

Regional Youth Employment: What are the recent trends and drivers?

Review paper on employment potential for NEETs through alternative sectors

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Abstract

This paper uses micro-data from the European Labour Force Survey of Italy, Spain, Greece and Ireland to construct a specifically designed regional macro-level data panel of youth employment for the period 2008 to 2021. Youth employment rates across regions fell as a consequence of the Great Recession, with the most severe declining rates in Greece and Spain, followed by Ireland and Italy. Post-2014, youth employment recovered in all countries at different rates, but dropped again after the COVID crisis, before starting a new recovery. The evidence points towards divergence at a rate of 10 per cent in youth employment rates across regions between 2008 and 2014, and conversely, convergence at a 5 per cent rate post-2014. In terms of the determinants of regional youth employment in Italy, Spain, Greece and Ireland, we find evidence to support policies aimed at improving overall labour force participation and promoting tertiary education as a means of enhancing youth employment. Regional GDP per capita is found to have positive impact on youth employment. We also identify some emerging labour market trends, as remote working and green economy, and try to understand the impact they might have on youth employment.

Keywords: youth employment; regional youth employment; dynamic panel data; green and brown sectors; remote working.

JEL Classification: E24; C23; J20.

Word Count: 12,601

1. Introduction

Young people in employment play a crucial role in shaping the future of a country's workforce and in the overall economic growth. Enhancing youth employment has always been one of priorities of the European Union, in particular of the European Employment Strategy, in line with the achievement of one of the goals of the European Pillar of Social Rights: having at least 78 per cent of the population aged 20 to 64 in employment by 2030.

To date, most research on youth employment has used country specific cross-sectional or panel datasets and has focussed on identifying the individual or firm-level characteristics associated with youth employment, or the impact of youth employment on outcomes such as wages, job satisfaction etc. These micro-level studies, however, do not provide any indication of extent to which youth employment is driven by labour demand, labour supply or macroeconomic factors. However, while there are many studies that examine both the determinants and impacts of youth employment at a national level, there is very limited research aimed at understanding youth employment from a cross-national and cross-regional perspective. The lack of comparative international regional research on the issue of youth employment is, arguably, due to a lack of available data sets that measure youth employment across countries over time.

In this paper, to address this substantial gap in the literature, we develop a unique panel dataset using the European Labour Force Survey data, in order to examine youth employment at a regional level across four European countries in order to assess variations in both levels and trends in youth employment across regions, the degree of convergence in youth employment rates over time and the key factors explaining regional level variations in youth employment rates in Europe.

We focus on four selected European countries, Italy, Spain, Greece, and Ireland, and examine youth employment trends at a regional level in the period 2008-2021. We also evaluate whether youth employment rates across regions have been diverging or converging over time: divergence implies a scenario whereby the gap between regions with the lowest and highest rates of youth employment is expanding over time, while convergence indicates the opposite. In order to identify factors that can make a positive contribution in enhancing youth employment, by using a panel estimation approach, we identify drivers of youth employment both on the labour demand and labour supply side. Specifically, emerging labour market trends (identified in Section 2), as 'remote' working and 'co-working' practices and the economy decarbonisation process, and sectors relevant for these trends have been analysed, to examine their employment potential for young people over time. The aim of the study is to provide knowledge in order to facilitate the further development of youth employment activities at a regional level in the EU.

The NUTS-2 level regions of the selected countries have been classified in three categories, in order to expand further on the spatial element of the analysis: regions that are the most

exposed to the decarbonisation process and the transition to a carbon-neutral economy (predominately rural settings); regions where there is a relevant concentration of co-working spaces (predominately urban settings); other regions related neither to the decarbonisation process nor to prevalence of co-working spaces.

We examine patterns in youth employment using a specifically designed panel data set constructed from the quarterly Labour Force Surveys of 27 EU countries over a 15-year period (2008-2021). Our results show that youth employment decreased across all the regions between 2008 and 2014, from around 80 per cent to 60 per cent, as a long-term consequence of the great recession in 2008. Since 2014, this process was reversed and youth employment began increasing over a 5-year period, before falling off again in 2020, due to the COVID-19 pandemic recession. During 2021, it started to rise again, reaching around 75 per cent. Divergence in youth employment at a rate of 10 per cent per annum is found between 2008 and 2014, and conversely, convergence at a rate of 5 per cent per annum post-2014. In terms of the determinants of youth employment, we find evidence to support policies aimed at improving the proportion of individuals with tertiary education, the regional participation rates, and GDP per capita as a means of increasing youth employment within regions. When examining only the post-2014 period, the results show negative impacts associated with 'brown' jobs sectors and 'co-work'/'remote work' sectors on youth employment, with the strongest impact in the regions classified as being most affected by decarbonisation. The findings suggest that while youth employment may respond to policy variables, the impact of particular policies will tend to vary depending on specific regional labour market contexts.

1.1 Youth Employment and Youth Employment Policies

Kelly et al. (2022) examines youth employment rates and youth employment policies in Italy, Spain, Greece and Ireland post-2008. As a result of the Great Recession, youth employment rates fell in all four countries under analysis for this project: the peak of the crisis came earliest in Ireland, followed by Greece and Spain at broadly similar times and later in Italy. By 2019, no country had returned to pre-recession levels. In 2019, youth unemployment rates were between 20 and 30 per cent across Greece, Spain and Italy, with a lower rate (9.1 per cent) in Ireland.¹ The drop in youth unemployment has been strongest in Spain and Greece, effectively halving since 2013. Long-term youth unemployment rates are marked by recovery to or close to pre-recession levels except in the case of Greece. NEET rates among youths deteriorated after the recession and they recovered by 2019 in Ireland, Greece and Spain, but not in Italy where they have failed to decrease significantly from 2014 levels. In both Spain and Ireland males dominated NEET rates after the peak of the crisis, but in more recent years females have constituted the larger percentage of NEETs. Across countries, some significant differences have been found in the characteristics of young people belonging to the employed, unemployed, long-term unemployed, and NEET categories.

¹ The data employed is the European Union Labour Force Survey (EU-LFS) data and several national-level indicators related to young people are examined: employment rates, unemployment rates, long-term unemployment rates, Not in Employment, Education and Training (NEET) rates, and inactivity rates. We also calculate sectoral youth employment shares for economic sectors that correspond to the region types of interest.

Another focus of the analysis of Kelly et al. (2022) is on non-metropolitan regions: namely those that are either tourism-dependent or ones that have witnessed energy transition, decarbonisation, or intense industrial decline. Youth employment in tourism-dependent regions was between 24.4 per cent and 43 per cent for the period 2008-2020, indicating the importance of tourism to young people in these areas. In key energy transition regions, youth employment has shown a slight decline since 2008 in Greece and Italy, whereas in Spain there is evidence of a slight increase prior to COVID-19.

Kelly et al. (2022) identified a number of key youth employment policy responses implemented in order to address the severe impact of the Great Recession, both individually and also collectively under the European Youth Guarantee (YG) and the Reinforced Youth Guarantee (RYG). Taking each country separately, Greek youth employment policy post-Great Recession has been characterised by an early and relatively substantial response to the financial crisis (i.e., minimum wage cuts). This policy response had an enduring impact on youth employment through a focus on low wage and low value-add employment, mainly in the tourism sector. The initially limited-outreach implementation of the Youth Guarantee has been somewhat improved by amendments in more recent years.

Due to institutional factors (i.e., multi-level governance system), the Italian policy response has been more varied, and there has been variation in both the design and effectiveness of policy responses across the country. Nevertheless, one important element of its Youth Guarantee is the focus on person-centred planning of employment support. Compared to the other study countries, Italy was also later in its implementation of policies to assist youths (2014/2015). The main labour market reforms in Italy may have had positive impacts on the prevalence of temporary and apprenticeship contracts, but they have not met expectations in terms of the youth labour market, particularly with regard to wage contraction.

In Spain, many measures already implemented were incorporated into the National System of Youth Guarantee (NSYG) in 2014. Spain's key policy responses focused on initial employment or experience upon leaving education or training. Although the policies may have succeeded in certain aspects, they have also been linked to the prevalence of temporary contracts in Spain. In addition, the formulation of the criteria for some of the implemented policies may have contributed to the exclusion of beneficiaries from further policies. The more recent 'Shock Plan for Youth Employment (2019-2021)' has, however, prioritised guidance and training.

Ireland did not take immediate action after the Great Recession, but eventually focused on structural reforms to remove barriers to employment, before implementing strategies to create new jobs and to support those who lost their jobs. The Irish employment activation system was reformed, and a principle of mutual obligation and sanctions was introduced. Unemployed youths were prioritised in the new system. Under the Youth Guarantee, many different initiatives were introduced; their effectiveness is not well documented, but labour market indicators suggest that some of the measures have been effective. Nevertheless, even

before the onset of COVID-19, employment had not reached pre-crisis levels, and the 'quality' of the jobs created for youths, and in general, remains unclear.

Finally, the European Youth Guarantee has brought a relative convergence of national policy responses, but there is no clear consensus on its effectiveness. Based on the analyses undertaken in this study, only some youth labour market indicators have reached pre-recession levels in the four study countries. The European-led Youth Guarantee (YE) and Reinforced Youth Guarantee (RYG) policies may have been overshadowed by significant national policies of labour market liberalisation pursued in the early years of the Great Recession. For instance, cutting labour costs and protections as a means of adapting to the changing macroeconomic environment led to a disproportionate negative effect on youth employment, particularly in Greece and Ireland.

2. Literature

This section presents relevant literature on youth employment in Europe; it provides an overview on labour market trends that could potentially have an impact in enhancing young people's employment opportunities. In particular, we examine the relatively underdeveloped relationship between green employment and the transition to a carbon-neutral economy, and the increase in remote working practices and the use of co-working spaces. In our model examining youth employment determinants, we use regional level data, therefore we also review some studies that used a similar approach. Lastly, we identify the regions among our sample of selected countries that are to be considered as: (i) particularly affected by the green transition; and (ii) where co-working practices are most common.

2.1 Youth Employment

Enhancing youth employment is among the priorities of the European Employment Strategy, in line with the achievement of one of the goals of the European Pillar of Social Rights: having at least 78 per cent of the population aged 20 to 64 in employment by 2030. Although the integration of young people into the labour market is crucial for the future of each country, generally, young people tend to be more exposed to the risk of unemployment than older people for many reasons. Youth employment is more responsive to business cycle compared to those of 'prime age': during expansive phases, youth and adults' employment rates are both high, while during recession periods the unemployment rates rise fastest for young people than for adults (Eurofound, 2012). For example, during the 2008 Great Recession, youths tended to be employed in cyclically sensitive industries (for instance, construction and accommodation), and held part-time jobs or had temporary contracts. Employment protection rules, regulating the use of temporary employment, are known to affect the labour market hiring and mobility dynamics, of young entrants in particular. Therefore, countries without strict employment protection, for example, Greece and Spain, are those where young people experience unstable labour market conditions and higher risk of unemployment (OECD, 2010).

When entering the labour market, young people deal with unique challenges: the transition from formal education to employment can result in a period of instability; a lack of work experience and/or lower productivity may represent an obstacle from being hired by employers. Therefore, they may prefer to hire more experienced workers than younger persons, to avoid training costs and have a higher qualified workforce. Within the literature, there is evidence of the positive relationship between high educational attainment and employment outcomes: the higher the level of education, the higher the probability of entering and remaining employed (Riddle et al., 2011; ILO, 2012). Therefore, a higher level of education can protect against unemployment. Young people with lower levels of educational attainment are particularly vulnerable in the labour market. Moreover, among young people there can be particularly vulnerable groups of workers that may have difficulties in accessing the labour market or remaining continuously in employment or accessing education. 'Not in Employment, Education or Training' is the term often used to refer to these young people and is defined as the share of young people who, regardless their educational level, are not in employment, education or training. The NEETs' concept first appeared in the EU policy agenda in 2010 and since then has been a constant concern and policy target at EU and national level. Section 2 identifies emerging labour market trends that could potentially have an impact on reducing NEET rates and enhancing in general young employment opportunities, whose study is relatively underdeveloped: the green economy, the increase in remote working practices and the use of co-working spaces, and the platform economy.

2.1.2 Young People Not in Employment, Education or Training (NEETs)

Reducing the number of workers Not in Employment, Education or Training (NEETs) is a major policy priority in the European Union. The target of the European Pillar of Social Rights Action Plan is to reduce the NEET rate to 9 percent by 2030, and this is supported by a considerable amount of EU funding. Understanding the causes and consequences of NEET status is therefore important. At an individual level, there are many factors that contribute to NEET status. For some individuals the reason can be quite specific, such as having an illness, disability or caring responsibilities, whereas in other cases it can be multifaceted and complex. The negative consequences associated with NEET status include poverty, labour market scarring, social exclusion and adverse mental health outcomes.

Redmond et al. (2023, forthcoming) review the potential policies that could be used to reduce the NEET rate. This includes a comprehensive review of active labour market policies. In summary, successful policies require a well-functioning and resourced public employment service. The availability of adequate and affordable childcare is also a key requirement. This is particularly important because approximately one quarter of NEETs are young people with caring responsibilities, a high percentage of which are young, single mothers. For unemployed NEETs, job search assistance has been consistently found to be associated with positive employment effects. The evidence on training is mixed. While classroom-based training often has a positive impact on employment, the benefit of on-the-job training is largely confined to the most disadvantaged unemployed people, with a potentially negative impact on highly-educated unemployed people. Self-employment and entrepreneurship schemes have been shown to have positive impacts, with some evidence indicating more success for males and highly educated individuals. Conversely, public employment programmes have consistently been found to be ineffective.

Redmond et al. (2023, forthcoming) review some important emerging labour market trends and their potential impact on NEETs. These include the green economy, co-working practices, and the platform economy. Citing research from the United Nations Environment Programme, it is suggested that the transition towards a green economy could generate an additional 60 million jobs by 2030 (Nishimura and Rowe, 2021). However, the author's caution that the efficacy of this shift in bolstering youth employment hinges on the provision of relevant skills and training.

Coworking spaces have the potential to provide important opportunities for NEETs. They are a useful infrastructure to equip NEETs with digital and entrepreneurial skills which they may be lacking (Avdikos and Papageorgiou, 2021) and to potentially facilitate self-employment among the unemployed (Bouncken and Reuschl, 2018). They could also be a solution to offset the lack of interactions and social capital of young, home-based female entrepreneurs (Rodríguez-Modrono, 2021).

The sharing economy may provide a potential source of employment for NEETs in Europe. Pissourios et al. (2021) examine whether short-term rentals (STR) operated through sharing platforms (e.g., Airbnb) can provide viable employment opportunities to NEETs in Spain, Italy, Greece and Cyprus. The focus is on low-skilled women and migrants aged 25-29, due to the increased risk of NEET status among these groups. It is suggested that the internet-based nature of such jobs, and the flexibility, may suit younger people and women who have caring responsibilities. While there appears to be some potential for employment opportunities for NEETs, it is somewhat limited at present. Only firms that own/manage large numbers of properties are able to hire NEETs, while smaller scale service providers are not able to provide sustainable employment. The prospects for NEETs in this sector could be improved by providing a mediator function to match NEETs with prospective employers. Training and mentorship in relevant areas could also improve the prospects for NEETs in this industry.

2.1.2 Youth Employment and Green Economy

In recent times, young people are more concerned than other age groups about climate change and environmental degradation and are using their voices in order to raise the policymakers' awareness and contribute to the design and implementation of climate policies (UNDP, 2022). 'Green jobs' tend to be associated with technological advanced environments, where young workers tend to perform better compared to older adults (ILO 2017). Moreover, young people are also more likely than other age groups to receive an education with a 'green' component and to have access to 'green' skills accumulation more easily; this implies that youth are likely to benefit from the creation of 'green' jobs and that the transition to a carbon-neutral economy has the potential to generate employment opportunities for this group (Janta et al., 2023). ILO (2019) shows how national employment policies can serve as entry points to designing effective strategies for green jobs for youth. Nonetheless, it may also be the case that green jobs require some technical and technological skills that need longer time to be accumulated, therefore they are not easy to be accessed by young people at beginning of their career and are held by a more mature, educated, and experienced adult workforce. In the present study, we try to expand the research on the association between 'green' economy and youth employment rates.

The green economy is defined as being 'low carbon, resource efficient and socially inclusive' (UNEP, 2011; Redmond et al., forthcoming 2023). Over the last few years, European and international organisations and European citizens have been expressing increasing concern about climate change, global warming, and environmental degradation. International and European institutions and single countries have been addressing their policies to combat climate change effects and to help carry out a transition to a low-carbon economy (Eurofound, 2023b). In 2019, the European Commission launched the 'European Green Deal'. The objective of the new deal is to make the European Union the first climate neutral continent in the World by 2050, through a decarbonisation process and a transition to clean and renewable energies. In July 2021, the European Commission presented the 'Fit for 55' strategy, setting an intermediate target in order to meet the climate-neutrality goal by 2050: the EU committed to reducing greenhouse gas emissions by 55 per cent by 2030 and it introduced a package of legislative proposals and policy initiatives 'to make the EU's climate, energy, land use, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55 per cent by 2030'.

According to the ILO's (2016) definition, 'green jobs are decent jobs that contribute to preserve or restore the environment, be they in traditional sectors such as manufacturing and construction, or in new, emerging green sectors such as renewable energy and energy efficiency'. They can be divided into two categories: (i) jobs that design and produce goods or provide services that benefit the environment, such as green buildings, clean transportation, and renewable energy (by developing, producing or maintaining green technologies) in an output perspective; (ii) jobs that contribute to more environmentally friendly processes in the production of any product or service, e.g., increasing water/energy efficiency, improving recycling systems in a process perspective. The decarbonisation process and the transition to clean and renewable energies will involve job destruction in the most carbon-intensive industries (OECD, 2017; European Commission, 2022), with 'brown' jobs located in sectors with a high pollution or emissions intensity in process or product (IMF, 2022). The exact definition of green jobs and the related green skills and the approach to empirically operationalise the concepts remain controversial (Eurofound, 2023a). In this study, we attempt to define a conceptual operationalisation of 'green' sectors i.e., where 'green' and 'greening' jobs are most dominant. Subsequently, we also classify 'brown' jobs in 'brown' sectors. Our classifications are heavily informed by the relevant literature, informed by CoWork4Youth partners' expertise, and based on the NACE rev.2 classification for sectors.

Decarbonisation of the economy is very likely to cause job losses, to a large extent, in the mining and quarrying sector (NACE B) as it reflects the shrinkage of coal, lignite, petroleum and natural gas extraction activities (Montt et al., 2018). Therefore, we consider 'Brown' jobs to be located in this sector. Coal mining is a first example of an economic activity that is planned to be phased out entirely and its decline has been over many years. The labour demand contraction in this sector will particularly affect countries and regions that have always been very dependent on these sources. Employment in coal mining has always been a small share of total employment in the European Member States and has declined over the years: from 0.17 per cent to 0.11 per cent of total employment between 2008 and 2021 (Vandeplas et al., 2022). Nonetheless, the employment shares in these activities at a regional level can still be important, due to the local concentration of extraction activities; therefore,

some regions are expected to be more affected by the green transition than others (JRC, 2021; CEDEFOP, 2021). In 2019, the European Commission launched the Just Transition Mechanism that “is a key tool to ensure that the transition towards a climate-neutral economy happens in a fair way, leaving no one behind”. It represents a financial support addressed to regions particularly affected by the transition, in order to alleviate the socio-economic consequences of the decarbonisation process, and to reduce the social and territorial disparities, not to worsen them.

The green transition is expected to create jobs in the electricity sector, due to the electrification of the economy and the shift to clean and renewable energies, such as hydro, biomass, solar thermal, solar photovoltaic, tide and wave, and geothermal (ILO, 2018). Water supply and waste management are expected to benefit from circular economy policies and create new jobs (CEDEFOP, 2021). Employment is to be created in sustainable transport, namely in the sector’s production and service supply, such as the promotion of quality public transport, sustainable mobility plans and improvement in vehicle efficiency (ILO, 2012). In accordance with this, we classify as ‘green’ sectors, or as sectors with high ‘greening’ potential i.e. sectors where ‘green’ jobs are or have the potential to be a relevant share of total employment in the sector: Electricity, gas, steam and air conditioning supply (NACE D); Water supply; sewerage, waste management and remediation activities (NACE E); Transportation and storage (NACE H). ‘Green’ jobs are to be found also in sustainable and organic agriculture, even if the share is small relatively to total employment in agriculture. For the purpose of this study, we use a specific classification of sectors in relation to green and brown employment. Nonetheless, we are aware of possible limitations of this approach, and that the use of a rigid classification could exclude important aspects, as ‘green’ and ‘brown’ jobs could cut across different sectors, also some that are not taken into account in this study.

2.2 Remote Working Practices and the Use of Co-Working Spaces

Another labour market trend underdeveloped in the literature that could potentially create and boost youth employment opportunities is the increase in remote working practices and the use of co-working spaces. Remote working has notably increased during the COVID-19 pandemic, as a result of mandatory temporarily workplaces closures given public health measures. According to EU-LFS data, in 2021 around 22 per cent of employees were usually or sometime working from home, while almost 40 per cent of self-employed were doing so (Eurofound, 2022). Coworking spaces are flexible physical locations where individuals, or companies, can work alongside other professionals (Redmond et al. 2023, forthcoming).

Coworking spaces can provide young people training for digital and entrepreneurial skills (Avdikos et al., 2021), or just a place where they can socially interact and build relationships. For the purpose of this study, we identified the sectors where co-working practices are most commonly used. Economic sectors where there is prevalence of co-working practices are those with a large share of jobs that can be performed remotely, where usually much work is office-based and reliant on intensive networked computer use (Fana et al., 2020). Moreover, they can be sectors where the collaborative element can be effective in fostering creativity and business innovation (Avdikos et al., 2022; Papageorgiou et al., 2022)). Information technology jobs are very suitable for telework and can be easily carried out in co-working spaces; financial activities companies can benefit from finding space opportunities where

they can meet their clients; also, professionals (for instance, in public relations, marketing or sales) as well as freelancers or start-up entrepreneurs can use co-working practices (Regional co-working analysis, 2020). Therefore, the sectors identified and classified as 'co-working' sectors are the followings: Information and communication (NACE J); Professional, scientific and technical activities (NACE M); Financial and insurance activities (NACE K); Administrative and support service activities (NACE N). In the present study, we try to expand the research on the association between co-working practices and youth employment rates.

2.3 Regional Framework

As already mentioned, this study focuses on four selected European countries, Italy, Spain, Greece and Ireland, and aims at examining the incidence of youth employment and its evolution over the years; we use a fixed effect model panel estimation approach to identify the drivers that have determined variations in youth employment rates over time. The approach we use is cross-regional: we consider regional employment shares as well as several independent variables extracted at regional level.

A similar approach in a panel-setting framework using regional level data was used by Di Cataldo et al. (2017) to analyse the determinants of employment creation and long-term unemployment across European regions over the 1999-2010 period, with a particular focus on factors such as transport infrastructure, innovation, human capital, and government quality. De Noni et al. (2018) used a similar approach to investigate which factors drive the innovation performances of less innovative European regions (operationalised as the regional cumulative number of patents per million inhabitants) when it comes to reduce the gap with highly innovative regions. By using regional data with a similar panel regression model, Majchrowska et al. (2012) explore the determinants of employment at NUTS2 level in Poland over the period 1999-2010. A, and, among other factors, they analyse the impact on employment of minimum wage- defined as the minimum to average wage ratio in a region.

One of the critical elements of the present study has been the identification of regions particularly related to the relevant labour market trends identified: the green economy and the decarbonisation process (where it is possible to geographically identify green and brown jobs) and co-working practices. Several regions have been identified by the EU Commission among those territories that will be particularly affected by the decarbonisation process and are part of the Just Transition Mechanism: specific sectors in these regions are considered to be particularly exposed to the consequences of the green transition and are to receive financial support through the Just Transition Fund (JTF), in order to achieve the decarbonisation of the area.

2.3.1 Just Transition Mechanism by Regions

In Spain, the regions under the umbrella of The Just Transition Mechanism are the six Autonomous Communities: Galicia (ES11), Asturias (ES12), Aragón (ES24), Castilla y León (ES41), the Balearic Islands (ES53) and Andalusia (ES61). In some of these areas the coal mining industry and petrol based heavy industry have been prevalent for years until the end of the 20th century, but over the last few years the regions implemented strategies for the energy transition, consisting of a number of measures such as reduction of oil dependency

and investment in renewable energies, and also policies to reallocate ex-miners into other sectors through re-training. The EU Commission estimates that through the European Union's Just Transition Fund (EU JTF) 6,000 jobs will be created in these territories, and over 1,900 companies, mostly SMEs, will receive support.

In Greece, the regions most affected by the economic and social impacts of the energy transition, mainly regarding the expected loss of jobs in fossil fuel production and use, and covered by the Just Transition Mechanism are North Aegean (EL41), South Aegean (EL42), Crete (EL43), Western Macedonia (EL53) and the Peloponnese (EL65) (Just Transition Program, 2021; SDAM, 2021).

In Italy, the areas most exposed to the consequences of the transition to a carbon-neutral economy (those still dependent on fossil fuels including coal, peat and bituminous shale) are the areas of the Province of Taranto (Puglia-ITF4) and Sulcis Iglesiente (Sardegna-ITG2). They will receive financial aid from the Just Transition Fund. Moreover, the Fund will support the retraining of thousands of workers for green jobs related to the clean energy transition and circular economy, apart from supporting the construction of infrastructure for renewable energies (EU Commission, 2022). Italy has made the commitment to close by 2025 all coal-fired thermal power plants, which account for less than 10 percent of national electricity production. Nowadays seven regions are already 'coal-free', as they have zeroed out coal consumption recently: Valle d'Aosta (ITC2), Abruzzo (ITF1), Molise (ITF2), Campania (ITF3), Basilicata (ITF5), Trentino-Alto Adige (ITH1 and ITH2), Emilia Romagna (ITH5) and Marche (ITI3) (Italy for Climate, 2021). In Ireland, the Midlands region has been identified as the area most negatively affected by the closure of peat-reliant power stations; therefore, it will be the target of the EU JTF.

For the purpose of this study, we also identify the regions where co-working spaces are most prevalent. This work has been informed by the relevant literature and by CoWork4Youth partners' expertise based in their home countries. Moreover, Avdikos et al. (forthcoming) identified for each region in each country the number of co-working spaces (CWS). As a robustness test of what was initially identified by the partners, we calculated the CWS average at country level and compared the number of CWS by region to the national CWS average. Whenever the regional share is at least 20 per cent above the country average, the region is considered a to have high-prevalence of co-working spaces.

In summary, for Italy, coworking spaces are mostly located in regions with large cities: Piemonte (ITC1), Lombardia (ITC4), Veneto (ITH3), Emilia-Romagna (ITH5) Toscana (ITI1), and Lazio (ITI4). Our calculations are in line with Italian Coworking Survey 2021 main findings. In Greece, co-working spaces are mostly prevalent in Attica (EL30) and Central Macedonia (EL52). In Spain, the regions with most prevalence of co-working spaces are Galicia (ES11), Comunidad de Madrid (ES30), Cataluña (ES51), Comunitat Valenciana (ES52) and Andalucía (ES61). In Ireland, almost all the counties have a large number of co-working spaces: in 2020, the three Regional Assemblies of Ireland identified a total of 67 co-working hubs (both privately and publicly owned) in the Northern and Western region; 158 co-working hubs in the Eastern and Midland region; 105 co-working hubs in the Southern region (Regional co-working analysis, 2020).

3. Data and Methodology

To date, most research on youth employment has used country specific cross-sectional or panel datasets and has focused on identifying the individual or firm-level characteristics associated with youth employment and/or the impact of youth employment on outcomes such as wages and job satisfaction. These micro-level studies cannot provide an indication of extent to which youth employment is driven by labour demand, labour supply or other macroeconomic factors. Since no reliable time-series data on youth employment exist to allow a systematic cross-region comparison across time, the data development aspect is a key contribution of the current study. The data used in this study is the quarterly anonymised country level files of the European Union Labour Force Study (EU-LFS) for the period Q2 2008 up to Q2 2021. The EU-LFS is a large household sample survey providing quarterly results on labour participation of people aged (at least) 15 and also on people outside the labour force. It is conducted in all EU-27 Member States, four candidate countries, and three European Free Trade Association (EFTA). The Labour Force Surveys are conducted by the national statistical institutes across Europe and then centrally processed by Eurostat.

We use the country level micro data to create a regional macro level data panel: for each variable extracted for each region, almost 60 quarterly observations are generated. We employ the NUTS 2021 classification at NUTS 2 level, and for Italy, Spain and Greece 53 regions are the data identifiers. However, data for Ireland must be collapsed into one region due to numerous changes to regional classification: previously the NUTS 2 regions were two separate regions and they were changed into three separate regions in 2018. However, problematically, the NUTS2 regional borders have not remained the same i.e., some geographical areas have been moved to from one NUTS2 region to another one, making the comparison over time impossible. For each region, in each quarter, for each extracted variable, the observations reflect the average share of that variable. The data allows us to examine the regional employment trends across 54 regions in the four EU countries under study.

3.1 Variables Construction

Our dependent variable is youth employment, and it is defined for each region in each quarter as the percentage of young people aged 15 to 29 in the labour force reporting to be in employment. We extract several independent variables that are considered to reflect demand and supply-side factors that may potentially drive youth employment. On the labour supply side, we consider the overall labour market participation rate, the share of migrants in the labour force as well as part-time workers and the share of women in the labour force. On the demand side, we take into account business cycle effects by the inclusion of per capita GDP at the regional level, sourced from Eurostat as a data source external to the EU-LFS. As a main focus of this study, we extract the share of employment in several sectors related to the process of transition to a carbon-neutral economy, meaning sectors where 'green' jobs are predominately located, and sectors where most 'brown' jobs are predominately found; we

also extract the share of employment in sectors where co-working practices are most common. We employ the NACE Rev.2 classification, which is the ‘statistical classification of economic activities in the European Community’, provided by Eurostat. The relevant sectors have been identified through different steps: (i) informed by the literature presented in the previous section, (ii) informed by the Cowork4YOUTH consortium partners, (iii) presented as part of the validation process to an audience of experts at the conference ‘Employment Opportunities for Young People’, held at the ESRI in May 2023. Table 3.1 shows the sectors classification.

Table 3.1 Classification of Sectors

‘Green’ sectors	‘Brown’ sectors	‘Co-Work’ sectors
NACE D: Electricity, gas, steam and air conditioning supply	NACE B: Mining and quarrying	NACE J: Information and communication
NACE E: Water supply; sewerage, waste management and remediation activities		NACE K: Financial and insurance activities
NACE H: Transportation and storage		NACE M: Professional, scientific and technical activities
		NACE N: Administrative and support service activities

As factors both relative to labour demand and supply, we consider the share of tertiary educated people, that is people holding a bachelor’s or master’s degree or PhD. We also add a variable to reflect the degree of symmetry between labour demand and supply, that is the ratio of workers employed in high-skilled professional occupations to workers in middle and low-skilled occupations. This can also be considered a measure of job polarisation in the employment structure, which is generally associated with a hollowing out of mid-skilled, mid-paid jobs, while high and low-skilled jobs remain stable or grow over time.

Finally, we classify the NUTS2 regions in three categories in order to expand further on the spatial element of the analysis: regions that are the most exposed to the decarbonisation process and the transition to a carbon-neutral economy labelled as ‘Decarbonisation Regions’; regions where there is a relevant concentration of co-working spaces labelled as ‘Co-Work Regions’ ; other regions related neither to the decarbonisation process nor to prevalence of co-working spaces labelled as ‘Other Regions’. The classification process has been the same as the one adopted per sectors. The maps in Figure 1 shows decarbonisation regions for Italy, Spain and Greece. The detailed list of region names is shown in Appendix Table A.

Lastly, in order to check the robustness of our findings in relation to the determinants models, we further analyse regional classification splits: (i) all regions, (ii) regions where co-working spaces are dominant, (iii) regions most affected by decarbonisation, (iv) other regions.

3.2 Methodology

One of the aims of the present study is to examine the extent to which youth employment rates have been either converging or diverging across the NUTS2 regions from 2008 to 2021. To do this, we employ a Barro regression model,

$$\frac{\ln y(t) - \ln y(0)}{t} = \beta_0 + \beta_1 \ln y(0) + \varepsilon$$

which examines the relationship between the growth rate of youth employment, $\frac{\ln y(t) - \ln y(0)}{t}$, and its initial level, $\ln y(0)$. If the estimated coefficient of the regressor is negative, it implies convergence across regions: in this case, regions whose initial levels of youth employment are lower, tend to have higher growth rates over time and catch-up faster with regions with higher initial level of employment. On the other hand, a positive coefficient implies divergence in youth employment rates across regions. We begin and end our analysis in Q2 2008 and Q2 2021, respectively, to ensure an accurate and comparable assessment of the employment rate dynamics. Using the same initial and final quarter allows us to analyse trends, and abstract from seasonal or structural changes in employment rates over time. Using a chow-test, we identify that a structural break in the data occurs in Q2 2014 (Chow, 1960).² Specifically, Q2 2014 represents the moment average youth employment rates begin trending upwards following a steady decline from 2008 Q2.³ Thus, the period of analysis is split into two distinct periods, namely, pre-2014 (period where employment rates steadily fall) and post-2014 (period where employment rates steadily rose) and perform Barro regressions for both periods.

Subsequently, we estimate the determinants of youth employment rates. We begin by examining the general framework for panel estimation,

$$y_{it} = \beta_0 + \beta_j X_{ijt} + \alpha_i + \varepsilon_{it}$$

where y_{it} is the dependent variable observed for region i at time t , β_0 is a constant term, β_j is a vector of coefficients associated with the matrix of j independent variables, X_{ijt} . α_i is the

² We implement a Chow-test, to investigate the presence of a structural break in the youth employment rate over this period of analysis. The Chow-test allows us to assess whether the coefficients of two distinct groups are significantly different. Formally, the Chow-test calculates an F-statistic based on the differences in the sum of squared residuals between the combined model and the separate models for each group. This F-statistic is compared against a critical value from the F-distribution to assess whether the differences in coefficients are statistically significant. In our context, we aimed to ascertain whether there is a notable change in the relationship between time and the youth employment rate, potentially signifying a structural shift. For more information, see Chow (1960).

³ In our analysis, we selected Q2 2014 (and surrounding quarters for robustness checks) as the potential breakpoint, guided by a visual inspection of the data showing a potential shift in the trend around that time (this is shown clearly in Figure 4). Upon applying the Chow-test, an F-statistic of 21.81 was obtained. To interpret this result, we computed the right-tailed cumulative probability for an F-distribution with 2 and 53 degrees of freedom (reflecting the degrees of freedom in the numerator and denominator of the F-statistic). This computation yielded an exceedingly low probability of approximately 1.229×10^{-7} . In essence, this probability represents the likelihood of observing an F-statistic as extreme as 21.81 or greater under the assumption that no structural break exists (null hypothesis). The exceptionally low p-value from the probability calculation strongly rejects the null hypothesis, providing robust evidence that the observed structural break around the second quarter of 2014 in the youth employment rate data is not a random occurrence. This substantiates our conclusion of a significant change in the relationship between time and youth employment, allowing us to proceed with pre- and post-break Barro regression analyses as a follow-up analytical strategy.

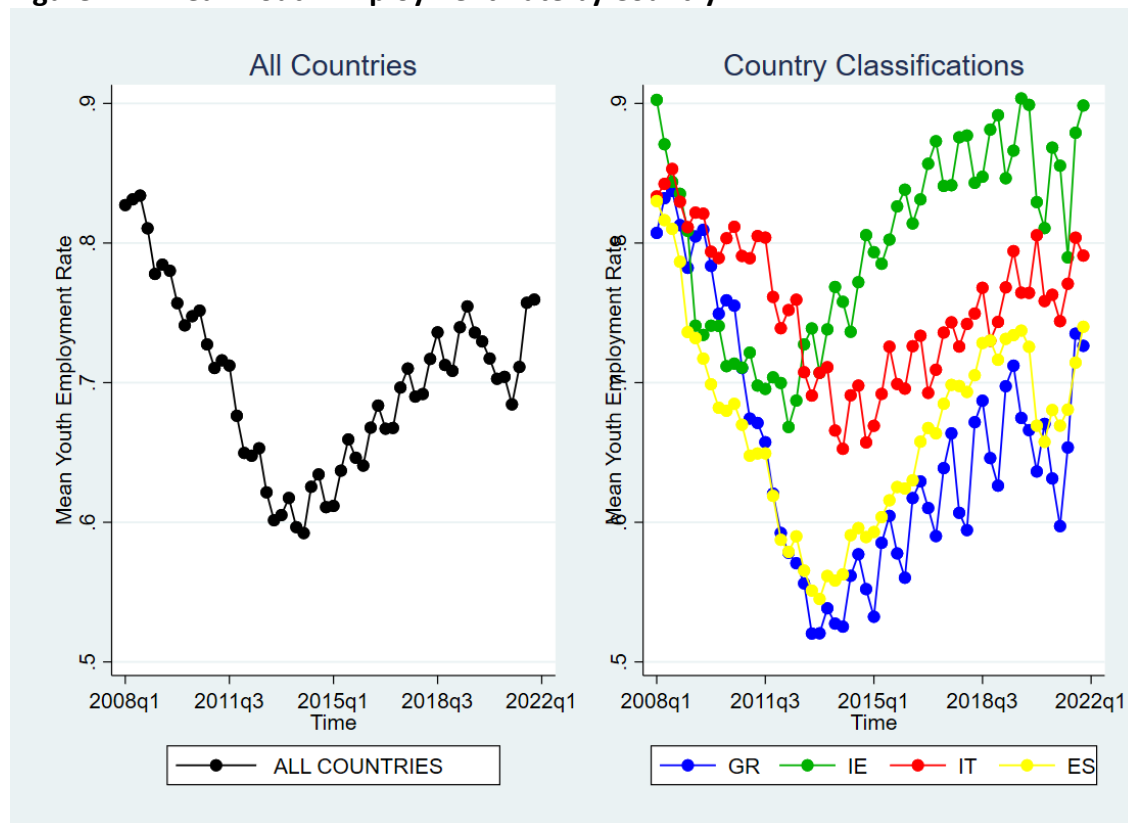
time invariant, region-specific, unobservable characteristic and ε_{it} the error term. In terms of the specific panel modeling approach adopted, we use a fixed effect estimator that allows us to model the determinants of youth employment while controlling for time invariant regional level fixed effects.⁴

4. Results

4.1 Youth Employment Trends

The average youth employment rate over time by country is shown in Figure 4.1. Youth employment is defined as the percentage of young people aged 15 to 29 in the labour force reporting to be in employment. Following the great recession, youth employment fell in all the countries, and the most severe declining rates have occurred in Greece and Spain, followed by Ireland and Italy. After 2014, youth employment recovered and increased at a faster rate in Ireland, followed by Italy, Spain and Greece. During the COVID-19 pandemic the rates fell off again, most severely in Greece, but the trends resumed recovery in 2021.

Figure 4.1: Mean Youth Employment Rate by Country

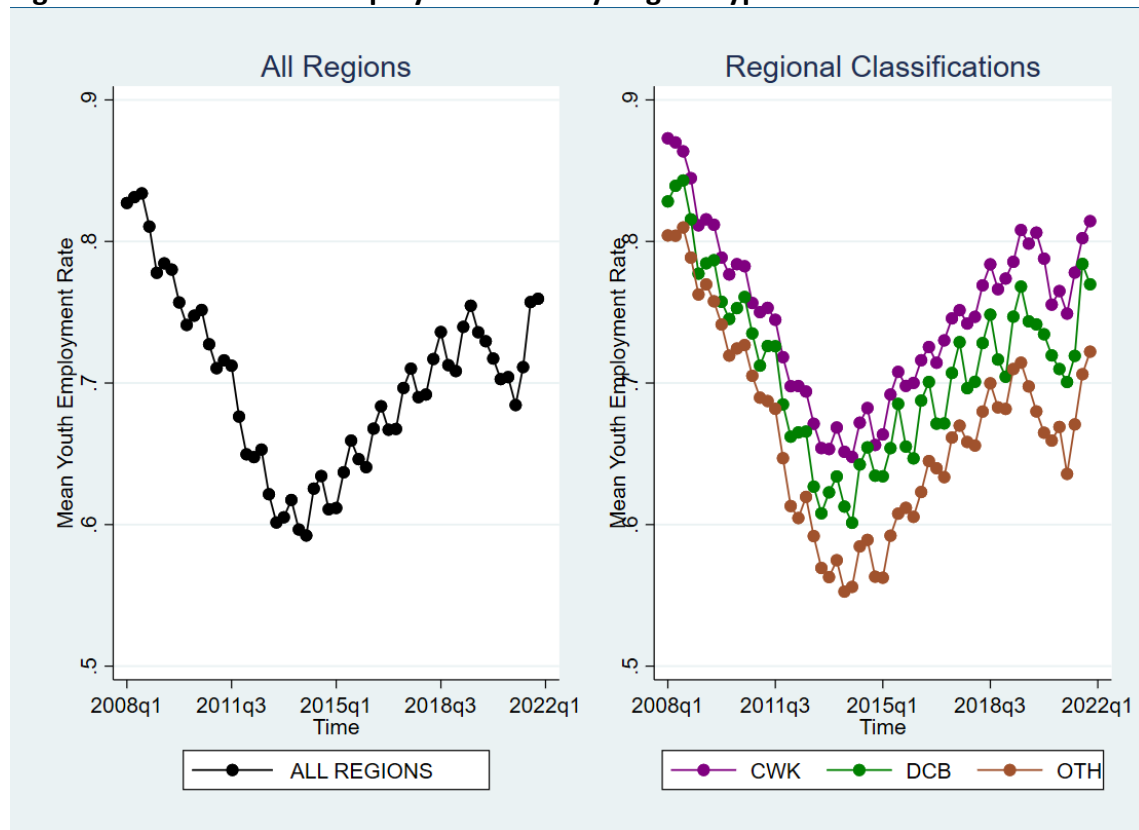


Source: EU-LFS data (authors' elaboration)

⁴ The fixed effect estimator was chosen after conducting a Hausman (1978) specification test to detect violations of the random-effects modelling assumption that the explanatory variables are orthogonal to the unit effects. A significant test result was taken as evidence of correlation between the explanatory variables and the unit effects, therefore, implying that the random-effects model should be rejected in favour of the fixed-effects model. In conducting the test, as recommended for linear regression comparisons, we specified that the two covariance matrices used in the test be based on a common estimate of disturbance variance (σ^2).

Figure 4.2 plots the average youth employment rate over time for all the regions in the sample and then, separately, for the different region types ('Decarbonisation', 'CoWorking' and 'Other'). Youth employment decreased across all the regions between 2008 and 2014, from around 80 per cent to 60 per cent, as a long-term consequence of the great recession in 2008. Since 2014, it has increased over time, before falling off again in 2020 because of the COVID-19 pandemic recession. During 2021, it started to rise again, reaching around 75 per cent. Next, we further investigate by grouping the different regions as classified within this report. We observe that the trend is the same as the one described above, but youth employment has always been highest in regions with prevalence of co-working spaces (more urban settings), followed by regions particularly related to the decarbonisation process (more rural settings) and then the regions classified as 'other'.

Figure 4.2: Mean Youth Employment Rate by Region Type



Source: EU-LFS data (authors' elaboration)

4.2 Barro Regression Results

As previously stated, for the purpose of this study, we want to investigate if youth employment rates have converged, or diverged, over the period across regions. Divergence encompasses a scenario whereby the gap between regions with the highest and lowest rates of employment is expanding over time while convergence indicates the opposite. A positive statistically significant coefficient from the Barro regression implies divergence while a negative coefficient suggests convergence. We investigate separately the effects by different region types, namely, co-working, decarbonisation, and other regions and we also test for divergence/convergence before and after 2014. We further examine the dynamics between gender in all regions and across regional classifications.

The resulting estimates from the Barro regressions for total youth employment are presented in Table 4.1. When considering the entire period, no statistically significant convergence or divergence is found across all regions. There is, however, evidence of divergence in areas classified as ‘co-working’, at a rate of 7 per cent per year. When we split the data into pre- and post-2014, two clear results are found. From 2008 to 2014, there was ongoing divergence across all regions: youth employment rates diverged by roughly 10 per cent per year, and this was mainly driven by the co-working regions, where the gap between the highest and the lowest rates of employment was increasing by 25 per cent per year. This indicates that these were the regions most affected during the period of volatility that followed the Great Recession, when we saw a general drop in youth employment rates (shown in Figures 4.1 and 4.2). Conversely, after 2014, ongoing convergence is found across all regions, with youth employment rates converging at a rate of 5 per cent per year, therefore at a slower pace compared to the diverging phase (pre-2014). All regions reported the same statistically significant trend, but the decarbonisation regions were catching up at a faster rate than the others.

Table 4.1: Barro Regressions Results by Regional Classifications

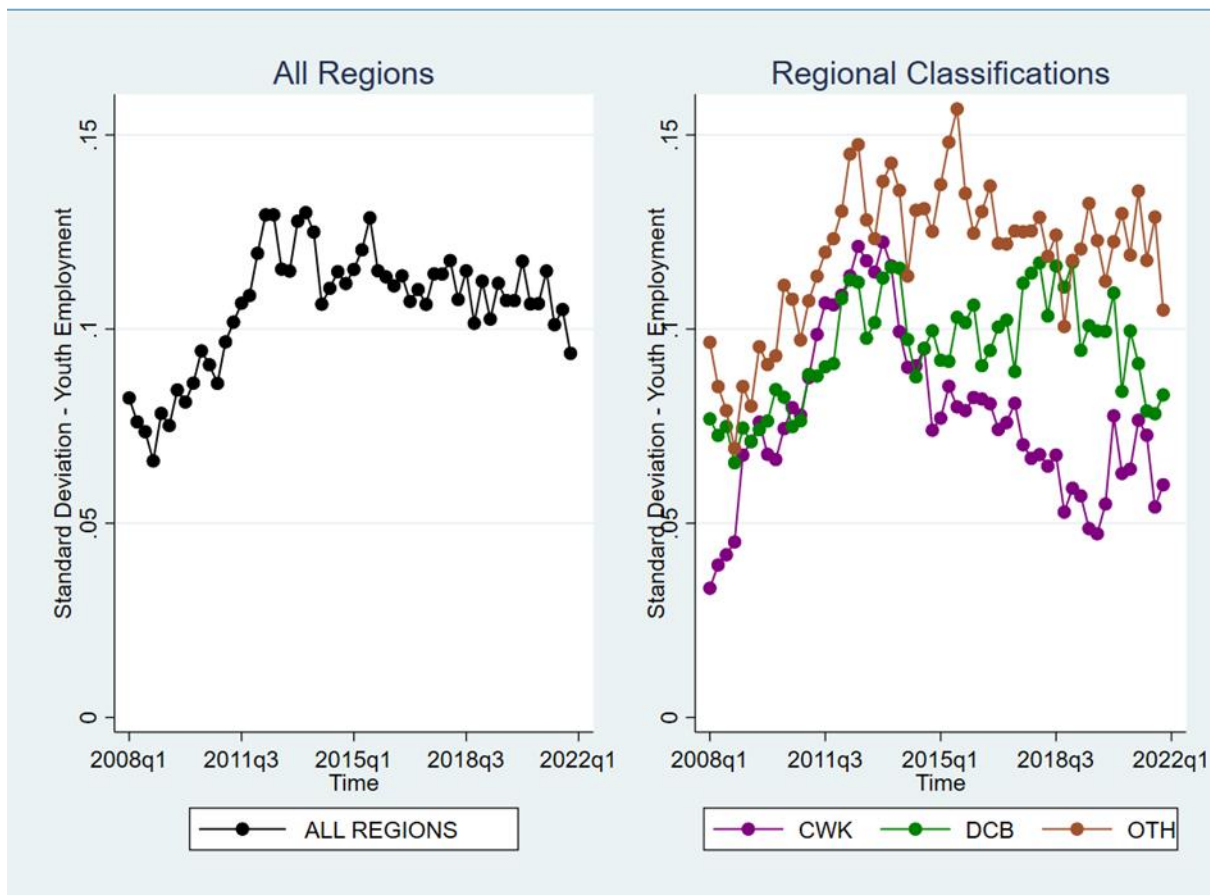
Youth Employment Shares	All Regions Coefficients	CoWork Regions Coefficients	Decarbon. Regions Coefficients	Other Regions Coefficients
Total Sample Period: Q2 2008 – Q2 2021	0.012 (0.011)	0.068*** (0.013)	-0.036* (0.019)	0.028* (0.016)
Pre-2014 Q2 Period: Q2 2008 – Q2 2014	0.100*** (0.035)	0.253*** (0.062)	0.023 (0.040)	0.081 (0.048)
Post-2014 Q2 Period: Q2 2014 – Q2 2021	-0.053*** (0.011)	-0.049*** (0.009)	-0.079*** (0.021)	-0.050** (0.018)

Notes: The regions in each classification are documented in the Appendix and the numbers are as follows: 54 regions in all; 13 regions in ‘CoWork’; 20 regions in ‘Decarbonisation’; and 23 regions in ‘Other’.

Source: EU-LFS (authors’ calculations)

As a robustness check for our findings, we plot the standard deviation of youth employment rates across regions: divergence would be consistent with increasing cross-regions dispersion over time, while convergence would be consistent with falling dispersion. Our results are confirmed: Figure 4.3 (left panel) shows increasing standard deviation across regions from 2008 to 2014 and decreasing standard deviation afterwards. Divergence rates appear similar across the different region groups, while convergence seems strongest within co-working regions and decarbonisation regions, and more modest within other regions (see Figure 4.3, right panel).

Figure 4.3: Standard Deviation of Youth Employment Rate by Region Type



Source: EU-LFS data (authors' elaboration)

4.3 Determinants of Youth Employment

In this section, we present the results of several specifications of the fixed effects model estimated to identify the determinants of youth employment over time. We present the descriptive statistics of the variables used in our model in Appendix D. Table 4.2 below estimates the determinants of youth employment over the entire time period (2008-2021) and separately pre-2014 Q2 and post-2014 Q2. For the purpose of this study, the regressors of interest are the dummy variables that identify the sectors we classified as 'co-working' sectors, 'green' sectors and 'brown' sectors. We also provide the results of models with a more detailed sectoral breakdown, i.e. we use individual dummies for the individual sectors included within our group classifications.

First, examining the impact of brown sector employment share, we observe that it is negatively associated with youth employment, particularly in the period post-2014, with no evidence of impacts pre-2014. Every one per cent increase in the share of individuals employed in the brown sector corresponds on average to a decrease of 1.52 per cent in the share of youth employment. This is an important result, because as the world is going through a decarbonisation process and a transition to a carbon-neutral economy, the share of people

employed in brown sectors is certainly decreasing and therefore this can have a positive impact on youth employment.

Second, when it comes to the green sectors, over the full sample, we observe that youth employment is negatively impacted pre-2014 when the labour market experienced a growth in the share of individuals employed in these sectors within all regions. That is, a one per cent increase in the share of individuals employed in the green sector is associated with a decrease in the youth employment rate by approximately 0.61 per cent. The sectors driving these results (pre-2014) are the electricity and transportation sectors (at a ten per cent significance level). However, we do not observe any evidence of impacts related to the share of individuals employed in the green sectors during the post-2014 recovery period. It may possibly be the case that 'green jobs' may require higher or more specific training that require more time and experience, given the more advanced technological processes involved, and therefore, it may take longer for youths to find jobs in these areas. As the 'green' economy phenomenon is relatively new, it may be still soon to identify any significant impact on youth employment.

Third, youth employment is negatively impacted when the share of individuals working in sectors classified as co-working increases. Specifically, a one per cent increase in employment in these sectors is associated with a 0.3 per cent reduction in the share of young people employed, within regions. The impact is driven by the period preceding 2014 and originates from the professional and administrative services sectors (at a ten per cent significance level). While for the co-working sectors at the overall level there is no evidence of impact post-2014, for the financial sector the marginal effect is negative and statistically significant. Therefore, a one per cent increase in employment share in the financial sector is associated with a decrease in youth employment on average by 1.17 per cent. Young people have historically been more likely to find work in low-wage, low-skilled jobs where there is less competition from older workers, predominately working in wholesale and retail, accommodation and food, with smaller relative shares working in these sectors classified as 'co-work' (O'Reilly et al, 2018).

Lastly, the data highlights several notable trends regarding other control variables. Over the entire period of time, we observe that tertiary education and GDP per capita positively impacts youth employment. Conversely, the share of migrants in the labour force and the ratio of high-to-low skilled occupations, a measurement for job polarisation, negatively impacts youth employment. To a lesser extent, the participation rate positively impacts youth employment while the share of part-time employment and the share of female labour force participation negatively impacts youth employment rates over the entire time period (significant at the 10 per cent level).

When splitting the sample in pre- and post-2014, the impact of the share of migrants in the labour force on youth employment is determined entirely pre-2014, with its effect disappearing post-2014. While the ratio of high-to-low skilled occupations and GDP per capita strongly affect youth employment pre-2014, the effects are significant only at a 10 per cent level in the post-2014. However surprising the drop off of significance in terms of GDP per capita may appear, the impact of the COVID-19 pandemic may partly explain this result. The effects of tertiary education on youth employment are entirely driven by the period post-

2014. Female and part-time youth employment effects are entirely observed in the pre-2014 period, while participation rate effects mainly post-2014.

Table 4.2: Fixed Effects Results: Determinants of Youth Employment across NUTS2 Level Regions in Greece, Italy, Ireland & Spain (2008-2021; pre-2014 Q2; post-2014 Q2; sectoral splits)

VARIABLES	ALL	ALL (Sectoral splits)	PRE- 2014	PRE-2014 (Sectoral splits)	POST- 2014	POST-2014 (Sectoral splits)
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Lagged Youth Employment	0.729*** (0.035)	0.723*** (0.037)	0.689*** (0.034)	0.684*** (0.031)	0.550*** (0.041)	0.540*** (0.040)
Participation rate	0.299* (0.156)	0.316** (0.156)	0.212 (0.131)	0.224* (0.130)	0.471** (0.201)	0.480** (0.202)
Share of migrants in the labour force	-0.242*** (0.090)	-0.220** (0.093)	-0.383*** (0.071)	-0.378*** (0.066)	0.120 (0.227)	0.130 (0.227)
Share of females in labour force	-0.188* (0.095)	-0.195** (0.097)	-0.330*** (0.106)	-0.313*** (0.097)	-0.036 (0.126)	-0.046 (0.128)
Share of part-time workers	-0.246* (0.125)	-0.244* (0.126)	-0.296** (0.126)	-0.294** (0.118)	0.160 (0.225)	0.138 (0.217)
Tertiary education	0.644*** (0.124)	0.619*** (0.099)	0.364 (0.299)	0.354 (0.271)	0.970*** (0.186)	0.912*** (0.172)
Ratio of High-Low SOC	-0.066*** (0.021)	-0.070*** (0.020)	-0.065*** (0.019)	-0.068*** (0.022)	-0.045* (0.026)	-0.047* (0.026)
lnGDP Per Capita	0.115*** (0.030)	0.114*** (0.030)	0.248*** (0.040)	0.250*** (0.036)	0.093* (0.050)	0.101* (0.052)
Green sectors	-0.243* (0.140)		-0.609*** (0.214)		0.131 (0.167)	
Electricity and gas		-0.418 (0.275)		-1.125* (0.604)		-0.508 (0.445)
Water/waste management		-0.920** (0.420)		-0.599 (0.412)		-0.414 (0.741)
Transportation		-0.044 (0.175)		-0.525* (0.272)		0.354 (0.256)
Brown Sectors	-1.522*** (0.497)		-0.620 (0.818)		-1.390** (0.528)	
Mining		-1.561*** (0.474)		-0.658 (0.783)		-1.527*** (0.425)
Co-Working Sectors	-0.300*** (0.095)		-0.324*** (0.104)		-0.201* (0.111)	
Information/Communications		-0.153 (0.259)		0.129 (0.240)		-0.295 (0.333)
Financial Services		-0.462 (0.289)		0.024 (0.309)		-1.175*** (0.431)

Professional Services		-0.088		-0.399*		0.224
		(0.155)		(0.218)		(0.184)
Administrative Services		-0.460***		-0.486*		-0.131
		(0.171)		(0.254)		(0.198)
Q2 Seasonal Dummy	0.022***	0.022***	0.022***	0.022***	0.019***	0.019***
	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Q3 Seasonal Dummy	0.016***	0.017***	0.019***	0.019***	0.016***	0.016***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Q4 Seasonal Dummy	-0.006**	-0.006**	-0.004	-0.003	-0.004	-0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Constant	-1.007***	-1.002***	-2.109***	-2.139***	-1.058**	-1.121**
	(0.284)	(0.283)	(0.361)	(0.347)	(0.450)	(0.463)
Observations	2,970	2,970	1,350	1,350	1,620	1,620
R-squared	0.741	0.742	0.869	0.870	0.524	0.530
Number of regions	54	54	54	54	54	54
Prob > F	0	0	0	0	0	0

Notes: Robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: EU-LFS (authors' calculations)

Table 4.2 revealed that youth employment was unaffected by changes in overall employment in the green and co-working sectors post-2014 while the brown sectors did. Table 4.3 looks at the post-2014 period by sectoral breakdown. We look at the post-2014 period to understand the magnitude of the effects the variables of interest had on youth employment during this most recent period. Specifically, to ascertain if the 'green', 'brown', and 'co-working' sectors findings from Table 5 remain consistent across our regional classification. To reemphasize, our classification of 'decarbonisation' regions includes predominantly rural settings, while 'co-working regions' are predominantly urban settings, and 'other' regions falling somewhere between the other two. Column 1 shows the results from the fixed effects models in all regions while column 2 presents the sectoral breakdown. Columns 3 to 8 illustrate the findings for the determinants of youth employment in the classified regions. Specifically, each even numbered column represents the sectoral breakdown.

First, examining the impact of brown sector employment share, we observe that the negative impact already seen in Table 4.2 is driven solely by the areas classified as being affected by decarbonisation (column 3). Second, post-2014 we see no evidence that the share of individuals employed in green sectors impacts youth employment across all regions or the region types as we classify them. However, we observe a negative impact of the employment share in 'electricity and gas' sector on youth employment in the regions classified as 'other' (to the magnitude of 1.7 per cent). Third, over the entire sample period we see evidence of a reduction in the share of youth employment following an increase in the share of individuals employed in the co-working sectors. This result is driven by the 'decarbonisation' regions, by the financial and information and communications sector in particular. For instance, a one per cent increase in the share of individuals employed in the financial sector in the regions classified as being affected by decarbonisation, is followed by a fall in the youth employment rate by approximately 1.6 per cent. Regarding the information and communications sector, the data indicates a fall in youth employment of 0.9 per cent following a unitary rise in its

employment share. Further the financial services sector also negatively impacts youth employment in the co-working regions. That is, a unit increase in the share of people working in the financial sectors reduces youth employment by approximately 1.1 per cent.

In the post-2014 period, the participation rate, the share of people with a tertiary education level and GDP per capita all positively impacted youth employment rates across all regions. While tertiary education is consistently positive and statistically significant across all the regional classifications, the participation rate is statistically significant in the 'co-working' regions and those classified as 'others', whereas youth employment in the 'decarbonisation' regions is only relevantly affected by the GDP per capita. Lastly, findings from Table 4.2 showed that the share of migrants in the labour force did not affect youth employment across all regions. Nevertheless, there is evidence of a negative impact on youth employment emerging from the 'co-working' regions, at only a 10 per cent level of significance. Since 'co-working' regions represent only the 25 per cent of all the regions, it is likely that the coefficient has been averaged out, due to the insignificance found in all the other regions. Similarly, we observed that the ratio of high to low skilled occupations is significantly and negatively affecting youth employment strongly and purely in the 'co-working' regions. Although the fact that, as previously mentioned, the regions classified as 'co-working' represent one quarter of all the regions, the negative impact related to the measurement for job polarisation still appears across all regions, but at a 10 per cent level of significance.

**Table 4.3: Fixed Effects Results: Determinants of Youth Employment across NUTS2 Level Regions in Greece, Italy, Ireland & Spain
(Post-2014 Q2; Regional Classification; Sectoral Splits)**

VARIABLES	All regions	All regions (sectoral splits)	Decarbon. regions	Decarbon. regions (Sectoral splits)	Co-Work regions	Co-Work regions (Sectoral splits)	Other regions	Other regions (Sectorial splits)
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Lagged Youth Employment	0.553*** (0.042)	0.543*** (0.041)	0.476*** (0.063)	0.475*** (0.058)	0.706*** (0.041)	0.669*** (0.035)	0.568*** (0.055)	0.555*** (0.058)
Participation rate	0.443** (0.202)	0.451** (0.202)	0.198 (0.230)	0.236 (0.231)	0.462*** (0.143)	0.472*** (0.138)	0.632** (0.280)	0.636** (0.281)
Share of migrants in LF	0.116 (0.222)	0.123 (0.224)	-0.189 (0.310)	-0.139 (0.300)	-0.329* (0.169)	-0.323* (0.156)	0.434 (0.282)	0.425 (0.255)
Share of females in LF	-0.033 (0.127)	-0.038 (0.128)	-0.142 (0.270)	-0.159 (0.296)	0.118 (0.223)	0.132 (0.200)	-0.080 (0.194)	-0.049 (0.180)
Share of part-time workers	0.154 (0.223)	0.131 (0.215)	-0.186 (0.250)	-0.208 (0.272)	-0.074 (0.188)	-0.108 (0.192)	0.536** (0.235)	0.491** (0.207)
Tertiary education	0.963*** (0.181)	0.908*** (0.167)	1.205*** (0.398)	1.089*** (0.369)	0.972*** (0.212)	0.923*** (0.189)	0.831*** (0.163)	0.835*** (0.152)
Ratio of High-Low SOC	-0.044* (0.025)	-0.046* (0.026)	-0.077 (0.066)	-0.077 (0.062)	-0.115*** (0.033)	-0.109*** (0.032)	-0.021 (0.018)	-0.018 (0.022)
lnGDP Per Capita	0.100** (0.047)	0.106** (0.049)	0.122** (0.051)	0.138** (0.051)	0.020 (0.029)	0.023 (0.029)	0.113* (0.059)	0.130* (0.068)
Green sectors	0.089 (0.160)		-0.268 (0.440)		0.258 (0.434)		0.196 (0.212)	
Electricity and gas		-0.505 (0.460)		0.048 (0.446)		-2.538* (1.279)		-1.743*** (0.465)
Water/waste management		-0.399 (0.674)		-1.577 (1.159)		0.446 (1.120)		0.437 (0.398)

5. Conclusions

Transitioning young people into productive work is a key labour market challenge and employment prospects for youth are a cause of concern for policymakers. This study focuses on four selected European countries, Italy, Spain, Greece, and Ireland to examine the incidence of youth employment, its evolution over time and the drivers that have determined variations in youth employment in a cross-regions comparison over time.

The aim of this research is to enable policy makers to identify, and target, factors that are responsive to change in order to help facilitate the further development of youth employment activities at a regional level in the EU. The data used in this study is the quarterly anonymised country level files of the European Union Labour Force Survey (EU-LFS) for the period covering Q2 2008 through Q2 2021. The study identifies emerging labour market trends and sectors that may have had positive or negative employment potential for young people over time. Furthermore we identify the NUTS2 level regions among our sample of selected countries that are to be considered as: (i) particularly affected by the green transition; and (ii) where co-working practices are most common.

Youth employment is defined as the percentage of young people aged 15 to 29 in the labour force reporting to be in employment. Our descriptive findings show that following the great recession, youth employment fell in all the countries, and the most severe declining rates have occurred in Greece and Spain, followed by Ireland and Italy. After 2014, youth employment started a slow recovery from the financial crisis, and it increased at a faster rate in Ireland, followed by Italy, Spain and Greece. During the COVID-19 pandemic the rates fell off again, most severely in Greece. As a result of the rapid recovery after the COVID-19 crisis, youth employment rates increased in 2021. Furthermore, youth employment has always been highest in NUTS2 regions with prevalence of co-working spaces (predominately urban settings), followed by regions particularly related to the decarbonisation process (predominately rural settings) and then our regions classified as 'other'.

The evidence points towards divergence across all regions in youth employment at a rate of 10 per cent per annum between 2008 and 2014, mainly driven by regions classified as 'co-work' regions. Conversely, the evidence shows convergence at a rate of 5 per cent per annum post-2014, with regions exhibiting the lowest incidences of youth employment in 2014 experiencing the highest growth rates in youth employment over the 2014 to 2021. Further analysis reveals that convergence appears strongest within the 'decarbonisation' regions and most modest among the regions classified as 'co-work' regions. Similar results emerged when male and female youth employment rates were assessed separately with some evidence that the gap between the highest and lowest rates of youth employment across all regions, post-2014, was decreasing at a lower rate for males than for females (approx. 7% per annum compared 13% per annum).

In terms of the factors that potentially drive regional variations in youth employment, a number of key variables emerged from our analysis. First, examining the impact of brown sector employment share, we observe that it is negatively associated with youth employment,

particularly in the period post-2014 (no evidence of impacts pre-2014). Every 1 per cent increase in the share of individuals employed in the brown sector corresponds on average to a decrease of 1.52 per cent in the share of youth employment. This is an important result, because as the world is going through a decarbonisation process and a transition to a carbon-neutral economy, the share of people employed in brown sectors is certainly decreasing.

Second, when it comes to the green sectors, over the full sample, we observe that youth employment is negatively impacted pre-2014 when the labour market experienced a growth in the share of individuals employed in these sectors within all regions. That is, a one per cent increase in the share of individuals employed in the green sector is associated with a decrease in the youth employment rate by approximately 0.61 per cent. However, we do not observe any evidence of impacts related to the share of individuals employed in the green sectors during the post-2014 recovery period. It may possibly be the case that 'green jobs' may require higher or more specific training that require more time/experience given the more advanced technological processes involved, and therefore, may take longer for youths to access jobs in these areas.

Third, youth employment is negatively impacted when the share of individuals working in sectors classified as co-working increases. Specifically, a 1 per cent increase in employment in these sectors is associated with a 0.3 per cent reduction in the share of young people employed within regions. The impact is driven by the period preceding 2014 and originates from the professional and administrative services sectors. While for the co-working sectors at the overall level there is no evidence of impact post-2014, for the financial sector the marginal effect is negative and statistically significant. Therefore, a one per cent increase in employment share in the financial sector is associated with a decrease in youth employment on average by 1.17 per cent.

Lastly, the data highlights several notable trends regarding other control variables. Over the entire period of time, we observe that tertiary education and GDP per capita positively impacts youth employment. Conversely, the share of migrants in the labour force and the ratio of high-to-low skilled occupations, a measurement for job polarisation, negatively impacts regional youth employment. To a lesser extent, the participation rate positively impacts youth employment while the share of part-time employment and the share of female labour force participation negatively impacts youth employment rates over the entire time period.

Examining further the post-2014 period to understand the magnitude of the effects the variables of interest had on youth employment during this most recent period, we find that the negative impacts associated with 'brown' jobs and 'co-work' sectors have had the strongest impact in the regions classified as being most affected by decarbonisation. The findings suggest that while youth employment may respond to policy variables, the impact of particular policies will tend to vary depending on specific regional labour market contexts. Nevertheless, the work does point to areas where policy could play a role. The findings show that the higher proportion of individuals with tertiary education, higher regional participation rates, and higher GDP per capita positively influences youth employment opportunities across all regions. Therefore, investing in higher education, scholarships, vocational training and wider skill development programmes in the sectors with high potential for 'green' jobs and

remote working potential will not only uplift the youth employment rate but also address the negative impacts seen with a rise in the ratio of high-to-low skilled workers. Hadjivassiliou et al. (2019) illustrate how countries perform better where employers see an incentive to participate in youth employment programmes, and employers are closely engaged in school-to-work transition regimes and vocational education and training systems. One of the key challenges in terms of policy learning and transfer requires activating regional employers and professional bodies within multi-agency forms of governance to deliver effective programs to overcome some of the adverse consequences for youth that have become evident over the past decade (O'Reilly, 2019).

Further research is needed particularly in the areas of 'green skill' identification and the specific types of jobs being created and the skills needed to do them. Utilising large-scale job advertisement data is one potentially useful way to examine the impact that decarbonisation policies are having on the labour market. For example, it is possible to identify the types of jobs, occupations and the skills required from the next generation of workers in these areas. Such knowledge can be used as a key input into any national, or EU level, skills strategies designed to ensure that the growth of youth employment in green sectors- but also in remote 'co-work' type-sectors- is not restricted as a consequence of skill mismatches.

The policies in line with achieving the green transition are usually estimated to have a positive but small net effect on employment (Eurofound, 2019; European Commission, 2020; Vona, 2021), and they will also have distributional effects. The impacts are expected to vary considerably among sectors, will affect countries' income, the employment levels and structure i.e., creating and destroying jobs and changing jobs' skills and tasks content. Therefore, different categories of workers will be affected in different ways. The green transition could lead to: (i) job creation in 'green' sectors that produce goods and services that reduce environmental pressure; and (ii) lead to job destruction in sectors with large environmental footprints ('brown' sectors) (OECD,2017). In relation to this, the European Union's Just Transition Fund (EU JTF) is a relatively new fund created under the 2021-2027 programming round. The Fund's single specific objective is to support the regions and communities in Europe that are most negatively affected by the transition to climate neutrality, in the effort to ensuring that no one is left behind. However, given this study examines data from 2008-2021, it is perhaps too early to detect some of the effects of this regional funding, particularly on youth employment. Implementation of a robust monitoring system to continually assess the impacts of these policies is important. As sectors evolve and regional dynamics shift, policymakers should be in a position to adjust strategies in real-time, ensuring youth employment remains a priority.

6. Appendix

Appendix Table A: Regions Most Affected by Decarbonisation Process

Italy	ITC2 - Valle d'Aosta/Vallée d'Aoste
	ITF1 - Abruzzo
	ITF2 - Molise
	ITF3 - Campania
	ITF4 - Puglia
	ITF5 - Basilicata
	ITG2 - Sardegna
	ITH1- Provincia Autonoma di Bolzano/Bozen
	ITH2 - Provincia Autonoma di Trento
	ITH5 - Emilia-Romagna
	ITI3 - Marche
Spain	ES11 - Galicia
	ES12 - Principado de Asturias
	ES21 - País Vasco
	ES24 - Aragón
	ES41 - Castilla y León
	ES53 - Illes Balears
	ES61 - Andalucía
Greece	EL41 - North Aegean
	EL42 - South Aegean
	EL43 - Crete
	EL53 - Western Macedonia
	EL65 - Peloponnese

Appendix Table B: Regions with High Density of Co-Working Spaces

Italy	ITC1 - Piemonte
	ITC4 - Lombardia
	ITH3 - Veneto
	ITH5 - Emilia-Romagna
	ITI1 - Toscana
	ITI4 - Lazio
Spain	ES11 - Galicia
	ES30 - Comunidad de Madrid
	ES51 - Cataluña
	ES52 - Comunidad Valenciana
	ES61 - Andalucía
Greece	EL30 - Attiki
	EL52 - Kentriki Makedonia

Appendix Table C: Regions Classified as 'Other'

Italy	ITC3 - Liguria
	ITF6 - Calabria
	ITG1 – Sicilia
	ITH4 – Friuli-Venezia Giulia
	ITI2 - Umbria
Spain	ES13 = Cantabria
	ES22 = Comunidad Foral de Navarra
	ES23 = La Rioja
	ES42 = Castilla-La Mancha
	ES43 = Extremadura
	ES62 = Región de Murcia
	ES63 = Ciudad de Ceuta
	ES64 = Ciudad de Melilla
	ES70 = Canarias
Greece	EL51 = Anatoliki Makedonia, Thraki
	EL54 = Ipeiros
	EL61 = Thessalia
	EL62 = Ionia Nisia
	EL63 = Dytiki Ellada
	EL64 = Sterea Ellada

Appendix Table D: Descriptive statistics of All Variables included in the determinants model

Variables	Description	Observations	Mean	Std. Dev.	Min	Max
Youth employment	Youth (aged 15 to 29) employed / youth in the labour force	3,024	0.69	0.12	0.27	0.97
Female Youth employment	Young females employed / young females in the labour force	3,024	0.67	0.14	0.15	0.98
Male Youth employment	Young males employed / young males in the labour force	3,024	0.72	0.13	0.16	0.98
Participation rate	Labour force divided by the total working-age population (aged 15 to 64)	3,024	0.67	0.06	0.45	0.80
Migrant	Migrants in the labour force	3,024	0.11	0.05	0.02	0.25
Part-time	Part-time workers	3,024	0.14	0.05	0.03	0.26
Female	Females in the labour force	3,024	0.44	0.03	0.34	0.52
Tertiary education	Short-tertiary education, Bachelor, Master and PhD (ISCED 5,6,7,8)	3,024	0.15	0.06	0.06	0.36

Ratio of High-Low SOC	Ratio of Workers in High (2,3) to Low (7,8,9) occupations	3,024	0.94	0.27	0.32	3
GDP	Regional GDP per capita	3,024	23527.27	9041.25	10200	84900
Green sectors	Combined employment in sectors with prevalence of green jobs (NACE D,E,H)	3,024	0.06	0.01	0.01	0.10
Electricity and gas	Share of employed in sector NACE D: Electricity, gas, steam and air conditioning supply	3,024	0.006	0.006	0	0.07
Water/waste management	Share of employed in sector NACE E: Water supply; sewerage, waste management and remediation activities	3,024	0.008	0.004	0	0.03
Transportation	Share of employed in sector NACE H: Transportation and storage	3,024	0.04	0.01	0.005	0.09
Brown sectors	Combined employment in sectors with prevalence of brown jobs (NACE B)	3,024	0.003	0.007	0	0.07
Mining	Share of employed in sector NACE B: Mining and quarrying	3,024	0.03	0.07	0	0.07
Co-working sectors	Combined employment in sectors with prevalence of co-working practices (NACE J,K,M,N)	3,024	0.12	0.04	0.02	0.28
Information/Communication	Share of employed in sector NACE J: Information and communication	3,024	0.017	0.01	0	0.08
Financial services	Share of employed in sector NACE K: Financial and insurance activities	3,024	0.02	0.01	0	0.05
Professional services	Share of employed in sector NACE M: Professional, scientific and technical activities	3,024	0.05	0.01	0	0.10
Administrative services	Share of employed in sector NACE N: Administrative and support service activities	3,024	0.04	0.02	0.00	0.14

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