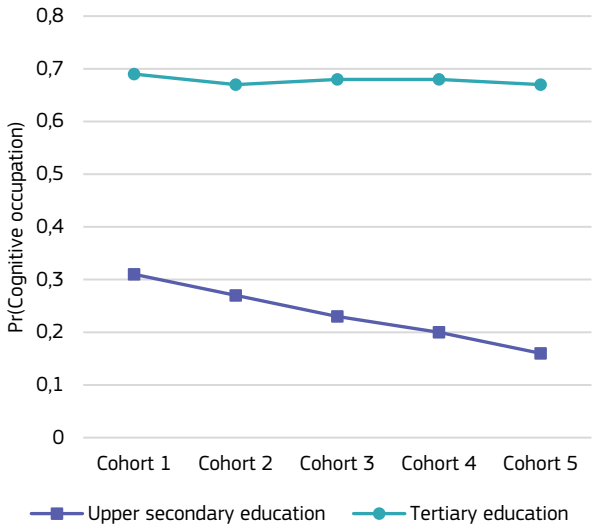


	Upper secondary education	Tertiary education
Cohort 1	0.28***	0.75***
Cohort 2	0.29	0.75
Cohort 3	0.28	0.75
Cohort 4	0.27	0.76
Cohort 5	0.27*	0.75

Source: European Labour Force Survey (EU-LFS), 1995-2020
*Note: The asterisks indicate statistical significance (*** = p<0.01, ** = p<0.05, * = p<0.1)*

Figure 7 illustrates how the likelihood of being employed in a cognitive occupation changes for cohorts of young workers with different levels of education in Western Europe. As might be expected, the probability of obtaining a cognitive job is significantly higher for young individuals with higher education compared to those with only upper secondary education. Notably, the likelihood of securing cognitive employment for workers with different educational backgrounds does not exhibit significant variations based on cohort affiliation. Indeed, whether an individual belongs to one cohort or another, there are no remarkable changes in the probability of obtaining a cognitive job.

Figure 8. Cognitive employment trends in Southern Europe: changes in the probability of obtaining cognitive jobs for young workers with upper secondary and tertiary education across different cohort groups

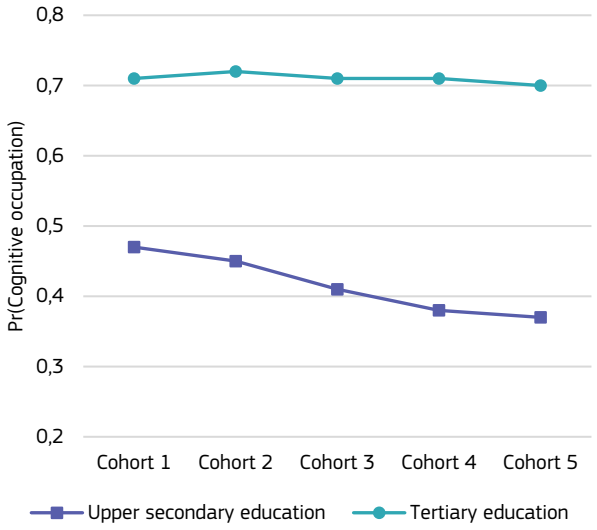


	Upper secondary education	Tertiary education
Cohort 1	0.31***	0.69***
Cohort 2	0.27***	0.67**
Cohort 3	0.23***	0.68*
Cohort 4	0.20***	0.68
Cohort 5	0.16***	0.67**

Source: European Labour Force Survey (EU-LFS), 1995-2020
*Note: The asterisks indicate statistical significance (*** = p<0.01, ** = p<0.05, * = p<0.1)*

Figure 8 displays changes in the probability of obtaining cognitive jobs for cohorts of young workers with upper secondary and tertiary education in Southern Europe. At first glance, we can notice that the likelihood of being employed in a cognitive occupation remains quite stable for cohorts of young individuals who have pursued tertiary education. On the contrary, this probability experiences a significant drop across cohorts of young workers with only upper secondary education. This decline in the probability of securing a cognitive occupation is sizable (from 0.31 to 0.16) and statistically significant.

Figure 9. Cognitive employment trends in Northern Europe: changes in the probability of obtaining cognitive jobs for young workers with upper secondary and tertiary education across different cohort groups



	Upper secondary education	Tertiary education
Cohort 1	0.47***	0.71***
Cohort 2	0.45**	0.72
Cohort 3	0.41***	0.71
Cohort 4	0.38***	0.71
Cohort 5	0.37***	0.70

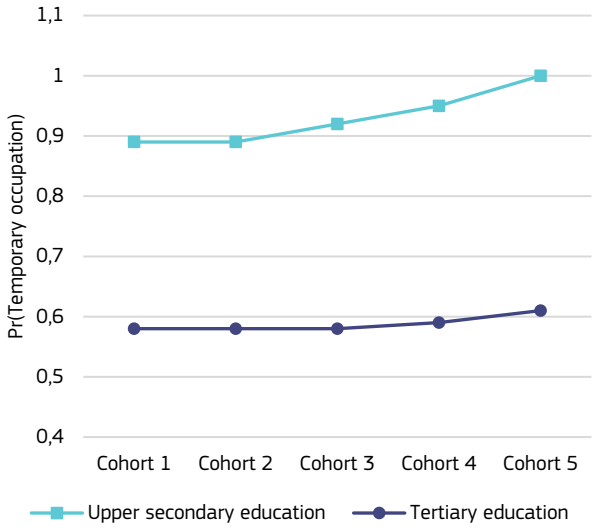
***Source**: European Labour Force Survey (EU-LFS), 1995-2020*
Note:** The asterisks indicate statistical significance (= p<0.01, ** = p<0.05, * = p<0.1)*

Figure 9 highlights how the likelihood of being employed in cognitive occupations evolves for cohorts of young individuals with different levels of educational attainment in Northern Europe. Notably, we spot a similar trend to the one observed in Southern Europe. Indeed, the probability of obtaining cognitive employment remains relatively stable for the different cohorts of young workers with tertiary education, while it consistently declines for the more recent cohorts of young workers with upper secondary education. Hence, for young workers who have only pursued upper secondary education, belonging to more recent cohorts is associated with a lower probability of receiving a cognitive occupation. This effect is substantial (from 0.47 to 0.37) and statistically significant.

The overall picture emerging from these empirical results is that in all areas of Europe, the likelihood of young workers with tertiary education obtaining cognitive jobs has remained relatively stable across different cohort groups, while it has significantly decreased for more recent cohorts of young individuals with upper secondary education in Southern and Northern Europe. This finding is surprising, as we would have expected an upturn in the probability of obtaining a cognitive job for more recent cohorts of young workers with tertiary education. Indeed, higher levels of education are supposed to enhance the acquisition of advanced cognitive skills, thereby facilitating access to occupations characterised by highly cognitive task content. However, this is not the case.

6.2. Temporary employment

Figure 10. Temporary employment trends in Western Europe: changes in the probability of obtaining temporary jobs for young workers with upper secondary and tertiary education across different cohort groups



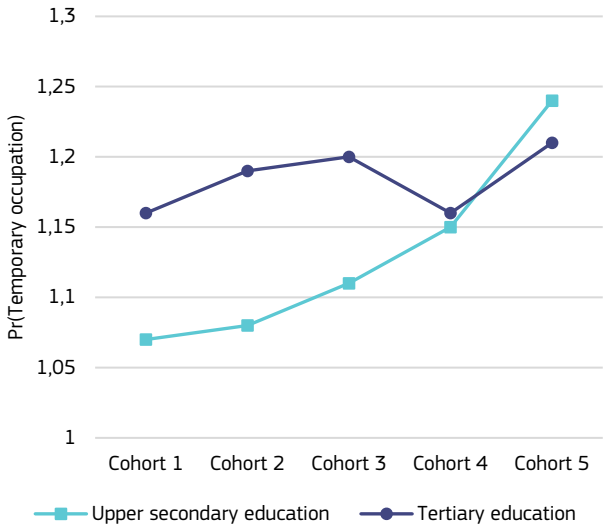
	Upper secondary education	Tertiary education
Cohort 1	0.89***	0.58***
Cohort 2	0.89	0.58
Cohort 3	0.92***	0.58
Cohort 4	0.95***	0.59
Cohort 5	1.00***	0.61***

Source: European Labour Force Survey (EU-LFS), 1995-2020
*Note: The asterisks indicate statistical significance (*** = p<0.01, ** = p<0.05, * = p<0.1)*

Figure 10 shows how the probability of obtaining temporary employment changes for cohorts of young workers with higher and upper secondary education in Western Europe. Looking at the picture, it becomes apparent that the likelihood of obtaining a temporary occupation is higher for young individuals who have only pursued upper secondary education than for young workers with higher education. We can also note that the estimated probabilities grow for both educational groups as we consider more recent cohorts, albeit to a different extent. Indeed, the likelihood of obtaining a temporary job increases at a much faster rate for cohorts of young individuals with

upper secondary education than for cohorts of young graduates. Drawing from these results, we may conclude that today, Western European young workers who have only attained upper secondary educational qualifications are far more likely to receive a temporary occupation with respect to young workers with higher education.

Figure 11. Temporary employment trends in Southern Europe: changes in the probability of obtaining temporary jobs for young workers with upper secondary and tertiary education across different cohort groups

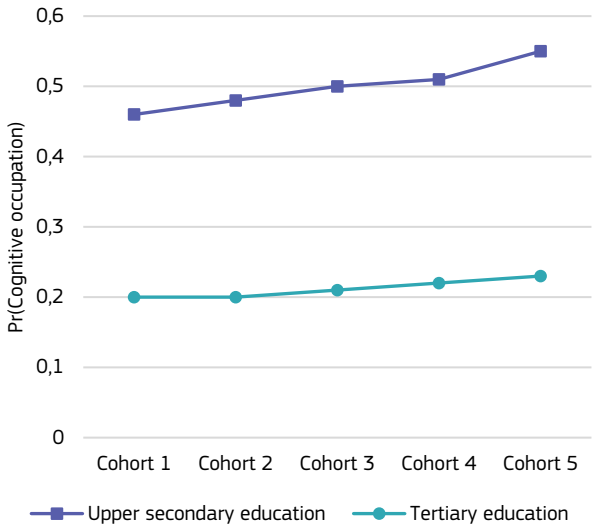


	Upper secondary education	Tertiary education
Cohort 1	1.07***	1.16***
Cohort 2	1.08**	1.19***
Cohort 3	1.11***	1.20***
Cohort 4	1.15***	1.16
Cohort 5	1.24***	1.21***

Source: European Labour Force Survey (EU-LFS), 1995-2020
*Note: The asterisks indicate statistical significance (*** = p<0.01, ** = p<0.05, * = p<0.1)*

Figure 11 illustrates variations in the probability of receiving temporary jobs for cohorts of young workers with different educational backgrounds in Southern Europe. Surprisingly, except for the last cohort, the likelihood of receiving temporary employment is higher for young workers with tertiary education than for young individuals with only upper secondary education. Moreover, as we consider successive cohort groups, we can notice that the probability of obtaining temporary contracts grows faster for cohorts of young workers with upper secondary education than for cohorts of young graduates. Concerning young individuals with tertiary education, it is good to specify that the drop in the probability associated with cohort 4, which clearly alters the overall trend, is not statistically significant, unlike the effects observed for all other cohorts.

Figure 12. Temporary employment trends in Northern Europe: changes in the probability of obtaining temporary jobs for young workers with upper secondary and tertiary education across different cohort groups



	Upper secondary education	Tertiary education
Cohort 1	0.46***	0.20***
Cohort 2	0.48***	0.20
Cohort 3	0.50***	0.21
Cohort 4	0.51***	0.22***
Cohort 5	0.55***	0.23***

Source: European Labour Force Survey (EU-LFS), 1995-2020
*Note: The asterisks indicate statistical significance (*** = p<0.01, ** = p<0.05, * = p<0.1)*

Figure 12 depicts how the likelihood of being employed on a temporary contract varies across cohorts of young workers with different levels of education in Northern Europe. As observed in Western Europe, the probability of obtaining a temporary job is generally higher for cohorts of young workers with upper secondary education. As we consider more recent cohort groups, we can notice that the probability of temporary employment grows rapidly for cohorts of young workers with upper secondary education, while it only experiences a slight increase for cohorts of young workers who have pursued tertiary education. Notably, the rise in the likelihood for cohorts of young individuals with upper secondary education is particularly significant.

On the whole, we can conclude that the probability of receiving a temporary job has increased in all European areas for more recent cohorts of young workers with both upper secondary and tertiary education. In particular, in Western and Northern Europe, young workers with upper secondary education are more likely to be employed in temporary occupations than those with tertiary education. On the other hand, concerning the Southern areas of Europe, results are far less straightforward, suggesting that, except for the last cohort group, the probability of obtaining a temporary job is higher for workers with tertiary education and lower for those who have attained only upper secondary educational qualifications.

7. Conclusions

This report attempts to investigate the evolving occupational outcomes of young cohorts in Europe, with a specific focus on cognitive occupations, temporary employment, and educational attainment. Our analysis presents some interesting findings that may contribute to a better grasp of the fortunes and challenges that have characterised European labour markets for young workers in the last few decades.

A key finding is that cognitive employment prospects have remained relatively steady for tertiary-educated cohorts but significantly declined for upper secondary-educated cohorts in Southern and Northern Europe. This divergence suggests that the expansion of higher education has enabled young graduates to maintain access to high-skilled cognitive occupations. However, young workers with only upper secondary education face greater challenges in obtaining such jobs. This finding reveals the crucial role of education in shaping employment opportunities. At the same time, temporary employment has risen substantially across younger cohorts during the analysed time period, though more sharply among workers who have only pursued upper secondary education. This indicates that while tertiary education may provide some protection against precarious work, the probability of receiving temporary jobs has increased for young people overall. Particularly interesting is the pattern observed for Southern Europe: this is the only area in which the share of temporary contracts has been higher among tertiary graduates (until 2015), casting some doubts on the attractiveness of tertiary education in the period 1995-2015 in this area. In essence, for Southern Europe we observe that the share of cognitive employment among young tertiary graduates has remained fairly stable across the years, but its quality (proxied by the share of temporary contracts) has declined in absolute terms (but not in relative terms, when compared to the experience of upper secondary graduates).

These results may have different policy implications. First, to increase access to well-paid cognitive occupations, it is important to guarantee strong basic skills, a well-functioning upper secondary education system (including in its VET component) and a continued tertiary educational expansion in fields that are in growing demand, hence aligning education with labour market needs. This may involve promoting fields such as STEM, expected to experience high demand, and enhancing resources for career guidance to help students make informed decisions. Relatedly, apprenticeship programs may represent another promising approach to provide alternative pathways to well-paying careers. These are the aims of past and current policy initiatives by the European Commission, such as the European Education Area, the New Skills Agenda, the Youth Guarantee, the "Aim, Learn, Master, Achieve" (ALMA) initiative, and the recently launched Union of Skills (following the 2023 European Year of Skills).

Second, it appears also necessary to reflect (and design policies accordingly) on the profound and complex relationship between industrial strategy, competitiveness and human capital development. The fact that, especially in some areas, tertiary graduates' employment in cognitive occupations is not rising as expected signals that, perhaps, in such areas, the demand for cognitive jobs has not grown (yet). This calls for integrated policies at the national as well as local/regional level, considering the comparative advantages of regions/local areas when developing educational programs.

Third, temporary employment has risen considerably among young cohorts in the period 1995-2000, but more so in Southern and Western areas. We also notice that in Northern and Western areas, temporary employment has been consistently higher among upper secondary graduates. The opposite is observed in the South, at least until recent years. This casts doubts on the quality dimension of the "returns to tertiary education" in Southern Europe (and might account for some of

the low tertiary educational attainment observed in some Member States located in the South). While temporary employment offers job opportunities for young workers who enter the labour market, the fact that, in some countries, temporary employment is still prevalent among workers who have been in the labour market for a considerable amount of time is an indication that a sequence of temporary contracts does not consistently lead to a permanent contract. The resulting uncertainly about the employment status of many young (and not so young) workers is likely to rise job un-satisfaction and, more generally, push to delay important choices that affect individual and societal well-being (such as parenting or the purchase of a house or apartment). Regulating temporary work arrangements might be an option to dampen precarious employment, though it likely requires nuanced approaches tailored to national contexts.

On the whole, this report provides valuable evidence and a conceptual discussion regarding the shifting occupational landscape facing young workers in Europe. It highlights the need for policy and research attention to support educational expansion and foster future job opportunities for young Europeans to navigate ongoing work transformation.

The main limitation of this report is the lack of wage data that could provide an additional metric for job satisfaction and for the overall functioning of the labour market. Considering together prices (i.e. wages) and quantities (i.e. employment) would allow us to better understand the supply vs demand drivers of the observed patters. We hope to overcome such limitations in further studies.

A second limitation is the impossibility to use longitudinal data over such a long period. However, this is a limit of EU-LFS data and cannot be easily overcome. This is also the reason why we have opted for an approach that mimics longitudinal data by using repeated cross-sections and focusing on groups of individuals who share some basic characteristics (e.g. age, gender and education).

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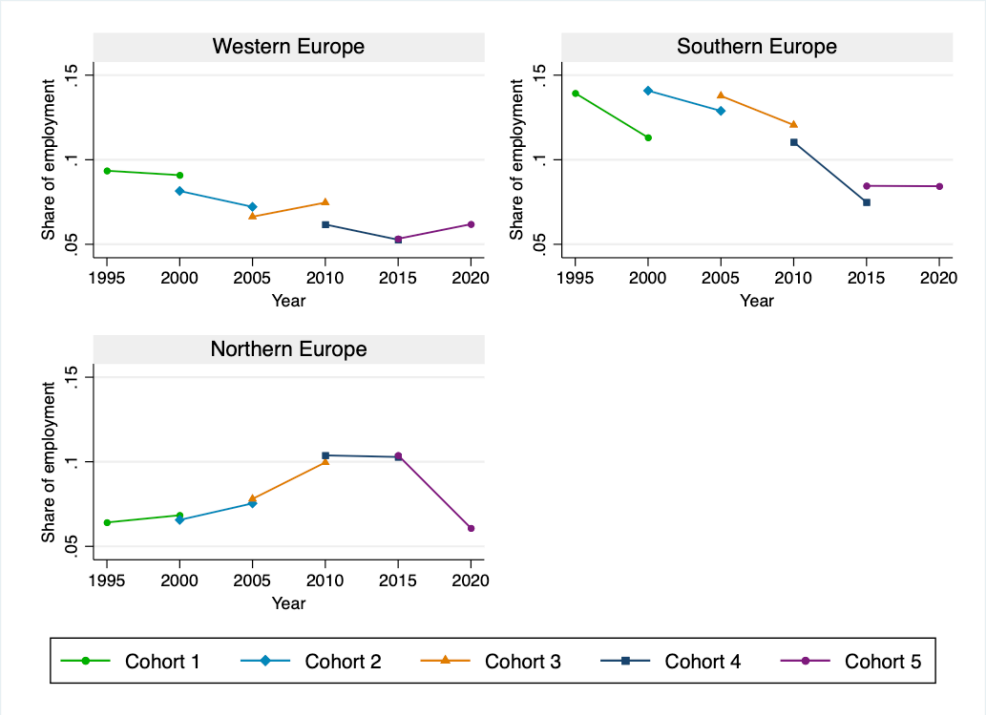
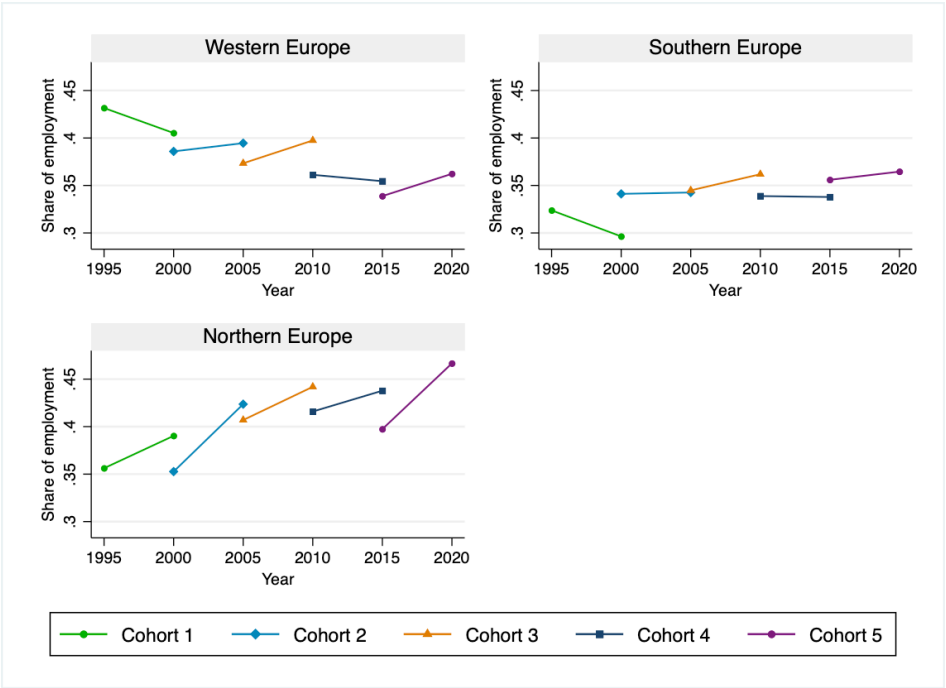
Annex

Figure 13. Physical employment profiles in Europe: cohort analysis of young individuals aged 20–29 with tertiary education and employed in a physical occupation across European areas in 1995–2020



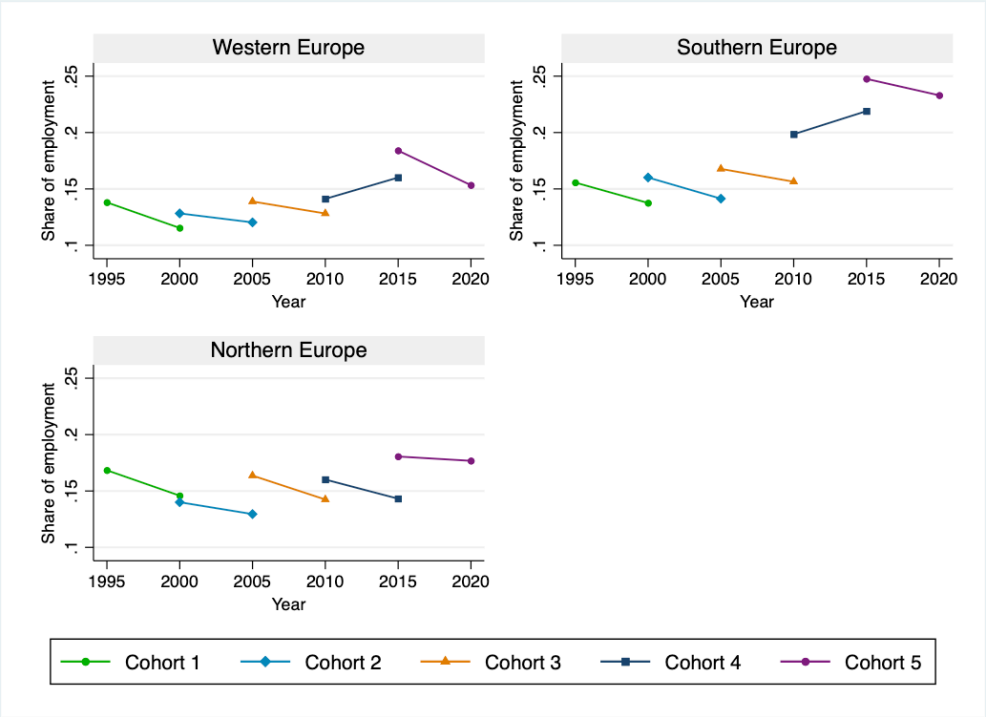
Source: European Labour Force Survey (EU-LFS), 1995-2020

Figure 14. Physical employment profiles in Europe: cohort analysis of young individuals aged 20–29 with upper secondary education and employed in a physical occupation across European areas in 1995–2020



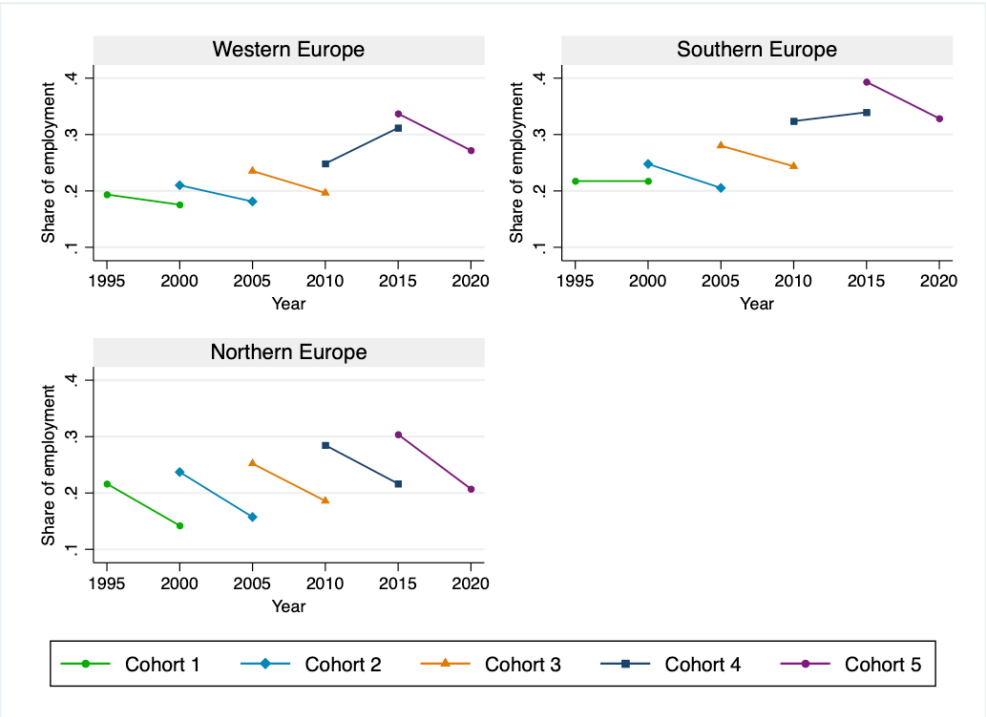
Source: European Labour Force Survey (EU-LFS), 1995-2020

Figure 15. Social employment profiles in Europe: cohort analysis of young individuals aged 20–29 with tertiary education and employed in a social occupation across European areas in 1995–2020



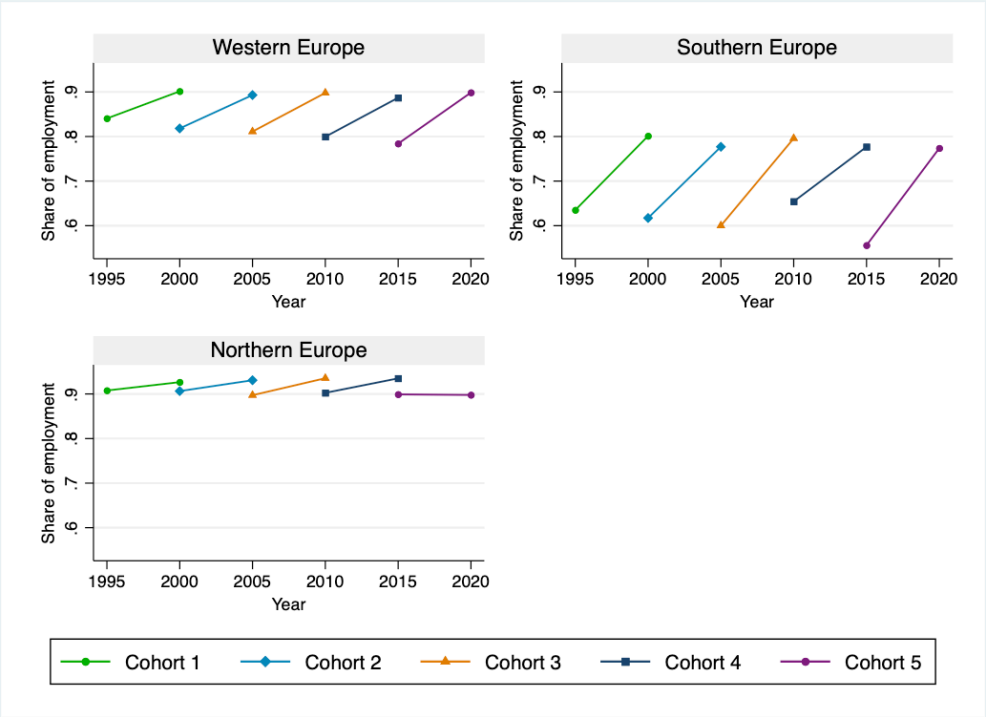
Source: European Labour Force Survey (EU-LFS), 1995-2020

Figure 16. Social employment profiles in Europe: cohort analysis of young individuals aged 20–29 with upper secondary education and employed in a social occupation across European areas in 1995–2020



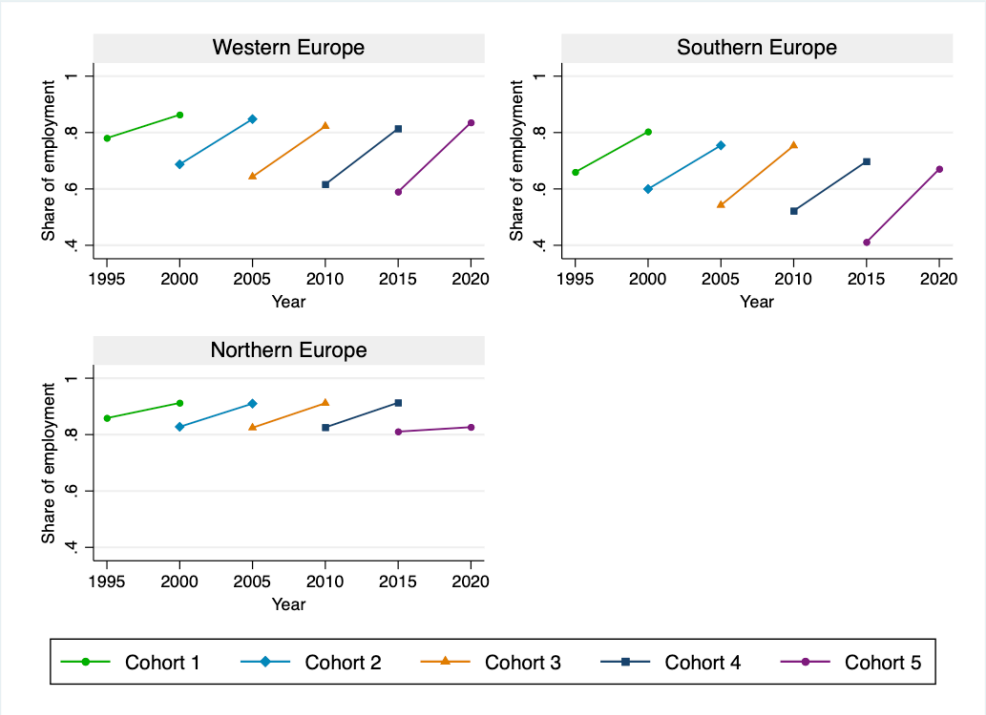
Source: European Labour Force Survey (EU-LFS), 1995-2020

Figure 17. Permanent employment profiles in Europe: cohort analysis of young individuals aged 20–29 with tertiary education and employed in a permanent occupation across European areas in 1995–2020



Source: European Labour Force Survey (EU-LFS), 1995-2020

Figure 18. Permanent employment profiles in Europe: cohort analysis of young individuals aged 20–29 with upper secondary education and employed in a permanent occupation across European areas in 1995–2020



Source: European Labour Force Survey (EU-LFS), 1995-2020

Table 4. Number of young workers with higher education and employed in a cognitive occupation across different cohort groups and European areas, thousands

	Western Europe	Southern Europe	Northern Europe	Total
Cohort 1	4.363	2.155	2.281	8.799
Cohort 2	4.757	3.145	2.804	10.707
Cohort 3	4.889	3.721	3.183	11.794
Cohort 4	5.552	3.090	3.729	12.372
Cohort 5	6.333	2.931	2.591	11.856
Total	25.895	15.043	14.589	55.526

Source: European Labour Force Survey (EU-LFS), 1995-2020

Table 5. Number of young workers with upper secondary education and employed in a cognitive occupation across different cohort groups and European areas, thousands

	Western Europe	Southern Europe	Northern Europe	Total
Cohort 1	7.998	3.541	3.247	14.787
Cohort 2	7.584	4.004	3.647	15.235
Cohort 3	7.947	3.513	3.909	15.368
Cohort 4	8.131	2.809	3.871	14.811
Cohort 5	7.308	2.520	2.764	12.591
Total	38.968	16.387	17.437	72.792

Source: European Labour Force Survey (EU-LFS), 1995-2020

Table 6. Number of young workers with higher education and employed in a temporary occupation across different cohort groups and European areas, thousands

	Western Europe	Southern Europe	Northern Europe	Total
Cohort 1	3.951	1.794	2.137	7.882
Cohort 2	4.405	2.683	2.661	9.749
Cohort 3	4.539	3.236	2.986	10.761
Cohort 4	5.153	2.618	3.491	11.262
Cohort 5	5.815	2.516	2.452	10.783
Total	23.863	12.846	13.728	50.437

Source: European Labour Force Survey (EU-LFS), 1995-2020

Table 7. Number of young workers with upper secondary education and employed in a temporary occupation across different cohort groups and European areas, thousands

	Western Europe	Southern Europe	Northern Europe	Total
Cohort 1	7.653	2.951	3.017	13.621
Cohort 2	7.259	3.412	3.432	14.103
Cohort 3	7.638	3.048	3.675	14.362
Cohort 4	7.810	2.453	3.581	13.844
Cohort 5	7.019	2.234	2.614	11.867
Total	37.380	14.097	16.319	67.795

Source: European Labour Force Survey (EU-LFS), 1995-2020

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