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79 WORKING PAPER

Active Labor Market policies in the framework of Just Transition Programs: the case of Italy, Spain, and Germany

Vienna, September 2024

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List of Abbreviations

ALMPs	active labor market policies
BLS	US Bureau of Labor Statistics
EGSS	Environmental Goods and Service Sector
ERDF	European Regional Development Fund
ESF	European Social Fund
ETS	Emission Trading System
EU	European Union
EU-LFS	EU Labor Force Survey
GDP	Gross Domestic Product
GHG	greenhouse gas
ILO	International Labor Organization
ITJ	Institute for Just Transition
JTF	Just Transition Fund
MA	Managing Authority
NECPs	National Energy and Climate Plans
NEETs	Not in Education, Employment or Training
NJTPs	National Just Transition Programs”
NRRP	National Recovery and Resilience Plan
NRW	North Rhine-Westphalia
PNIEC	Spanish National Integrated Plan on Energy and Climate
R&D&I	research, development and innovation
SMEs	Small and medium-sized enterprises
SSA	Structural Strengthening Act
TJTPs	Territorial Just Transition Plans
UK	United Kingdom
US	United States of America

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Abstract

Within the context of the green industrial policies debate, this paper seeks to examine the progress of policy implementation regarding the upskilling and reskilling of workers under the European Just Transition Fund (JTF) 2021-27. Specifically, it focuses on distinct regions in three countries: Italy, Spain, and Germany. Through a combination of desk research and qualitative analysis via interviews with key informants, the research aims at assessing the advancement of training and retraining interventions for workers in those regions and identifying any implementation deficiencies and critical challenges encountered by these initiatives. The paper thus aims to contribute to the ongoing debate on green industrial policies and their implications for just transition and workforce development. Although it is too early for a comprehensive assessment due to limited actions in this field based on JTF implementation so far, some relevant policy implications can be drawn. These refer in particular to the need of better integrating the active labor market policy interventions under examination with a more comprehensive regional development strategy, while taking account of regional specificities and actual workers' needs in such specific contexts.

Keywords: Just transition; active labor market policies; workers' upskilling and reskilling, industrial policy.

1. Introduction

The EU has committed to achieve climate neutrality by 2050 in alignment with the Paris Agreement. The European Green Deal, launched by the European Commission at the end of 2019, is a program for radical technological, energy, and economic transformation. It is, however, expected that the social transformation will be equally profound and challenging, with significant employment and social costs (Greco et al. 2023). The Commission itself insists that the economic transition must be just and inclusive; this means prioritizing people and paying special attention to the regions, industries, and workers facing the greatest challenges. Given the substantial changes it will bring, active public participation and confidence in the transition are crucial for the policies to work and be accepted.

In this context, the Just Transition Fund (JTF), approved in 2021, serves as the financial tool to support the transition to a climate-neutral economy in regions most heavily dependent on coal extraction and use (European Commission 2021). These regions will experience significant job losses and will require a substantial redesign of their development models. Creating new jobs is a central objective of the transition and is essential for building community consensus. Job creation can occur through three main approaches: a) the training and retraining of workers that can be integrated into growing and sustainable sectors (if any); b) the revitalization of the economic fabric through industrial policies and public investment strategies; and c) the environmental remediation of territories through the reclamation of polluted areas and the regeneration of sites (European Commission 2021; Greco et al. 2023).

Indeed, achieving climate targets involves not only expanding green industries but also redirecting technologies and workers away from environmentally damaging activities to promote sustainable production practices (Hafele et al. 2023). This demands a fundamental restructuring of the industrial ecosystem (Andreoni 2022) and entails significant social costs. To mitigate these negative social and economic impacts, governments must anticipate the transition costs for individual sectors. Scaling down so-called “non-future-fit sectors”, namely those emission-intensive sectors with limited potential to stay competitive (Hafele et al. 2023) requires proactive management, which means dealing with the social consequences of job losses to avoid cases of *noxious deindustrialization* (Feltrin et al. 2022), that occur when employment losses take place in areas where harmful industries are still operating.

According to the perspective raised by transformation studies, instead of passively observing polluting industries to decline, an “active” downsizing of such industries should be promoted together with ensuring a just transition for workers (Heyen 2017).[1] This challenge is intensified when leading economic activities are concentrated in specific regions, creating a path dependence that makes reversing the spatial pattern difficult (Arthur 1989, 1990; Malmberg and Maskell 2002). Phasing out certain economic activities can significantly impact the local economies of entire regions. In fact, the European Union calls for the full involvement of the affected communities, in line with the principles established by the International Labor Organization and the 2015 Paris Agreement. Engaging all pertinent stakeholders in the restructuring process, advocating for participatory approaches, and cultivating a shared understanding are considered essential to forestall social backlash against environmental initiatives, albeit they remain challenging endeavors. In some cases, issues of self-identification of workers with the coal/non-sustainable industry can arise – as one of the key informants emphasized during an interview stressing that a “*special type of pride [exists since] there was some mining industry and employment was found for generations in the mining professions and many people don't want to leave it, they don't want to switch to another type of jobs because this is not something they can identify with”.* A similar issue is highlighted by Brauers and Oei (2020) underscoring the necessity to challenge core beliefs and values

[1] This literature refers to *exnovation*, meaning to “exit from non-sustainable infrastructures, technologies, products, and practices”.

associated with coal production through changes in media communication about climate change to successfully phase out coal in Poland.

While there is a certain degree of consensus in the political and scientific discourse regarding the imperative to address the social consequences of the just transition, the same level of agreement is not evident when it comes to determining the path to be taken to create new job opportunities. According to evolutionary economic geography (Boschma et al. 2015) and transition studies (Bergek et al. 2008; Geels 2002; Rip and Kemp 1998), the ecological transition should be accompanied by regional diversification, particularly in areas reliant on unsustainable activities. These approaches suggest that regions should diversify into related activities that capitalize on existing local capabilities, thus reducing the uncertainty of diversification (Boschma et al. 2015). Hence, according to this perspective, any active transition policy must consider the relatedness of existing regional capabilities and those required by potential sustainable activities to replace the current non-future-fit activities.

Besides relatedness, the mission-oriented industrial policy approach (Mazzucato et al. 2020) highlights that the private sector cannot bring about the market-defying transformations necessary to the ecological transition from current comparative advantages and emphasizes that the state should function as an “entrepreneurial agent” capable of catalyzing activities. According to this perspective, so-called megaprojects should be promoted. The latter are large-scale projects characterized by a high level of complexity entailing an intricate planning, management, and execution across multiple interdependent systems and subsystems (Andreoni et al. 2022).

Moreover, the literature suggests that successful transition planning necessitates consideration of not only economic factors but also the politics and power dynamics of incumbent industries (Scoones et al. 2015). Understanding the interests and networks of actors involved can illuminate why certain sectors persist in specific places and help identify pathways for change (Brauers and Oei 2020).

Besides the debate on which kind of direction a green industrial policy should take, policies for the upskilling and reskilling of workers are deemed crucial to ensure that such processes take place in a socially just way. Therefore, in this contribution, we focus on a specific set of initiatives funded by the European Just Transition Fund, which are designed to implement upskilling and reskilling programs for workers in regions affected by heavy industries restructuring. The JTF is a key component of the European Union's broader strategy to achieve a green transition by mitigating the socio-economic impacts of moving away from fossil fuels. By targeting areas that have historically depended on coal mining and related industries, these actions aim to support the workforce in adapting to new, sustainable economic opportunities, developing so-called “green skills” (see Section 3 for the specific debate).

The upskilling and reskilling initiatives encompass a range of activities, including vocational training, apprenticeships, and continuous education programs. These should be tailored to the specific needs of the local labor market and are designed to equip workers with the skills required in emerging industries, such as renewable energy, digital technology, and sustainable manufacturing. Furthermore, these programs often involve or should involve collaboration between various stakeholders, including local governments, educational institutions, businesses, and trade unions, to ensure that the training provided is relevant and effective. The overarching goal is to create an adaptable workforce that can thrive in the new green economy, thus contributing to the overall objectives of the European Green Deal.

Against this background, by focusing on specific regions in three countries – Germany, Italy, and Spain – characterized by very heterogenous labor markets and employment dynamics over the last decade (see Section 2), we investigate the advancement of training and reskilling initiatives for workers – Section 4 – and preliminarily explore any implementation deficiencies and critical challenges encountered by these initiatives by means of a set of interviews with key informants (Section 5). Through this analysis, the paper aims to contribute to the ongoing

debate on green industrial policies and their implications for workforce development and transition.

Several caveats apply. First, the implementation of the JTF program is at a very preliminary stage, as many actions only began last year, and a general slowdown in the execution of the program has been observed. Second, although interviews with key informants are representative from a qualitative point of view for the insights they provide, we aim to extend the analysis in the coming months, especially with Managing Authorities, to gain a more comprehensive understanding of the situation on the ground.

The rest of the paper is structured as follows. Section 2 focuses on the employment trends in the labor markets of the selected regions across the three contexts. Section 3 delves into the debate on green skills. Section 4 illustrates the allocation of the JTF in the three countries, specifically focusing on upskilling and reskilling actions. Section 5 complements the desk research based on regional JTF and official documents with selected interviews with key informants. Finally, Section 6 concludes the paper by drafting preliminary conclusions and take-home messages.

2. Setting the scene: upskilling, downgrading or job polarization? An overview of European employment trends

A comprehensive discussion on the job implications of green industrial policies must consider the long-term trends of national and regional labor markets. These trends reflect underlying structural factors such as industrial specialization, participation in global value chains, and broader path dependencies in the accumulation of technological capabilities (Gräbner-Radkowitsch 2022). Understanding these historical trajectories is crucial for anticipating the potential impacts of green industrial policies and related upskilling and retraining actions on employment patterns, skill requirements, and overall economic dynamics.

Over the last three decades, significant shifts in employment structures have been observed across Europe, with some sectors/regions/countries experiencing an upsurge in high-quality or high-skilled jobs,[2] while others witness a rise in low-quality occupations or face some sort of deskilling pattern. Job polarization, marked by an expansion at both the high and low ends of the wage distribution, has also been observed and represents a mingling of these trends, challenging the middle-wage job sector. More in detail, the literature describes job upgrading as an increase in employment levels, characterized by significant growth in high-quality or high-skill jobs compared to both low- and middle-skill positions. Conversely, deskilling/downgrading of the occupational structure occurs when low-quality work proliferates at the expense of middle- and high-quality positions. A combination of these trends is possible when employment growth is most limited in the middle, while more pronounced at both the upper and lower ends of the wage distribution. Such structural changes in the labor market are commonly referred to as job polarization, leading to the displacement of middle-wage jobs.

From an empirical standpoint, there is no consensus in the literature on the predominance of one trend over another, mainly because changes in the occupational structure could be evaluated at different levels of analysis (firm, industry, sector, region or even country) and by adopting different methodologies. Furthermore, it is crucial to recognize the influence of economic cycles on shaping employment dynamics. Overall, depending on various factors,

[2] While acknowledging the academic distinction between job upgrading and job upskilling, it is important to note that this paper will not delve into this difference. Therefore, throughout the text, we will use these terms interchangeably as synonyms. This decision is made to maintain clarity and consistency in the discussion without delving into the differences between the two concepts. Instead, the focus will remain on analyzing the broader aspects of workforce development and training initiatives within the context of the European Just Transition program.

including the methodology employed, data indicate the coexistence of both upskilling, polarization and downgrading within the workforce.[3]

Part of the literature has outlined job polarization trends within the labor markets of Western countries, notably in the UK and the US (Cortes 2016; Autor and Dorn 2013; Autor 2015; Salvatori 2018). Analyzing the EU Labor Force Survey (EU-LFS) data from 1993 to 2010, Goos et al. (2014) identified a prevalent trend of job polarization in Western Europe. They argue that the adoption of technologies more complementary to specific types of tasks and the ongoing process of offshoring have negatively impacted the "middle class", represented by workers involved in middle-skilled jobs and performing routine tasks. Conversely, Oesch and Piccitto (2019) challenge the notion of a "polarization myth" in Europe, showing that the polarization thesis does not hold empirically. By developing several job quality indicators, they demonstrate the existence of an upskilling pattern in at least three continental European countries.[4] In line with this perspective, Albertini et al. (2020) and Moawad and Oesch (2023) refute the polarization hypothesis in Europe.

In summary, numerous studies (such as Fernández-Macías 2012; Cirillo 2018; Fernández-Macías et al. 2017; Hurley et al. 2019; Torrejón Pérez et al. 2023) have identified significant variability in evidence across European countries. One of the most comprehensive analyses, provided by Torrejón Pérez et al. (2023), assesses changes in mean hourly wages (utilized as a wage-based measure of job quality) across quintiles from 1997 to 2021 in eight EU countries, relying on specific occupations performed within precise sectors.[5] They identify four main patterns of employment changes across Europe corresponding to each phase of the business cycle. Specifically, during the upswing (1997-2007), most EU countries experienced job upgrading, particularly in the service sector. Notable exceptions included Germany and France, which faced job polarization, and Romania, characterized by net employment losses primarily due to a declining population trend. Conversely, during the downswing, notably as the financial crisis impacted Europe, employment declined in all but the top quintile. Germany and Sweden saw upskilling processes, while Italy experienced a pure deskilling trend.

[3] Beyond the focus on employment change by occupational groups, several studies have analyzed the type of tasks performed by workers over time, accounting in some way for the content of work performed. For instance, already in 1991, Gallie (1991) underlined the existence of three main patterns in changes of skills – upskilling, deskilling and polarization. While upskilling postulates a positive association between technological development and complex types of work tasks and skills, the deskilling hypothesis argues the tendency towards a decline in the real skill content of jobs (Crompton 2010), where the growth of non-manual occupations was accompanied by a transformation of their character and by a declining quality of work due to a high level of employee discretion and lower capacity of employees to resist the substitutability of labor. More recently, this strand of the literature, mainly referring to the sociology of occupations, has developed taxonomies of tasks with respect to two dimensions: the nature of occupational tasks (mental, social, manual) and the degree of routinization (Cirillo et al. 2021). Until 2015, a general increase in task complexity was evident in Europe (Martinaitis et al. 2021), driven by a growth in non-routine cognitive tasks and a decline in manual tasks, with significant differences across countries as routine cognitive tasks increased in Eastern Europe and declined in Western Europe (Fana et al. 2020; Fernández-Macías and Bisello 2016; Hardy et al. 2018). In a recent study, Fernández-Macías et al. (2022) found an increase in work routinization across Europe, by estimating the net contribution of changes in job content and occupational structure.

[4] The countries analyzed are Germany, Spain, Sweden, and UK.

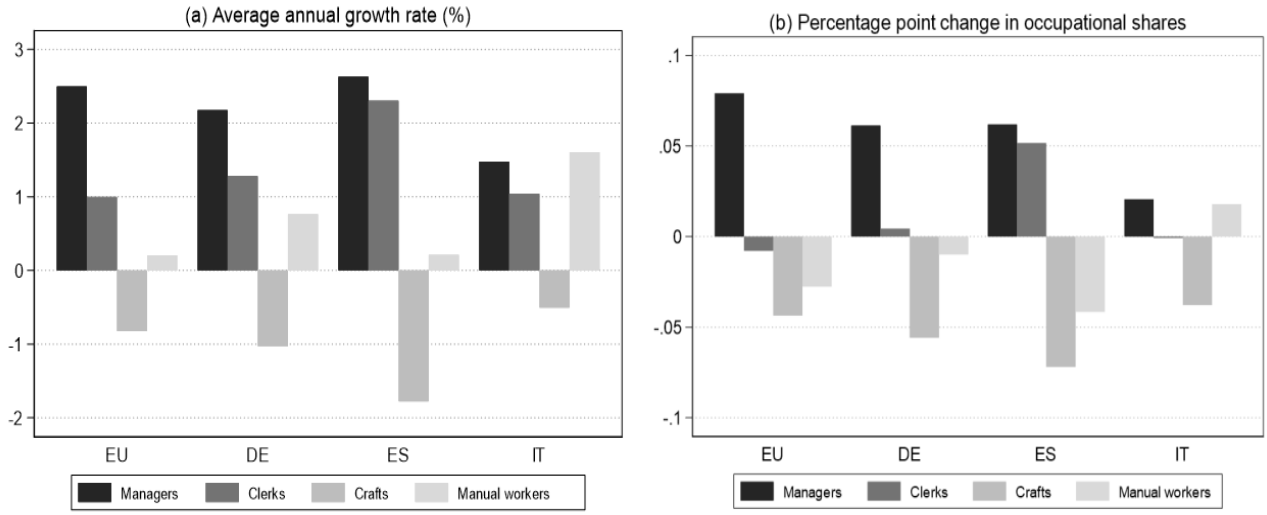
[5] Torrejón Pérez et al. (2023) focus on eight European countries: Czech Republic, Germany, Spain, France, Ireland, Italy, Romania, and Sweden. While for these countries they used national data recorded between 1997 and 2019, the authors extend their analytical framework to encompass the period 2020-2021 at the EU27 level, thereby offering a comprehensive examination of trends during the COVID-19 pandemic.

The changes in national labor markets during the post-crisis recovery exhibited heterogeneity. Torrejón Pérez et al. (2023) highlight that employment growth varied across sectors: it was more polarized in the private sector while characterized by upgrading in the public sector. Furthermore, at the EU27 level, they observe that the impact of the pandemic was asymmetrical, primarily affecting low-paid, in-person service activities, and agriculture. In conclusion, they observe a long-term upskilling trend in the European Union from 1997 to 2021. However, when analyzing medium-term changes in the labor market, a significant interplay between the phases of the business cycle and the succession of job polarization and upskilling patterns emerges. Each country displayed different trends in employment shifts over the period, suggesting that the strength and timing of the impact of negative phases of the business cycle could help explain this heterogeneity.

Focusing on a shorter period and employing a different methodology, Hurley et al. (2019) find similar results at the national level, but strong within-country heterogeneity at a regional scale. Their study categorizes countries and regions based on changes towards upgrading, polarization, downgrading, or a middle-biased pattern. In 2002, significant differences in regional employment structures were noted, with most regions initially clustered in either the upgraded or downgraded cluster, while polarization was less apparent. Indeed, capital city regions differ from more remote or peripheral areas since they exhibit more upskilling trends. For instance, when focusing on a regional scale, Italian and Spanish regions display a general trend toward job downgrading, whereas most of German regions move toward a mild upskilling, indicating a growth in mid-paid jobs.

When considering *Figure 1* and the broader trends in Europe from 2002 to 2018, it is essential to recognize the methodological limits of interpreting skill dynamics purely based on employment changes in occupations. While *Figure 1* confirms an overall upskilling trend at first glance, characterized by the growth of managers and clerks at sustained annual rates of 2.5% and 1%, respectively, and a just slight increase of manual workers, the decrease in crafts at an annual average rate of nearly 1% complicates the interpretation. Additionally, the observed patterns in Germany and Spain, with a pronounced upskilling process, contrasts with Italy's skewed polarization towards downgrading. This suggests a potential polarization trend at the EU level, with a bias towards upskilling, rather than a straightforward upskilling trend.

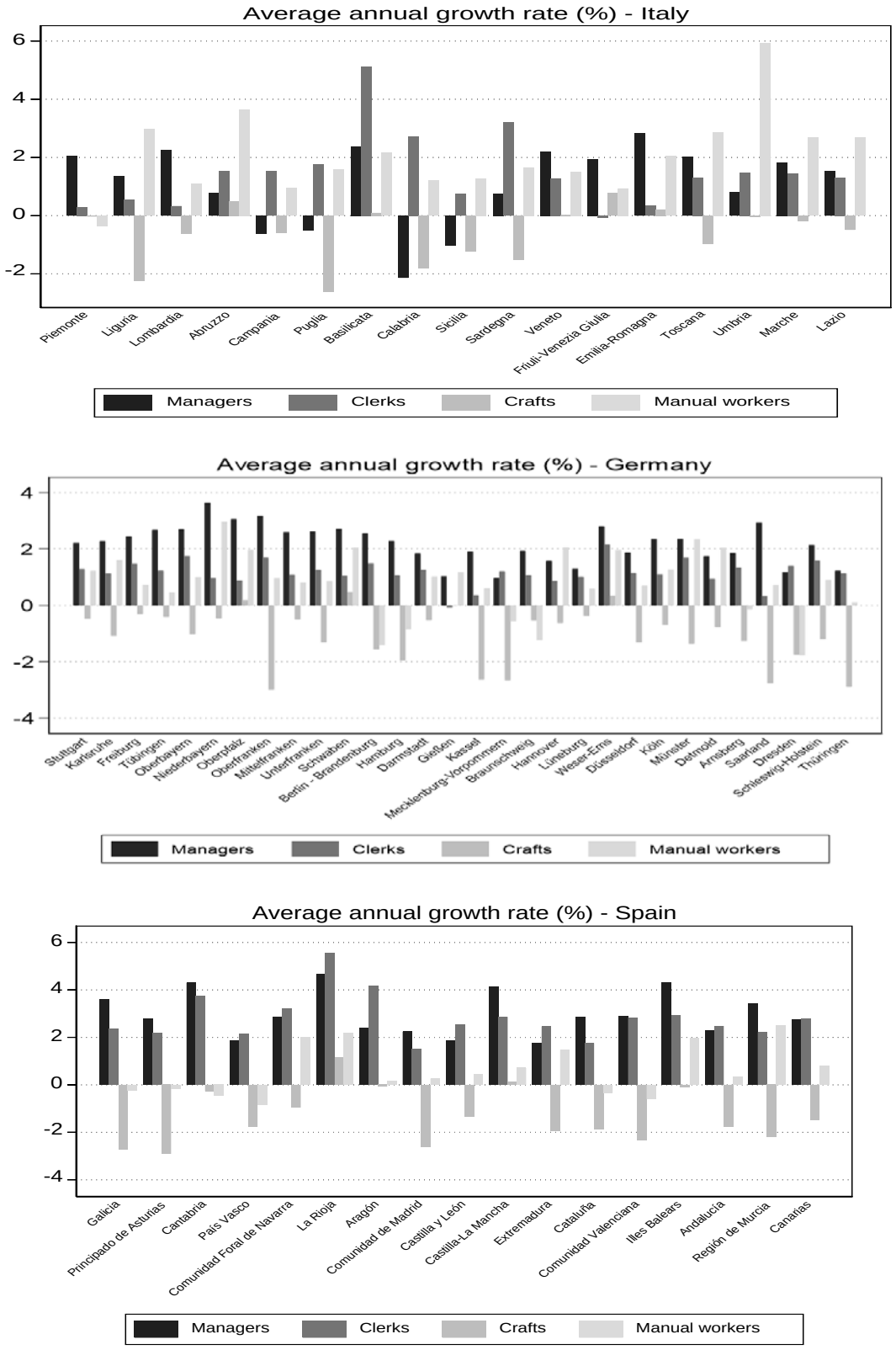
Figure 1: Change in employment growth by major ISCO groups (2002-2018). Compound annual rate of change of employment (a) and change in shares of occupations (b)



Source: Own elaborations on EU Labor Force Survey data.

When examining regional labor market changes, significant heterogeneity becomes apparent. Specifically focusing on the three countries under investigation and particularly on areas affected by the Just Transition Fund, the following patterns are highlighted. In the Italian regions, particularly those affected by the JTF such as *Puglia* and *Sardinia*, significant polarization has been observed (see *Figure 2.a*). *Puglia*, over the period, appears to have experienced the largest decrease in medium-low skilled workers among Italian regions, accompanied by an increase of about 2% in both clerks and manual workers. *Sardinia* has also witnessed a polarization pattern, although mitigated by significant increases in both clerks and managers. In Germany, most regions mirror the national trend (see *Figure 2.b*). For example, *Dusseldorf* displays a similar national trend of upgrading skewed towards polarization, while *Brandenburg* and *Dresden* have undergone a strong upskilling process. In these two regions, both crafts and manual occupations have decreased at an annual rate of nearly 2%, while *Dusseldorf* has seen a modest increase in manual workers, resulting in polarization. In Spain, while most regions reflect an upskilling trend, there are exceptions. For instance, in the regions affected by JTF interventions like *Galicia and Principado de Asturias*, a sharp decline in the number of crafts is observed along with a slight decrease in manual workers (see *Figure 2.c*). Similarly, in *Andalucia, Castilla y Leon*, and *Aragon*, crafts have decreased, but this is matched with a minor increase in low-skilled workers, indicating limited polarization processes. Across all these regions, a pronounced rise in managers and clerks corroborates the national upskilling trend.

Figure 2: Change in employment growth by major ISCO groups (2002-2018). Compound annual rate of change of employment by selected regions (NUTS 2) in Italy (a), Germany (b) and Spain (c)



Source: Own elaborations on EU Labor Force Survey data.

2.1 What are the main explanations behind these trends?

Scholars identified several drivers. The first one is related to the unfolding of technological change at the workplace level. Automation, robotization, digitalization, and the diffusion of information and communication technologies have profoundly affected labor market structures across all Western Countries and their sectors (Fernández-Macías et al. 2021; Urzì Brancati et al. 2020; Torrejon-Perez et al. 2023). The integration of these technologies into workplaces has transformed labor demand, necessitated different skills and led to new organizational models. This transformation has proven to affect high- and low-skilled workers asymmetrically, as well as routine- and non-routine occupations (Cirillo et al. 2021)[6].

Along with technological change, the outsourcing of production processes has influenced job structures. Due to globalization and the surge in international trade, routine jobs, which are more easily standardized and offshorable, have been relocated from developed to developing countries and often automated (Blinder 2006; Levy and Murnane 2004). This shift contributes to the hollowing out of low- and mid-skilled routine-task-performing employment in developed economies, leading to job polarization as middle-wage jobs are outsourced or automated. Furthermore, the globalization process has been accompanied by increased migration. The availability of migrant labor has expanded employment at the lower end of the job-wage structure. In some regions, these inflows have been associated with job polarization, where migrants fill low-paid jobs and, indirectly, facilitate the reallocation of native workers to better-paid positions (Wright and Dwyer 2003; Edo 2019; Murphy and Oesch 2018).

Despite their importance, the dynamics of labor demand and supply alone do not fully explain the variations in upskilling, polarization and downgrading across countries. Institutional settings and national labor market regulations also play a crucial role. Some mechanisms, such as robust wage-setting institutions, counteract job polarization (Farber et al. 2018; Brennan 2016). Similarly, some scholars stress that higher minimum wages reduce the likelihood of increases in low-wage employment (Maarek and Moiteaux 2021; Lordan and Neumark 2018). On the other hand, deregulation and de-standardization of labor market policies tend to increase the proportion of non-standard workers, thereby expanding the share of low-paid workers and contributing to both downgrading and polarization (Hurley et al. 2013; Fernández-Macías 2012; Torrejón Pérez et al. 2023).

According to a more radical perspective and enlarging the time horizon of the analysis, job changes need to be linked to phases of capital accumulation. Therefore, a specific phase of capital accumulation characterized by declining profits, intensified competition and financialization – such as the one of post-Fordism – is linked to changes in employment relations that put a downward pressure on income and labor share. In this line, polarized job growth reflects the post-Fordist stage of capital accumulation featured by job growth of low paid/low skilled workers (Cirillo 2018).

[6] The neoclassical literature proposes two interpretative frameworks: *Skill-Biased Technological Change* (SBTC) and *Routine Biased Technological Change* (RBTC). The first suggests that innovations asymmetrically enhance labor productivity based on the skill level of workers, increasing firms' demand for high-skilled workers at the expense of low-skilled ones. Conversely, RBTC focuses on the specific tasks that technologies can replace (Autor et al. 2003; Autor and Dorn 2013). While SBTC does not adequately explain recent polarization trends in labor markets, RBTC emphasizes that non-routine manual tasks are less likely to be automated. Consequently, there should be an increase in non-routine (cognitive and manual) tasks, typically performed by both high- and low-skilled workers, and a decrease in routine cognitive and manual tasks, at the expense of middle-skilled employees.

2.2 Upskilling, Downgrading, and Job Polarization in the context of the Green Transition

Against this background, a major role toward upskilling, downgrading and polarization can be played by the digital and green transition. Indeed, in the coming years a significant driver of job market changes in Europe will be the unfolding of the so-called “Twin transition”. Muench et al. (2022) estimate that the European Union will see a net increase of up to 884,000 jobs by 2030 due to these transitions, which will require new skills such as digital competencies and building renovation expertise, currently lacking in the labor market. As certain sectors like coal, oil, and gas are likely to experience more job losses than other, the effects will vary across EU regions (Balsmeier et al. 2019; Stryzhak 2023). Consequently, reskilling is identified as a crucial strategy for transitioning workers into evolving or new sectors, addressing the skill gaps prompted by the shift towards a greener economy.

More in detail regarding the green transition, it is expected to induce structural shifts in employment, moving away from carbon-intensive industries toward a growing demand for labor in greener sectors (Gerstenberger et al. 2023). Changes in skill composition within sectors will also play a crucial role. Marin and Vona (2019) investigate the skill-biased dynamics of employment in relation to climate policies across 14 European countries and 15 industrial sectors from 1995 to 2011. By utilizing energy prices as a proxy for climate policies and controlling for automation and globalization effects, their study reveals biased occupational changes against manual workers and in favor of technicians, attributable to climate policy impacts. Climate policies are estimated to account for between 9.2% and 17.5% of the increase in technicians' employment share and between 4.2% and 8.0% of the decrease in manual workers' share, leading to upskilling processes. Focusing on Italy, Basso et al. (2023) highlight that the role of sectoral reallocation – defined as the decline in employment share of high-emitting sectors – has been very limited. Consequently, emissions have been reduced without any significant impact on total employment within the affected sectors. They also observe that employment in air and climate-protection goods and services has represented a small and stable share of the Italian economy since 2014, suggesting a limited involvement in the green transition to date.

Given the limited empirical evidence and the lack of adequate data, forecasting the systemic effects of the twin transition remains challenging. Nonetheless, by focusing on specific sectors, it may be possible to predict the occupations most affected and devise policies to facilitate a just transition. Furthermore, research on green policies and employment has two main shortcomings: it neglects the uneven geographic impacts of these policies and fails to clearly reveal how they change the job composition within labor markets, which in turn is a crucial information for educational/training and other active labor policies (OECD 2023b). However, green industrial policies could enhance local employment, though by necessitating significant labor policy adjustments in the most affected areas. Addressing these gaps is thus essential for supporting a just transition and aiding workers who may suffer adverse effects or face displacement due to the green transition.

3. Assessing the labor market impact of green transition

Between 2008 and 2010, there was a marked global increase in the focus on green skills and employment, mirroring the growing interest in the green economy concept and the search for sustainable growth models following the financial crisis. This trend brought research into green jobs and skills to the forefront of international and national policy discussions. The concepts of green jobs and green skills had thus started to gather significant attention, both in research and policy circles.

In the following years, the concern for evaluating skills for the green transition waned. A resurgence happened only in 2019, alongside major policy developments such as the United States recommitting to the Paris Agreement with ambitious emissions targets, and the EU launching the European Green Deal to achieve a climate-neutral Europe by 2050 (OECD 2023a). The current renewed interest in characterizing and measuring green skills is mainly driven by the recognition of the green transition as not only a path towards environmental sustainability, but also an opportunity for job creation in existing and emerging sectors (European Commission 2019). By promoting the adoption of new environmental technologies and the creation of new green firms, as well as by contributing to the closure of firms with high pollution footprints, green policies may nonetheless lead to profound changes in the labor market and the unequal distribution of benefits across sectors and regions (Rodriguez Pose and Bartalucci 2023). They not only affect employment through changes in the industrial structure, but also transform the occupational composition within industries and the variety of tasks within occupations, thereby affecting the demand for skills (Vona et al. 2018; European Commission 2022). Such evidence supports the necessity for retraining and enhancing workers' abilities to ensure a fair and equitable progression towards a technologically advanced and sustainable future. Active labor policy interventions for the green transition, particularly to mitigate its negative impacts on the labor market through training and re-skilling initiatives for workers, presuppose first and foremost a quantification of the affected workers and thus a precise identification of the occupations and skills that can be defined as "green". However, this is not straightforward: the absence of a universal definition also means there is no single measurement criterion. Hence, the debate about green jobs and skills is as much about their enumeration as it is about their essence, reflecting a landscape where quantitative assessments are as fluid as the definitions they seek to operationalize.

3.1 Defining and quantifying the green workforce: methodologies and challenges

The conceptualization of green jobs does not lend itself to a singular, definitive, interpretation. Green jobs, by their very nature, are dynamic and multidimensional concepts. As such, any attempt to quantify them is inherently influenced by the parameters set by these varying definitions and the methodologies employed in their assessment. While some may cast a broad net, considering any job that contributes to environmental sustainability as "green", others adopt a stricter lens, only classifying roles with direct involvement in environmental protection or renewable energy as such. Moreover, the diversity in definitions not only affects the quantification of green jobs, but also extends to the identification of the requisite skills for these roles.

This variability presents several challenges, making it difficult to collect and compare data on emerging green occupations as well as to assess the labor market impact of the green transition (Janta et al. 2023; OECD 2023b). In fact, it leads to a diverse array of estimates concerning the size and growth of the green job market. The ambiguity also hinders the ability to pinpoint the exact skills that workers need to acquire or improve upon to support the green transition. As a result, policymaking aimed at upskilling and reskilling the workforce becomes a challenging endeavor.

3.2 A brief overview of the relevant literature

So far, various definitions, theoretical concepts and measurement approaches have been employed to characterize and measure green employment. A growing number of studies and reports have been published. By employing different definitions and measurement approaches, they aim to quantify the share of green occupations. Valero et al. (2021), Vona (2021), Urban et al. (2023), OECD, (2023a, 2023b) and Apostel and Barslund (2024) provide the most recent and updated reviews of the current trends in this literature, highlighting the main classification frameworks and major caveats. Valero et al. (2021) distinguish two broad methods for defining green jobs: "top-down" and "bottom-up". The "top-down" approach looks at the industry level, deeming entire sectors or activities as "green" based on their role in the zero-carbon transition. A "narrow" top-down approach estimates 1-2% of jobs in the US or Europe as green, whereas a "broader" approach based on emissions may rate a higher share as green (ILO 2016; Georgeson and Maslin 2019; Kapetaniou and McIvor 2020; Eurostat 2021). The "bottom-up" method examines green characteristics at the firm or job-specific level, with estimates suggesting over 20% of jobs could be considered green (Muro et al. 2011; Consoli et al. 2016; Bowen et al. 2018; Bowen and Hancké 2019; Robins et al. 2019; Christie-Miller and Luke 2021). In the "top-down" approach, green jobs are identified by two sub-categories: firstly, by defining certain industries or activities as green, like the renewable energy sector and environmental protection; secondly, by considering industries with low greenhouse gas emissions intensity as green. However, this industry-level method may lead to over- or underestimation due to its broad categorization. For example, all employees in a "green" industry are counted as having green jobs, regardless of the specific occupation and job function, leading to potential misclassification. The "bottom-up" approach seeks to address these issues by looking within organizations to identify green jobs or using revenue shares from green goods and services to determine the green employment share. It defines green jobs based on the skills or tasks that different occupations entail and the extent to which these skills and tasks are green.

Classifications from the O*NET database in the United States are the basis for defining and analyzing green jobs at the occupational level in the literature. Despite being more detailed, the occupational approach has also limitations. Indeed, the O*NET classifications are from 2010 and US-centric,[7] potentially missing new jobs or different green jobs emerging in other countries characterized by different skills needs related to the transition. Additionally, this approach does not account for variances in job "greenness" across firms, considering an occupation as "equally green" regardless of the type of firm it occurs in. Future research is thus needed to merge occupation data with firm-level information to define green jobs more accurately (Valero et al. 2021). As also highlighted by a recent OECD analysis (OECD 2023b), the top-down approach to identifying green employment is primarily employed for industry analysis by leveraging existing national accounts data, therefore requiring minimal new data collection. Moreover, since all jobs in the sector are included, this method allows to capture ancillary jobs, namely those that may not directly contribute to green activities but support them. However, this approach has limitations. Indeed, it struggles with choosing an appropriate statistical unit for consistent comparisons, often lacks detailed sub-national data, and may inadvertently classify unrelated jobs as green due to their association with green firms (e.g., accountants or security guards if their observed statistical unit, the sector, is deemed to have an environmental purpose). Additionally, the market structure and extent of outsourcing can significantly influence which jobs are considered green, leading to potential inconsistencies in job classification.

[7] Using O*NET classifications for labor force data in countries outside the United States necessitates a "crosswalk" that aligns US occupational codes with those of the respective country. It is thus presumed that occupations deemed green in the US context can be similarly considered in other international settings.

Unlike sector-specific analyses, the bottom-up approach, especially when focused on specific tasks within occupations, can cover green activities across various sectors by identifying roles that contribute to environmental goals, regardless of the industry. It thus has significant advantages for policymaking, including the fact that it enables sub-national estimates and the use of socio-economic information related to workers in green occupations. This method facilitates the analysis of the green transition's impact on job reallocation and the evolving demand for skills. Consequently, it allows for an examination of how workers may transit into new job roles or industries through retraining and upskilling, thus offering valuable insights to inform labor market policies. Nevertheless, this approach also has limitations. Indeed, it relies heavily on US-based task data from O*NET, which may not translate perfectly to other countries due to differences in occupational classifications. Additionally, these data offer a static snapshot of green tasks that may not reflect changes over time or capture ancillary jobs indirectly related to green activities. Furthermore, inconsistent levels of detail in occupational employment data across countries can hinder international comparability (OECD 2023b).

Vona (2021) details the task-based approach for classifying green jobs and skills, emphasizing that job tasks are changing with technological advances, including those occurring in green tech sectors. The task-based approach provides a nuanced way to define and study green jobs in an occupation. However, the effectiveness of this approach hinges on detailed data on tasks and skill content of occupations, which are currently well established only for the United States through resources like the US Dictionary of Occupation and Titles (DOT) and O*NET's Green Economy program, with a special section devoted to identifying green jobs and tasks. This program offers two ways to define green jobs: a binary system (green or not green) and a continuous scale based on the extent of green tasks in an occupation. The O*NET'S Green Economy Program provides a binary classification of jobs – green or not – closely linked to standard occupational classifications, which represents a clear advantage. Green jobs are categorized into three types: (i) those with growing demand due to the green economy (*green increased demand* occupations); (ii) those that will change significantly in their tasks due to green policies (*green-enhanced skills* occupations); and (iii) new roles created by the green economy (*new & emerging green* occupations). Occupations belonging to any of these groups can be considered as "green" in a binary fashion[8]. Nevertheless, the binary approach to green job definitions generates some ambiguities, because some occupations in the list of green increased demand, green-enhanced skill and new & emerging green occupations cannot be considered as entirely green. To overcome this problem, a much finer method for identifying green jobs using O*NET's detailed task and skill data is based on the creation of a continuous *Greenness* indicator based on the proportion of green-specific tasks in an occupation k: $Greenness_k = green\ specific\ tasks_k / total\ specific\ tasks_k$. This index ranges from 0 to 1, with a higher score indicating a greater presence of green tasks (see also Vona et al. 2018). This approach allows for a more nuanced view, revealing that some jobs are in transition towards being greener and that occupations that, on average, encompass both green and non-green tasks, have an intermediate *Greenness* score. The index also helps differentiate within the same occupation between green and non-green posts, such as maintenance workers specializing in green technology like hybrid cars or those specializing in a "brown" technology like diesel cars. This approach thus shows that only a few certain roles, like environmental engineers, are completely green, while others, like electrical engineers, have a mixed green task profile, providing a more accurate way to assess the greenness of jobs beyond binary classification. The task-based approach and, particularly, the continuous occupational *Greenness* indicator can thus be used to measure green employment by adjusting the

[8] The group of *green increased demand* occupations include very general occupations such as Software Developers (SOC 15-1133.00), Customer Service Representatives (SOC 41-4011.00) and Chemical Plant and System Operators (SOC 51-8091.00). *Green enhanced skill* occupations are directly involved to develop solutions to various environmental problems although not exclusively so; examples are Electro-Mechanical Technicians (SOC 17-3024.00), Roofers (SOC 47-2181.00) and Urban and Regional Planners (SOC 19-3051.00). Finally, the group of *new & emerging green* occupations includes new jobs involved in the development and diffusion of green innovations such as Weatherization Installers and Technicians (SOC 47-4099.03), Recycling Coordinators (SOC 53-1021.01) and Solar Energy Systems Engineers (SOC 17-2199.11) (see Vona et al. 2021).

employment shares of occupations based on their greenness (see also Vona et al. 2019). This method aligns closely with the Bureau of Labor Statistics' findings on green jobs, accounting for about 2-3% of total employment in the US. It can be applied to different industries and regions, providing insights into the distributional effects of green policies.

A key advantage of these more granular measures is therefore that they enable more precise differentiation between green and non-green jobs and workers within the same category, enhancing the understanding of the impact of green technologies on the labor market. Indeed, the O*NET database's textual descriptions of tasks provide a basis for validating green job classifications and allow for differentiation within green economy subsectors. Moreover, as these measures allow to track changes over time and across sectors/regions, they can be employed to estimate the distributional effect of green policies across locations (Vona 2021).[9]

With reference to Europe, although a legal definition of green jobs has not been established, various reports by EU agencies have provided different definitions and interpretations, concentrating on the aspect of green skills (Urban et al. 2023). For instance, CEDEFOP (2022b: 1) defines green skills as "the knowledge, abilities, values and attitudes needed to live, work and act in economies and societies seeking to reduce the impact of human activity on the environment". Utilizing the Classification of Occupation, Skills, and Competences (ESCO) database, the European Commission further categorizes skills as brown, white or green (European Commission 2022). Brown skills, like coal-based electricity production, contribute to the negative environmental impacts of human activities. In contrast, white skills have a neutral effect, and green skills, such as geothermal energy production, work to diminish these negative impacts (ibid.). Drawing from these and other definitions, various organizations have proposed a range of classification frameworks and taxonomies for green jobs, which display some overlaps and key analytical differences that impede comparability of assessments.

Another way to classify the green content of occupations is to focus on the output of production. In this way, the output approach considers jobs "green" based on the eco-friendly nature of the goods and services produced (UNEP et al. 2008; Janser 2018; Bohnenberger 2022), or by aggregating these on a sectoral level, the Environmental Goods and Service Sector (EGSS), which is defined by Eurostat as a sector focused on producing goods and services or technologies that help reduce environmental damage and resource use (Eurostat 2009). However, this approach can miss green jobs in sectors like education and healthcare, as it may not consider the environmental impact of the production process itself. To address this issue, organizations like the US Bureau of Labor Statistics (BLS) and the International Labor Organization (ILO) have included process aspects, looking at whether production methods are sustainable or efficient (Sommers 2013), with the ILO also adding a social dimension for decent work standards (ILO 2013). Part of the process-oriented research has delved into the nature of green jobs by examining the associated tasks and skills, thus enabling the evaluation of "job greenness" on a spectrum, rather than categorizing a role strictly as "green" or "non-green" (Vona et al. 2018; Bowen et al. 2018).

By criticizing the task-based approach, the so-called "systemic approach" calls for a broader view of green jobs that includes technological and economic shifts towards sustainability, emphasizing social aspects and especially the role of labor and trade unions in transition (Bohnenberger 2022; Hoffmann and Paulsen 2020; Gerold et al. 2022). Extant taxonomies offer valuable perspectives on defining and measuring green jobs, predominantly adopting a production approach focused on the output of production sectors to identify green occupations. Yet, the varied dimensions considered, like skills and tasks, underscore the concept's complexity.

[9] O*NET frequently updates their database of occupational tasks, typically revising the content every 3 to 5 years. In contrast, standard occupational classification systems like the SOC and ISCO are updated much less frequently, often only once every decade or so.

An essential takeaway from the literature is thus the necessity of integrating different approaches to fully capture the multifaceted nature of the ecological transition. This is illustrated, for instance, by the ILO taxonomy that combines output and processes to refine the measurement of green jobs. However, counting green jobs often occurs at the sectoral level, which can overlook the specific greenness of occupations within or across sectors. The report by Urban et al. (2023) therefore proposes another, integrated, taxonomy that incorporates diverse elements from previous models, making it measurable and practically viable. It is structured around four main pillars: inputs, outputs, processes, and job quality. By employing various indicators to operationalize these components, the aim is to facilitate more precise evaluations of green employment and allow for better comparison across studies.

Apostel and Barslund (2024) is the most recent and updated study summarizing the literature on green jobs definition and measurement, offering a conceptual framework that distinguishes between output-based and process-based green job concepts, alongside two measurement techniques: (i) entity-level measurement, which assumes jobs within identified green industries or companies are green; and (ii) occupation-specific measurement, which classifies jobs as green based on their tasks or required skills. According to the authors, for the variety of purposes that green jobs estimates serve, the use of different concepts and techniques is acceptable, but studies should improve comparability by clearly stating their methodology. In other words, future studies should compare their methods against a standard, justifying any deviations in terms of their impact on results. Eurostat's EGSS approach for entity-level measurement and O*NET for occupation-level are suggested as standards. Beyond enhancing study comparability, this review identifies new areas for research, particularly regarding the distinction between "brown" and green employment. Brown jobs – often defined as those in high-emission industries following Vona et al. (2018)'s criteria – may not accurately reflect the shift in employment due to the green transition. Indeed, the underlying assumption that the green transition will only render obsolete occupations concentrated in high-pollution industries may not be valid. Future work should thus focus on validating this brown employment measure. Additionally, concerns about the datedness of O*NET green job classifications call for external validation or updates to the system, especially if O*NET does not revise its list of occupations to account for the specific content of tasks.

Table 1: Summary of green jobs definitions and measurement approaches

Approach	Description, Pros and Cons	Methods	Authors/Sources
Top-down	• **Classifies entire sectors or activities as green based on their role in the zero-carbon transition** • Broad coverage but may lead to over- or underestimation due to broad categorization.	Use of emissions data and specific industry data	ILO (2016), Georgeson and Maslin (2019), Kapetaniou and McIvor (2020), Eurostat (2021), Valero et al. (2021)
Bottom-up	• **Examines green characteristics at the firm or job-specific level, identifying green jobs based on specific skills and tasks** • More detailed and specific, allows better identification of green jobs but requires more granular and updated data	Firm-level analysis and revenue data from green goods and services	Muro et al. (2011), Consoli et al. (2016), Bowen et al. (2018), Robins et al. (2019), Valero et al. (2021)
Task-based approach	• **Defines green jobs based on the change in tasks due to green policies** • Provides a more nuanced and dynamic definition, but heavily relies on US data which might not translate well to other contexts	Data on specific tasks and skill content of occupations	Vona (2021), O*NET's Green Economy program
Integrated approach	• **Proposes an integrated taxonomy combining elements from previous models for more accurate evaluations** • Allows more precise comparisons and in-depth analysis but requires complex implementation and homogeneous data	Combination of inputs, outputs, processes, and job quality	Urban et al. (2023), Apostel and Barslund (2024)

3.3 Key insights from literature review

The green transition's impact on labor markets is undeniable, yet there is a lack of systematic evidence regarding its effects on local labor dynamics. These are however crucial for designing effective policies to support workers negatively affected, especially through interventions for upskilling and reskilling. Insights from the review of the current literature help to highlight and summarize some primary concerns in this area.

First, there is no universal agreement on what constitutes a green job, leading to diverse and sometimes conflicting approaches to its definition and measurement. Such variance can range dramatically from 2% (Eurostat 2020) to 40% (Bowen and Hancké 2019) of the workforce considered to be in green jobs, which makes cross-country comparisons challenging. Additionally, the analysis on the location and geographic distribution of green jobs produced have been limited to just a few countries. Most importantly, the territorial distribution of green occupations is poorly understood, with most studies offering only national overviews and not addressing within-country variations. Nonetheless, local impacts of green policies can be profound, especially in regions dependent on energy-intensive industries that face immediate labor market challenges in the shift to cleaner sectors (OECD 2023b).

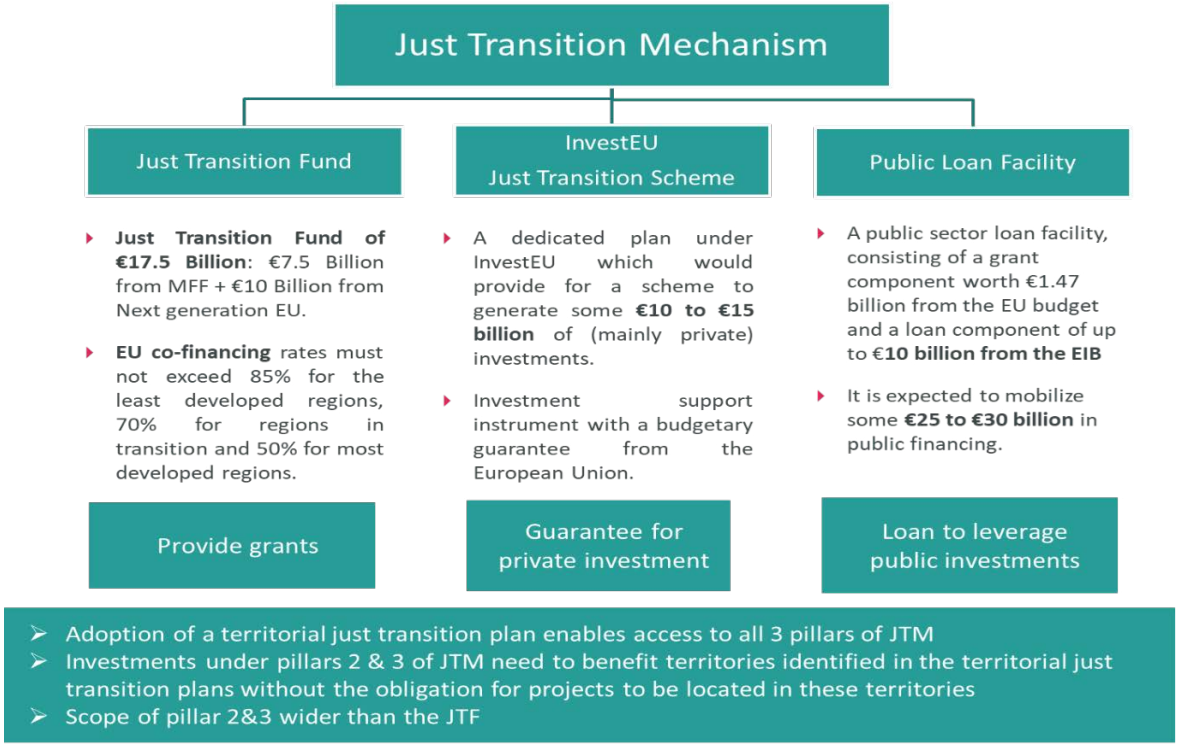
Furthermore, the focus on green jobs often overlooks the variety of skill requirements involved (OECD 2023a). However, focusing solely on green jobs (and green tasks within occupations), without considering the diversity in skill requirements, is a limitation, as green jobs encompass a wide range of qualifications and skills. So far, just few institutions and researchers have attempted to clarify the role of skills in the green transition (ILO, CEDEFOP 2011; OECD 2023a). A significant challenge in adopting a skills-based approach is defining what constitutes a green skill, with ongoing debates and different definitions presented by entities like CEDEFOP and the European Commission. For instance, some argue that skills cannot be inherently green but are competencies used in green contexts, such as installing clean energy or recycling (ILO 2011). Hence, a common understanding has emerged that the "greenness" of a job is determined by varying levels and combinations of skills applicable across various industries impacted by environmental changes and policies, not just those directly involved with environmental outputs (OECD, CEDEFOP 2014). Despite the gradually emerging consensus, however, strategies and policies explicitly and effectively targeting the development of skills necessary for the green transition are lacking. This is particularly pressing as such skills are crucial to achieve climate goals.

4. The Just Transition Program 2021-27 in Italy, Spain, and Germany

The Just Transition Mechanism (JTM) is one of the tools implemented within the framework of the European Green Deal to finance the EU's 2030 climate target and the EU climate neutral economy by 2050, as established in 2019.[10] It is made up of three pillars (*Figure 3*): the Just Transition Fund (JTF), entrusted with more than € 17 billion; a dedicated scheme under the InvestEU programme, expected to generate some € 10-15 billion of private investments; and a Public Sector Loan Facility, provided by the European Investment Bank, which should mobilize some € 25 to 30 billion in public financing.

[10] The fund is complementary to Structural Funds and the other EU financing programmes such as the European Social Fund+ (ESF+), the European Regional Development Fund (ERDF), or the European Globalisation Adjustment Fund for Displaced Workers (EGF).

Figure 3: The scheme of the Just Transition Mechanism



Source: IndustriALL 2021.

As said, the JTF is designed to mitigate the negative social and economic impacts of the climate transition, ensuring that no region is left behind. Specifically, it supports the diversification of local economic structures, creates new business opportunities, and helps people adapt to changes in the labor market. This includes facilitating the upskilling and reskilling of workers affected by the downsizing of high-carbon-emitting activities. Its specific measures thus aim to cushion the effects of the green transition by funding the diversification and modernization of local economies and mitigating the negative impact on employment.

Access to the Just Transition Fund is contingent upon the approval of "Territorial Just Transition Plans" (TJTPs), which Member States must develop in alignment with their "National Energy and Climate Plans" (NECPs) targeting 2030 goals. In the TJTPs, EU countries preliminarily identify eligible territories and sectors for funding under the Just Transition Fund. In February 2020, the European Commission has published a document on the adoption of the investment guidelines for the Just Transition Fund for the period 2021-27, also called "Annex D". This first analysis, based on the study of the TJTPs submitted by the Member States to the Commission, has established the list of territories eligible for JTF funding. Approximately 100 regions at "NUTS 3" level have been pre-selected.

The European Commission services have then published a working document on Territorial Just Transition Plans (TJTP) on 23 September 2021. This document outlines the eligibility criteria for territories to receive support from the Just Transition Fund. In particular, it specifies that, to qualify, territories must demonstrate a dependency on fossil fuels (such as coal, lignite, peat, oil shale, heavy oil, and diesel) and/or greenhouse gas (GHG)-intensive industrial activities; they must also show that they are significantly impacted economically and socially by the transition to a climate-neutral economy, particularly in terms of job losses and changes in production processes in high GHG industries. Hence, regions that require the most support to adapt to climate neutrality due to the decline or transformation of their economic sectors are the primary focus of the JTF. Member States need to prove the expected changes in local labor market skills, employment reduction in fossil fuel industries, or transformation of high

GHG industrial processes. Special consideration is given to islands or outermost regions, recognizing their unique challenges in the energy transition. Moreover, if a Member State requests additional territories to be included in the JTF scope, such requests will be assessed based on the aforementioned criteria, considering the definition of the area, affected sectors, socio-economic impacts, and alignment with the Commission's geographical priorities. The Commission formally responds to these requests through program adoption or amendments.

The TJTPs allow each territory to allocate the JTF funding for a variety of purposes: support for SMEs, including microenterprises and startups; research and innovation activities by universities and public research bodies; development of renewable energy and energy efficiency projects; enhancement of smart and sustainable local mobility, including the decarbonization of local transport sectors and their infrastructure; modernization of district heating networks; and digital innovation. Additionally, the JTF can support circular economy initiatives such as waste prevention, resource efficiency, and recycling; upskilling and reskilling of workers and job seekers, along with job search assistance and active inclusion programs; and educational and social inclusion projects, including infrastructure investments for training centers and care facilities for children and the elderly.

Table 2 presents the overall JTF allocations as documented by the "National Just Transition Programs" (NJTPs) of the three countries analyzed in this study: Italy, Spain, and Germany. Italy was allocated over € 1 billion to deliver a just climate transition in Taranto (Apulia) and in Sulcis Iglesiente (Sardinia) by fostering economic diversification and job creation in green sectors, including renewable energy. Spain was allocated almost € 869 million from the JTF to advance in the transition towards a climate-neutral economy; the JTF funding is supposed to deliver a just climate transition in the areas most affected by the closures of coal mines and coal power plants, that are: Asturias (Asturias), A Coruña (Galicia), León and Palencia (Castilla y León), Teruel (Aragon), Cádiz, Córdoba and Almería (Andalucia), Alcudia (Islas Baleares, Mallorca). The € 2.5 billion of JTF funding allocated to Germany are addressed to six major territories moving from coal-based and lignite mining industries to industries based on renewable energy: the Lausitzer Revier (in Brandenburg and Saxony) and Schwedt/Oder in Uckermark (Brandenburg); the Rheinisches Revier and Northern Ruhr area in North Rhine-Westphalia; the Mitteldeutsches Revier in Saxony and Saxony-Anhalt; and the city of Chemnitz (Saxony).

Table 2: The allocations of the JTF funding (millions of euros) in Italy, Spain, and Germany

Country	Total JTF Funding	Of which EU contribution	Territories
Italy	€ 1,211	€ 1,030	Taranto (Puglia), Sulcis Iglesiente (Sardinia)
Spain	€ 1,255	€ 869	Asturias (Asturias), A Coruña (Galicia), León and Palencia (Castilla y León), Teruel (Aragon), Cádiz, Córdoba and Almería (Andalucia), Alcudia (Islas Baleares, Mallorca)
Germany	€ 4,044	€ 2,478	Lausitz Revier (Brandenburg and Saxony) and Schwedt/Oder in Uckermark (Brandenburg); Rhenish district and Northern Ruhr (North Rhine-Westphalia); Mitteldeutsches Revier (Saxony and Saxony-Anhalt) and the city of Chemnitz (Saxony)

Source: Italian, Spanish, and German NJTPs.

4.1 The case of Italy: The National JTF program and the territories of the JT

The National Just Transition Program for Italy, approved in December 2022, identifies the Sulcis Iglesiente area in Sardinia and the province of Taranto in Apulia as the territories most significantly affected by the transition towards a climate-neutral economy. In total, slightly more than € 1 billion have been allocated for these areas, including national co-financing. The Sulcis Iglesiente area will receive about 30% of these funds, amounting to just under € 400 million, while the Taranto area will receive two-thirds of the total, approximately € 800 million. An additional € 48 million are earmarked for technical assistance, accounting for 4% of the total funds. Regional authorities have been tasked with creating Territorial Plans for each area through a participatory process and by enhancing social dialogue with workers' representatives.

The Sulcis Iglesiente region has historically been a hub for metallurgical production, particularly of aluminum and non-ferrous metals (lead and zinc), alongside agriculture which contributes significantly to regional GDP but suffers from low productivity. Its main industrial center, Portovesme, underwent restructuring and privatization in the 1990s and has since struggled to establish a new industrial identity. A coal-fired thermoelectric power station operated by ENEL has been active in the area since 1963. Additionally, the Carbosulcis mine in the region is currently in the process of closure (Greco et al. 2023). The region faces significant employment and investment challenges. According to the Territorial Just Transition Plan for Sulcis Iglesiente, the unemployment rate in 2019 was 16.1%, higher than both the regional and national averages of 14.7% and 10%, respectively. The inactivity rate is particularly high among women and youth. The region also has one of the highest percentages of *Not in Education, Employment or Training* (NEETs) among young people in Italy, at 36.7%, with over 60% of residents not having education beyond secondary school. This trend shows no signs of improvement due to low university enrollment and high school dropout rates, coupled with a significant skills mismatch in key economic sectors. The energy transition also poses potential risks, as Sardinia has the highest energy costs in Italy. Despite ranking second after Sicily in renewable energy potential, the region experiences significant energy poverty, affecting 14% of its population. The Portovesme industrial area also contends with pollution from industrial and mining activities, with ongoing but incomplete remediation efforts. While pollution emissions have generally decreased in recent years, with a 4.6% reduction in CO_2 emissions attributed to local Emission Trading System (ETS) facilities, tourism is emerging as a growth area. There is a particular focus on slow tourism and on enhancing the archaeological heritage, which are seen as key opportunities for sustainable development in the sector. However, an effective reconversion plan for Sulcis is crucial to overcoming these challenges, which in turn is closely tied to the requalification of local workers.

Turning to Apulia, Taranto hosts the largest steel production complex in Europe, “Acciaierie d’Italia” (formerly “ILVA”), which utilizes the continuous casting production process (Dunford and Greco 2007). The operation of the plant and its recurring production crises have posed significant economic and environmental challenges for the area (Greco et al. 2023). Along with three other industrial sites, the ILVA plant accounts for more than half of the regional ETS emissions, contributing to poor air quality and elevated disease and mortality rates; it also impacts local water and soil quality. Out of 541 confirmed contaminated sites in Apulia, 77 are in Taranto, which was designated a Site of National Interest for decontamination in 2000. Remediation efforts are ongoing but remain insufficient. Taranto's labor market has faced persistently high unemployment (Greco et al. 2023), with rates at 13% in 2019 and youth unemployment at nearly 31% (TJTP – Province of Taranto). This severe employment situation, worsened by the 2008 financial crisis and COVID-19, is compounded by educational shortcomings, with less than half the population holding a secondary school level education. Additionally, low university enrollment and high school dropout rates exacerbate skills mismatches in the job market, complicating the recruitment of highly specialized personnel. Inefficiencies in employment services, highlighted by understaffing, further obstruct job search efforts. Strategic diversification efforts aim to enhance Taranto’s cultural heritage and tourism

potential. Logistics, port infrastructure, the blue and energy economies, and agriculture are identified as key sectors for local development (Greco et al. 2023; TJTP – Province of Taranto). Amidst reducing industrial capacity and the emergence of new sectors, there is a growing need for both young and older workers to acquire new professional and green skills, underscoring the importance of reskilling and upskilling to adapt to the evolving economic landscape.

For both areas, the JTPs outline three main priorities for the transition: (i) increasing renewable energy usage, (ii) promoting economic diversification, and (iii) mitigating the social and employment impacts of the transition. Regarding active labor market policies (see *Table 3*), both plans primarily allocate financial resources towards initiatives designed to enhance access to the labor market and support workers, businesses, and entrepreneurs in adapting to the green transition. Additionally, the Sulcis JTP allocates resources to strengthen labor market institutions and services. Specifically, the strategy for Sulcis targets unemployed individuals, first-time job seekers, workers at risk of job loss, and potential entrepreneurs. Action 1.7 of the plan allocates funds for the training and retraining of unemployed and at-risk workers impacted by the green transition. This action includes provisions for an attendance allowance for all participants in the training programs, which are scheduled to last approximately two months. Special attention is given to women and young people at risk of school dropout or who have already left the educational system, with training focused on green jobs.

Table 3: Active labor market policies in Italy by type of intervention, territory, and JTF funding (millions of euros)

Active labor market interventions	**Territories**	
	Sulcis Iglesiente	**Taranto**
Measures to improve access to the labor market	€ 90	€ 156
Measures to modernize and strengthen labor market institutions and the services useful to assess and anticipate necessary skills and to ensure timely and targeted assistance and support	€ 0.85	€ 0
Actions to support the adaptation of workers, businesses, and entrepreneurs to the green transition	€ 3	€ 5
Total	€ 94	€ 162

Source: Italian NJTP.

As of the drafting of this report in spring 2024, the regional government of Sardinia has issued a call for tenders (deadline: May 15; budget: approximately 6 million euros) for up-skilling and re-skilling programs in the Sulcis Iglesiente area. To obtain the funding, these programs must fall into six fields: (i) training and re-skilling for unemployed and at-risk workers; (ii) expansion of educational programs to incorporate new training pathways; (iii) enhancement of job seeker assistance services, including facility expansion; (iv) support for new business creation via improved labor market services; (v) active inclusion of job seekers with additional support measures, such as attendance allowances for training participants; (vi) establishment of new educational and social inclusion infrastructures, with ongoing evaluations during implementation.

In the province of Taranto, similar strategic priorities are evident. Action 2.7 of the related plan supports the development of retraining courses for workers at risk of losing their jobs due to economic transitions, as well as creating training pathways for economic diversification and enhancing job search services. These initiatives aim to soften the impact of rapid economic changes by improving access to employment for the unemployed, women, and youth, and by creating new income opportunities for single-income families, who are particularly vulnerable

during these transitions. Additionally, this action includes an active inclusion strategy for job seekers, providing a participation allowance for those involved in the training activities outlined in the plan, which last approximately two months, akin to a probation period. In conclusion, the initiatives described in the Territorial Just Transition Plans for Sulcis-Iglesiente and Taranto, especially in active labor market policies, are designed to support the green transition by enhancing the skills of workers and unemployed individuals, as well as by facilitating a better alignment between labor demand and supply.

4.2 The case of Spain: The National JTF program and the territories of the JT

Spain has embarked on a comprehensive Just Transition Strategy, with significant efforts directed towards regions like Asturias (Asturias), A Coruña (Galicia), León and Palencia (Castilla y León), Teruel (Aragon), Cádiz, Córdoba and Almería (Andalusia), Alcudia (Islas Baleares, Mallorca). These regions are facing significant socio-economic challenges as they transition towards a climate-neutral economy, which entails the closure of coal mines and decommissioning of coal-fired power plants.[11] This shift brings substantial social and economic consequences to the affected areas, resulting in a temporary increase in the country's energy dependency. Additionally, many of these areas are dealing with depopulation and weak economic performance, which exacerbate the negative impacts of the decarbonization process. In this respect Spain has notably been a pioneer globally to ensure a fair and equitable transition. In 2020, as part of its Strategic Framework for Energy and Climate, the Spanish government has set up the Institute for Just Transition (ITJ), which has developed the Spanish Just Transition Strategy. Through the ITJ, significant resources have been mobilized to revitalize the most affected areas. Most of these resources come from European Just Transition funds, Next Generation EU funds, the National Recovery and Resilience Plan and other national fundings. The Spanish Territorial Just Transition Plan 2021-27 has been approved in December 2022 by the European Commission, alongside the Spanish Just Transition Program 2021-27. However, these initiatives have been preceded by other national efforts aimed at facilitating a just transition.

More in detail, already in 2019, in line with the European regulations, the Spanish government has established the Strategic Framework for Energy and Climate structured on three pillars: (i) the climate change law, (ii) the Spanish National Integrated Plan on Energy and Climate (PNIEC) (2021-2030) and (iii) the Just Transition Strategy. In 2020, the Spanish Strategy for Science, Technology and Innovation (2021-27) has been approved; one of the strategic lines is "Climate, Energy and Mobility" including climate change and decarbonization, sustainable mobility and sustainable cities and ecosystems (MCI 2020). Like for Italy, following the crisis after the COVID 19 pandemic, the EU has proposed a plan for the recovery of the economy; this is the National Plan for Recovery, Transformation and Resilience which is also dedicated to the ecological transition[12].

A key implementation mechanism of the Just Transition Strategy is the use of *Just Transition Agreements*. These agreements act as comprehensive regional action plans aimed at supporting economic activity, promoting diversification, and fostering employment in areas vulnerable to the phase-out of coal. They outline specific timelines and strategies for the implementation of initiatives to facilitate a smooth transition away from coal-dependent

[11] According to IndustriALL (2021), by the end of 2018, Spain had 14 operational coal-fired power plants: 4 in Asturias, 4 in León and Palencia (Castilla y León), 3 in Cádiz, Almería, and Córdoba (Andalucía), 2 in A Coruña (Galicia), and 1 in Teruel (Aragon), with a total installed capacity of approximately 10,000 MW. About 3,300 individuals were employed in the operation and maintenance of these plants. Nearly all of Spain's remaining coal mines, located in Asturias, Palencia, Teruel, and León, closed in December 2018. Subsequently, in July 2020, the coal-burning thermal power stations also ceased operations. These closures, stemming from a historic agreement among the government, employers, and trade unions, were expected to result in the loss of approximately 6,700 direct jobs held by miners and thermal power station employees.

[12] The third chapter of the Spanish government's Recovery, Transformation and Resilience Plan includes the development of a decarbonized, competitive and efficient energy sector. This chapter aims to mobilize significant private investment, with the objective of leveraging renewable potential and existing value chains to strengthen competitiveness for domestic and export markets.

industries[13]. There are currently 15 Just Transition Agreements – *Convenio de Transición Justa* (CTJ) – in place in the following regions: Asturias: CTJ Suroccidente; CTJ Valle del Nalón; CTJ Valle del Caudal and Aboño; Andalusia: CTJ Valle del Guadiato; CTJ Los Barrios; CTJ Carboneras; Aragón: CTJ Aragón; Balearic Islands: CTJ Alcúdia; Castilla y León: CTJ El Bierzo-Laciana; CTJ Montaña central leonesa-La Robla; CTJ Guardo-Velilla; CTJ Garoña; Castilla-La Mancha: CTJ Zorita; Galicia: CTJ As Pontes; CTJ Meirama.

The agreements prioritize maintaining and creating economic activity and employment, as well as stabilizing populations in rural or coal mining areas, including regions with coal-fired power plants or nuclear plants undergoing closure. They aim to promote diversified and specialized economic activities that align with the local socio-economic context. They support collective sectors through investments, territorial restoration, assistance for industrial projects, development of small and medium-sized enterprises and worker retraining initiatives. The development of the agreements involves participatory processes, including assessments of potential job losses, and commitments are made to maintain employment and population levels (ITJ 2023).

To provide institutional support to the just transition process, two specific public bodies have been created: besides the Institute for Just Transition (https://www.transicionjusta.gob.es/), there is also the Institute for the Diversification and Saving of Energy (IDAE) (https://www.idae.es/). Between 2018 and 2022, this support has been channeled through two main lines of action (ITJ 2022c) towards:

- Social plan for coal mining workers, which includes early retirements, incentivized leave, and unemployment assistance. The ITJ has provided aid for the early retirement of 323 workers amounting to € 19 million, with the total cost of maintaining these workers in the labor market estimated at around € 126 million. As of December 31-2021, compensated retirements totaled € 540 thousand.
- Investment in 400 projects in territories covered by Just Transition Agreements, amounting to a total investment of € 338.9 million. These projects are expected to lead to the creation of approximately 2170 jobs (ITJ 2023).

Focusing on the Territorial Plan for Spain, the following actions can be identified: (i) ecological transformation of industry and promotion of sustainable mobility, circular economy and energy efficiency; (ii) boosting the value chain of renewable energies, self-consumption, energy storage and renewable hydrogen; (iii) promotion of SMEs and business projects that are drivers for the economic diversification of the territories; (iv) promotion of research, development and innovation (R&D&I), the integration of ICTs and digital transformation; (v) environmental rehabilitation, conservation of nature, biodiversity and ecosystems, promotion of historical, cultural and industrial heritage, and promotion of sustainable tourism and (vi) promotion of social infrastructures, social economy and training and qualification initiatives[14]. With respect to the latter, the Plan mentions that "there is, therefore, a need for training and

[13] The climate change law established that the so-called Just Transition Agreements (JTAs) are the Institute's main tool for implementing the Just Transition Strategy in the territories affected by the closure of coal mines and thermal and nuclear power plants. They have been presented as "a tool for co-governance aimed at guaranteeing the commitment and coordination of public administrations and proposing support instruments in the Just Transition process". While sectoral agreements are at state level and focus on selected companies and workers, just transition agreements focus on the territory.

[14] More in detail, the Spanish Territorial Just Transition Plan builds upon previous efforts and identified needs in affected areas, aiming to expand, improve, and complete ongoing initiatives with the following objectives: "(i) Contribute to achieving the goals outlined in the Just Transition Strategy and its Urgent Action Plan, ensuring that closures in affected areas do not result in negative impacts on employment and local communities in the medium term; (ii) Support emerging projects in affected areas to foster economic diversification; (iii) Promote the decarbonization and industrial renewal process, especially in areas with high industrial emissions; (iv) Develop tailored solutions for challenging and rural areas; (v) Foster business projects that enhance economic sustainability in these regions; (vi) Extend the scope of action beyond the areas covered by Just Transition Agreements to the provincial level; (vii) Attract investments that generate incomes comparable to those lost due to closures; (viii) Promote energy innovation solutions adapted to local contexts; (ix) Preserve and celebrate the identity of these areas, highlighting their mining and industrial heritage; (x) Provide comprehensive support to affected workers and unemployed individuals through vocational training and requalification programs; (xi) Ensure efficient utilization of resources across all involved administrations" (*TJTPs* 2021, p. 6).

vocational training programmes and actions to support labor market integration into the labor market. These should pay special attention to the surplus working population of the coal activities, to unemployed people, women, and other vulnerable groups such as people over 45 years of age and people with disabilities, ensuring the accreditation of professional competences" (Spanish NJTP 2021: 9). *Table* 4 illustrates the allocation of JT funds across various territories in Spain, while *Table* 5 details the types of active labor market interventions planned for each territory along with the corresponding Just Transition funding.

Table 4: Spanish JTF overall funding (€ million) by territory

Territories	**JTF Funding**	**%**
Asturias	€ 263	30.3
A Coruña	€ 111	12.8
León	€ 126	14.4
Palencia	€ 72	8.2
Teruel	€ 92	10.6
Cádiz	€ 70	8.0
Córdoba	€ 32	3.7
Almería	€ 52	6.0
Alcudia	€ 17	2.0
Total	€ 869	100.0

Source: Spanish NJTP.

Table 5: Active labor market polices in Spain by type of intervention, territory, and JTF funding (€ million)

Active labor market interventions	Territory
	Asturias
Infrastructure for vocational education and training and adult learning	€ 12
Specific support for youth employment and the socio-economic integration of young people	€ 3
Support for the adaptation of workers, companies and entrepreneurs to change	€ 4
Total	€ 19
	A Coruña
Infrastructure for vocational education and training and adult learning	€ 3
Measures to improve the access to the labor market	€ 3
Supporting the development of digital capabilities	€ 0.8
Total	€ 7
	Leon
Infrastructure for tertiary education	€ 2
Measures to improve the access to the labor market	€ 5
Total	€ 8
	Palencia
Infrastructure for tertiary education	€ 9
Measures to improve the access to the labor market	€ 3
Total	€ 13
	Teruel
Measures to improve the access to the labor market	€ 9
Measures to modernize and strengthen labor market institutions and services to assess and anticipate skills needs and ensure personalized and timely assistance	€ 2
Supporting the development of digital capabilities	€ 4
Support for adult education (excluding infrastructure)	€ 4
Total	€ 19
	Cádiz
Measures to improve the access to the labor market	€ 2
Total	€ 2
	Almería
Measures to improve the access to the labor market	€ 1
Total	€ 1
	Córdoba
Measures to improve the access to the labor market	€ 1
Total	€ 1
	Alcudia
Support for adult education (excluding infrastructure)	€ 0.7
Total	€ 0.7

Source: Spanish NJTP.

4.3 The case of Germany: The National JTF program and the territories of the JT

Germany committed to 65% less CO_2 emissions by 2030 and climate neutrality by 2045. The country's commitment to phase-out coal by 2038, or earlier, will be an important step towards its climate goal. The European Commission's Just Transition Fund strategy in Germany focuses on supporting the following six major territories affected by the coal phase-out: the Lausitzer Revier (in Brandenburg and Saxony) and Schwedt/Oder in Uckermark (Brandenburg); the Rheinisches Revier and Northern Ruhr area in North Rhine-Westphalia; the Mitteldeutsches Revier in Saxony and Saxony-Anhalt; and the city of Chemnitz (Saxony). The German federal states of Brandenburg, North Rhine-Westphalia, Saxony, and Saxony-Anhalt launched the JTF program in October 2022 to facilitate the transition of these eight

identified territories to a green economy. The JTF will distribute € 2.5 billion to assist these regions.

The German JT strategy is implemented within the framework of the European Social Fund (ESF) and European Regional Development Fund (ERDF) during the funding period 2021-27. The ESF is already used in many projects aimed at improving the living conditions of people, for instance in North Rhine-Westphalia. In addition to the financial resources provided by the ESF regulation, the JTF specifically supports the goal of managing the transition to a climate-neutral economy in the selected areas particularly affected by the gradual phase-out of coal, as identified by the territorial plans, part of the ERDF/JTF 2021-27 program approved by the EU Commission for each federal state. *Table* 6 reports the distribution of JTF funding across the designated German regions.

Table 6: German JTF total funding (€ million) by territory

Territories	JTF funding	%
Brandenburg (Lausitz Revier and Schwedt/Oder)	€ 785	31.7
North Rhine-Westphalia (Rhenish district and Northern Ruhr)	€ 680	27.5
Saxony (Lausitz Revier and Mitteldeutsches Revier)	€ 645	26.1
Saxony-Anhalt (Mitteldeutsches Revier and the city of Chemnitz)	€ 364	14.7
Total	€ 2,474	100.0

Source: German NJTP.

More in detail, in North Rhine-Westphalia JTF investments will focus on land restoration from lignite mines, fostering new SMEs and startups in green sectors like resource efficiency and circular economy, and providing targeted training and coaching in the Rheinisches Revier to support job retention as the region moves away from lignite mining. Brandenburg will get JTF funding to diversify from its lignite and petrol-based economy, with significant investments in the Lausitzer Revier. This includes supporting innovative SMEs and establishing a hydrogen plant to replace lignite-based production. Additional investments will focus on renewable district heating, an innovation campus, and job training, aimed at maintaining employment for local workers and attracting skilled youth. In Saxony, JTF allocations will be invested to ensure a just transition in the Lausitzer Revier, the Mitteldeutsches Revier, and the city of Chemnitz; these are areas heavily reliant on lignite mining and energy production. The funds are supposed to boost innovation, especially in renewable energy and circular economy, replacing traditional raw materials like gypsum with green, hydrogen-based alternatives, and facilitating job creation in SMEs. Moreover, the funds will help reskilling almost 1,300 people and expand vocational schools. Saxony-Anhalt will receive JTF to aid in the greening and gradual cessation of lignite use in the Mitteldeutsches Revier. The JTF will support the clean-up of mining sites, the creation of green SMEs and startups, and the establishment of a new hydrogen infrastructure. Training programs will also be enhanced to ensure that workers in the lignite sector can transition to new jobs within the green economy. The fund will also implement measures in line with the New European Bauhaus, such as the use of alternative raw materials.

Nevertheless, there is ongoing debate regarding the actual allocation of these funds. The Länder governments are concerned that the Just Transition Fund (JTF) will not deliver additional benefits to the mining regions but rather assist the national government in funding the initiatives as outlined in the Structural Strengthening Act (SSA) (Klemp and Budke 2020). The National Ministry for Economic Affairs and Energy has confirmed that the government does not intend to provide extra support through the JTF for these regions. Instead, the funds

will be allocated to finance the SSA's measures,[15] justifying this approach by stating that the SSA's funding level was mutually agreed upon with the mining regions and Länder and therefore no reason exists to increase this volume with the JTF (BMWi 2020).

Table 7: Active labor market polices in Germany by type of intervention, territory, and JTF funding (€ million)

Active labor market interventions	Territories	
	Lausitz	**Schwedt/Oder**
IT services and applications for digital competence and digital inclusion	€ 0	€ 10
Development of skills for smart specialization, industrial change, entrepreneurial initiative, and adaptability of companies to changes	€ 4	€ 4
Educational institutions (primary and secondary levels)	€ 0	€ 2
Educational institutions (vocational training, further education, and adult education)	€ 43	€ 30
Support for the development of digital skills	€ 0	€ 1
Support for the adaptation of workers, companies, and female and male entrepreneurs to changes	€ 11	€ 1
Support for primary and secondary education (excluding infrastructure facilities)	€ 1	€ 0
Support for adult education (excluding infrastructure facilities)	€ 0	€ 0.5
Total	€ 60	€ 40

Source: Brandenburg NJTP.

Both the Lausitz coal region in Brandenburg and Saxony and the Schwedt/Oder refinery region in Uckermark aim to mitigate the impacts of economic transitions by creating sustainable employment opportunities and improving local infrastructure and education systems. *Table 7* details the allocation of JTF funds designated for supporting planned active labor market interventions in these regions.

The North Rhine-Westphalia (NRW) state government actively supports the adaptation of workers and enterprises through a variety of funding programs, included those with a specific focus on the fields of the green economy. Through the Just Transition Fund, managed by the Ministry of Labor of North Rhine-Westphalia, will approximately € 120 million be allocated for employment and social policy measures. When it comes to active labor market interventions, both in the Rhenish district and Northern Ruhr area, JT financial resources are directed towards initiatives focused on enhancing vocational training, continuing education, and retraining opportunities for individuals who have become unemployed due to the shift to a climate-neutral economy. This includes measures tailored to support small and medium-sized

[15] In June 2018, the German government formed the Commission on Growth, Structural Change, and Employment, also known as the Coal Commission. This multi-stakeholder body, including government officials, workers, and representatives from trade associations, environmental organizations, and research bodies, was charged with devising a plan to phase-out coal and lignite power in Germany. Their recommendations supported the goal of eliminating coal power by 2038 to reduce greenhouse gas emissions. Following the commission's advice, the Coal Power Generation Termination Act (CPGTA) was enacted in 2020, mandating the closure of all coal-fired power stations and lignite mines by 2038. This act also provides financial support for workers affected by the phase-out, offering adjustment money until they are eligible for pension benefits. Additionally, the Structural Strengthening Act (SSA) was passed in 2020 to implement the commission's structural policy recommendations. It aims to economically support coal-dependent regions with €40 billion in funding allocated through 2038, potentially extending to 2041. This includes € 14 billion for investments in lignite regions and € 26 billion for support through national programs and infrastructure projects to improve connectivity. The National-Länder Coordination Committee – comprising representatives from the national government, including the National Ministry for Economic Affairs and Energy, and the lignite states (Brandenburg, Saxony, Saxony-Anhalt, and North Rhine-Westphalia) – oversees these programs to ensure proper funding alignment with the closure of lignite plants, aiding the transition from coal dependency and boosting regional development.

enterprises (SMEs) in the coal industry and their employees, providing qualifications, training, continuing education, retraining, and counseling services. At present, North Rhine-Westphalia is the only state where the first projects under the JTF, focusing on upskilling and reskilling workers, are being initiated. Since March 2024, the "Coach2Change" program has been implemented to offer individual, job-related transformation coaching for employees in SMEs located in the JTF area of the Rhenish district and the Northern Ruhr region. The coaching is designed to enable employees to modify work structures and processes in such a way that their companies can handle the challenges of the transformation. EU-funds also support the Saxon economy to become greener and less carbon intensive and to alleviate the socio-economic consequences of the climate transition. The related funding will be allocated to the Lausitzer Revier, the Mitteldeutsches Revier and the city of Chemnitz. They are part of the area which will be most severely affected by the phasing-out of lignite mining for electricity generation and the transition to a climate neutral and circular economy. Out of the total of € 645 million available for Saxony, € 375 million are designated for use in the Lausitz region, € 200 million in the Central Germany region, and € 70 million in the city of Chemnitz.

Active labor market initiatives under the JT funding in Saxony are specifically aimed at facilitating the adaptation of employees to new realities in the energy sector and circular economy. This entails raising awareness among companies and workers, identifying evolving needs, and addressing emerging gaps through targeted measures such as consultations, additional training, and knowledge exchange initiatives. The funding priorities include strengthening vocational schools. Specifically, with the help of € 32 million from the JTF, vocational schools will be specifically supported to enhance the quality and attractiveness of training and to strengthen the profiles particularly important for future industries in the JTF regions. These include careers in electrical engineering, energy, and construction technology, as well as hydraulic engineering. Vocational school centers will be transformed into regional competence hubs, fostering collaboration with general education schools, universities, and local businesses. The focus is on equipping school authorities with technical advancements and updating professional profiles, while training teachers on climate policy and regional challenges. Ultimately, this effort aims to address future qualification needs and empower teachers to drive structural change.

The Mitteldeutsches Revier of Saxony-Anhalt has a rich heritage that highlights the profound impact of lignite coal on its landscape, communities, and economic structures over the years. Out of the total € 364 million allocated for Just Transition funding, approximately € 59 million are designated for initiatives targeting active labor policies specifically for the regions within the Central German Mining District. *Table* 8 outlines the details of active labor market interventions and their corresponding JTF allocations.

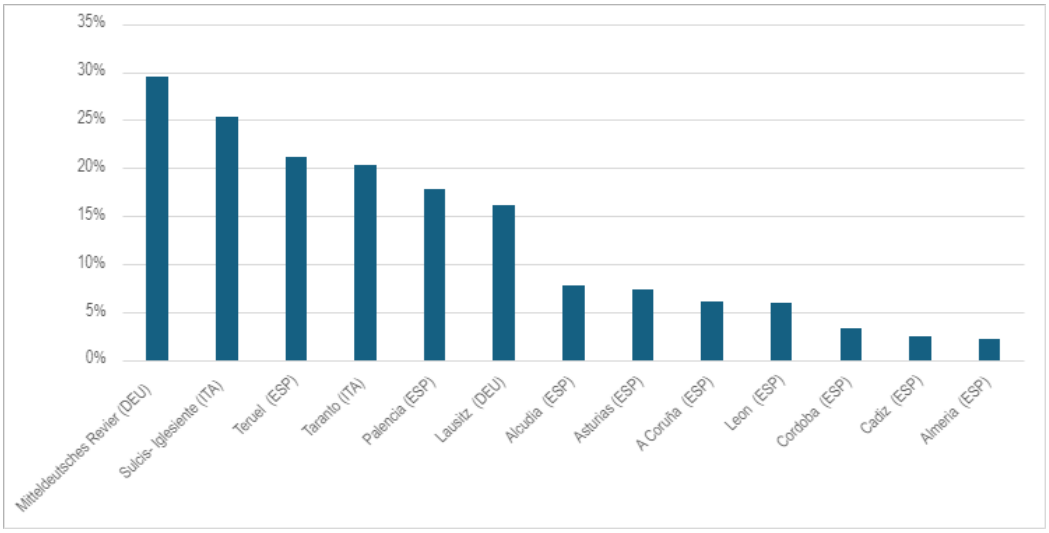
Table 8: Active labor market polices in Germany by type of intervention, territory, and JTF funding (€ million)

Active labor market interventions	Territory Mitteldeutsches Revier
Educational Institutions (Primary and Secondary Education)	€ 23
Educational Institutions (Vocational Training and Adult Education)	€ 23
Measures to Improve Access to the Labor Market	€ 6
Support for Aligning Supply and Demand on the Labor Market and for Labor Market Transitions	€ 3
Support for Adapting Workers, Businesses, and Entrepreneurs to Changes	€ 5
Total	€ 60

Source: Saxony-Anhalt NJTP.

The bar chart (*Figure 4*) illustrates the distribution of the active labor market policies (ALMPs) under the Italian, Spanish and German JT programs by territory. As can be seen, there is a significant variance in ALMPs allocations across different territories. The Mitteldeutsches Revier in Germany allocates the highest proportion (nearly 30%) of its JTF funding to ALMPs. The shares then decrease gradually, with the lowest observed in three regions of Andalusia – Córdoba, Cádiz, and Almería – in Spain. Among Spanish regions, only Teruel reaches the share of 20%. In Italy, instead, both regions, Sulcis-Iglesiente and Taranto, heavily rely on ALMPs, allocating 25.4%. and 20.3% of their JTF resources respectively.

Figure 4: The share of active labor market policies on JTF by territory



Source: own elaboration based on data from Italian, Spanish and German TJTPs.

5. The Just Transition Fund in action

In this section we complement the desk research on the national and regional plans of the Just Transition by presenting some qualitative evidence coming from some interviews carried out in the three countries selected for this chapter. Semi-structured interviews focusing on the state of implementation of the active labor market policies in JT programs were carried out with (i) the JTP Coordinator at the European Commission's Directorate-General for Regional and Urban Policy (DG REGIO); (ii) the Managing Authorities (MA) Officers of the JTF for selected regions; (iii) a representative for the German Trade Union Federation, an umbrella organization for eight trade unions in Germany. Although limited in their number, such interviews involving interviewees with different roles and backgrounds allow to highlight some of the key issues concerning the implementation of upskilling and reskilling measures within the JTF, deserving further future research.

5.1 The state of implementation of upskilling and reskilling policies in the Just Transition territories

In the JT territories analyzed in this study, the state of implementation of actions addressed to the upskilling and reskilling of workers is heterogeneous. In the Italian territories of Sulcis Iglesiente and the province of Taranto such actions are in a very embryonic state. Both MAs are involved in the preliminary activity of mapping the initiatives that already exist in this field in their territories. This appears to be a crucial administrative step with the aim to avoid duplications and design more effective initiatives as financial resources are available from different funds for active labor market policies, such as the cohesion funds as well as from the

National Recovery and Resilience Plan (NRRP). As indicated by the Sardinia Official of the MA: *the Sardinia Region has published a tender notice last December within the framework of the European Social Fund on initiatives of upskilling and reskilling, by using JT resources, in order to test the responsiveness of the local territory.* Evidence from this tender is not available yet but it signals extreme caution in the starting phase of implementation at the local level.

The situation is different in the German case. As indicated by the representative of the General Trade Union Federation, some programs are already running, such as *Fit for Future* and *Coach for Change,* the latter being addressed to companies and workers that can get a coach or a consultant to support new training activities and business development. The slow and heterogenous implementation of JTF actions is confirmed by the JTP Coordinator at the European Commission. Overall, considering the different amounts of financial resources allocated to Member States at the EU level, only about 6% of the total JTF allocation had been spent by March 2024. Actions on upskilling and reskilling appear to be even more delayed. Although the rate of spending is not very high, at the EU level there is confidence about the speeding up of overall programs in the coming months due to the activation of the assistance mechanism that should enhance the implementation.

5.2 Planning and implementing effective upskilling and reskilling policies

To plan and implement effective upskilling and reskilling policies several aspects are highlighted by the interviewees.

Firstly, coordination is essential between initiatives and policies for the upskilling and reskilling of the local workforce and initiatives/policies addressed to strengthen the entrepreneurial structure and/or its diversification towards the green economy. In other words, upskilling and reskilling interventions are called to be coherent with the more general strategy of development designed for a specific territory to enhance its capacity to shift to a more sustainable society and economy. As pointed out by the Managing Autority officer for the Apulia Region: *if those initiatives [addressed to companies].. aim to shift the attention away from what was the previous source of income [reference to the steel plant], the diversification strategy must consolidate and the initiatives [training] to support people must, however, be coherent. We cannot send out tenders concerning training ….., because we might not be able to match the needs of the companies that are going to be established or consolidated.*

Secondly, qualitative evidence suggests that the effectiveness of training policies is also ensured by the design of targeted and tailored interventions that are in line with the specific needs of the local context and workforce. Both Italian MAs show great attention to ensure that skill formation responds to and matches with the needs emerging from the local production context. This should be conceived as made of private companies as well as by third sector organizations (non-profit organizations, cooperatives, etc.) and public institutions. With concern to the workforce, besides the acquisition of green skills as requested by a program conceived to ensure the shift to a more sustainable model of development, basic formation is also planned as the education and training levels of the local population in both areas are extremely low.

As stressed by the TU representative, interventions and measures should also target different types of workers: older people, less educated ones, low skilled, unskilled. The Italian MAs appear fully aware of the challenge they face in this regard, and this is especially apparent in the words of the Sardinia Region officer.

The other problem of the territory; its picture also tells us that there is a fairly low schooling rate, that is, the majority of the population gets middle school levels [it is the degree obtained by 14 years old] and in advanced age.

Also, to address this concern, the MA of the Taranto's program is planning to involve local stakeholders to discuss its Operational Plan, namely the document that synthesizes its strategy on the JTF for the area.

The importance of mapping skill needs is stressed by the Officer of the European Union as well as by the Unions representative according to whom: *the problem is not so much the skill mismatch but the mismatch deriving from uncertainty.* In this regard, the use of the Technical Assistance could support local territories and especially those local authorities that are at the forefront of these activities. As observed by the EU JT Platform Coordinator, so far only few States have asked for technical and advisory assistance.[16]

5.3. Critical issues and opportunities of the JTF in the field of active labor market policies

Interviewees undoubtedly consider the JTF as an important opportunity for the diversification of the areas that face the hardest consequences of the climate transition. Overall, it deals with a program that provides additional resources that are targeted at sub-national level and cannot be spent elsewhere. According to the officer of the Apulia MA: *one should value the additionality logic of the JTF.*

This is reiterated by the EU Officer when she stressed that: *it's very important to stress that this element of support that comes from JTF for reskilling and upskilling activities is really key in the JTF and this is different than in many other funds because JTF is [territorially] focused.*

More importantly, the JT should be regarded as a tool that allows a strategy of socio-economic change to start becoming a reality in the areas involved. The provision of dedicated resources allocated based on a plan, approved at national and European levels, represents a way for communities to start thinking differently about their common destiny; such a strategy and its concrete impacts and consequences should be therefore expected to deliver their effects in the long run.

Critical issues have also emerged. It is a specificity of the Italian case that the National Recovery and Resilience Plan (NRRP) finances training programs, such as the GOL program, that have the same target beneficiaries. Overlapping policies, measures, and interventions risk diminishing their effectiveness, particularly because they are managed by different administrative levels. Local authorities involved in managing the JTF are especially focused on avoiding duplications that could lead to a waste of resources. Another critical issue emerging from the interviews is timing: 70% of the JTF is required to be spent by 2026. This is an extremely limited time horizon for the ambition of the program. Besides time, the JTF creates differences and inequalities among territories and among sectors which are a source of concern. As indicated by the German trade union association: *As you can imagine there are big discussions … as there are regions that aren't covered by the JTF and this is not fair because we are facing the same challenges with transition, but we get not support, we get no money…. It is the case of the automotive industry and suppliers which are located in a different region, and they cannot benefit from the JTF.*

[16] Since 2023, the Commission has provided technical assistance to JTF regions in order to provide the JTF managing authorities in those regions with further administrative capacities and, thus, better support them in the implementation of the strategies and actions envisioned in the TJTPs.

Some interviewees reflect on the main targeted beneficiaries of the JTF, namely SMEs, and this is a source of concern. In contrast to large companies (excluded by the program), that can also exploit their internal labor market, SMEs have greater difficulties in retaining their workers and in envisaging and planning adequate training activities. In most cases they are unable to identify their current and future skill needs. It is precisely for this reason that in the German case the JTF is also being used to hire a Human Resources (HR) manager in charge of helping with training interventions. A further difficulty of SMEs is connected to their involvement in traditional activities and their incapacity to demand innovative training and competencies.

A possible reason explaining the generalized difficulty with the planning for training activities is identified by the EU officer when stressing that: *…there are gaps, for instance, as regards the identification of needs for vocational training, or there are gaps in terms of involvement of research institutions or academia into the support for upskilling and reskilling; It differs from Member State to Member State, we have now established a list of approved JTF projects.* [17] Although the JT Platform does not directly provide any specific advice or guidance on which skills should be acquired by workers benefiting from the program – because this falls under other DG activity, such as DG Employment and because this activity should be region specific –, it is nonetheless providing a series of supporting documents, such as toolkits and information related to future-proof skills.

5.4 Concluding remarks

The JTF represents an important opportunity for regional societies to shift towards more sustainable models of development. Dedicated financial resources have been allocated to sustain those regions that face the hardest challenges connected to the green transition. In this picture the implementation of upskilling and reskilling interventions constitutes a crucial step as the quality of the workforce is one of the main ingredients for a more sustainable economy. In this regard qualitative evidence suggests that widespread and focused interventions can be set in place at the same time. Interventions for the improvement of basic and specific skills of the existing workforce do not exclude interventions for specific categories of workers, such as young workers, low skilled ones, women, etc.

The lack of a clear identification of skill needs at the local scale emerges as probably the most important limit when planning active labor market policies. In addition, JTF regions suffer from structural features, such as ‘brain drain’ due to the lack of good employment perspectives for young people who tend to migrate, the difficult integration of migrant workers who beg for other types of interventions, besides training, such as the recognition of education and training certifications they acquired in their countries of origin. The qualitative evidence indicates that in JT territories a wider and more strategic planning is needed for the future aiming to better understand skills’ demand, from basic to high-skill jobs, to attract workers to these areas, as well as to avoid emigration of skilled young workers.

The interviewees' analysis also highlights that the transition to a new socioeconomic model is not only a matter of training and skills, but it also requires innovation, the attraction of investors and workers in these areas, the existence of industrial policies, the expansion of new sectors and the reconversion of the old ones. Lastly, a just transition also involves addressing cultural attitudes, as there remains the issue of people identifying with old industries that have provided employment opportunities for generations. In this regard, there is a need for policies at the EU level aimed at rebranding these territories to facilitate the transition.

[17] Romania was an exception, asking for specific support in a training for young people.

6. Conclusions

This paper has delved into the green transition by investigating the extent to which active labor market policies outlined in the Just Transition Program 2021-27 are being implemented and how they are contributing to the transformation of labor markets in selected regions of Italy, Spain, and Germany, which are particularly affected by the shutdown and conversion of non-sustainable and coal-based industries.

Are these policies effective? Given the time span of the JTP, it is too early to provide an exhaustive appraisal, as training actions have only commenced to be implemented in a few regions. Additionally, to properly evaluate the programs and the effectiveness of the related active labor market policy interventions, comprehensive worker-level data should be collected.

Industrial specialization of these areas influences the types of jobs available, while participation in global value chains determines the extent to which domestic labor markets are interconnected with international trade dynamics. Moreover, path dependence in technological capabilities underscores the long-term implications of past investments, policies, and institutional arrangements on current and future job opportunities. Incorporating these historical insights into discussions on green industrial policies enables a more nuanced understanding of their potential effects on employment. Especially, it highlights the importance of aligning policy interventions with existing labor market dynamics – that, as mentioned in Section 2, have proven to be very heterogeneous across the three cases – as well as of addressing structural challenges to ensure inclusive and sustainable job creation in the transition to a green economy.

Although preliminary, the combination of desk research and qualitative analysis carried out in this study has allowed to shed light on some relevant points that would deserve further investigation in the future.

First, the JTF in the three countries, and especially in Spain, seems to support a participative governance approach to the transition. Trade unions are formally involved in the process; however, it is not yet clear whether their involvement is primarily in the management phase of actions to ensure the policies' functioning, or if it includes a more substantial role in the design phase, where decisions about the types of actions to be planned are made. This aspect needs further exploration beyond the official government documents.

Second, a coordination effort is required among different administrative levels, particularly in contexts where the JTF adds resources in addition to the National Resilience and Recovery Fund and Cohesion Funds. In other cases, the JTF has simply replaced other forms of EU financing. This aspect deserves further investigation, as it needs to be explicitly considered when evaluating the policy's results. Such coordination becomes even more important when discussing the integration of JTF-funded training initiatives with other national active labor market policies.

Third, the timing of the JTP raises widespread concerns among interviewees. The challenge with timing arises from the fact that, on the one hand, the financial resources allocated for the program must be spent by 2027. This puts pressure on local authorities to expedite the implementation of JTF actions, increasing the risk of resource misallocation and poorly designed policies. On the other hand, the transition process is complex and requires significant structural changes that cannot be fully achieved by 2027. Therefore, it is crucial to plan for a new JTF programming period that would allow for necessary adjustments and to addressing unforeseen challenges.

Fourth, when drafting actions related to the training and upskilling of workers, there is currently significant uncertainty and a general lack of planning regarding the specific skills needed for the transition. This stems from a quite generic vision of development presented in the territorial plans, which is also not followed by more operational programs that translate a development strategy into effective actions. Moreover, upskilling and reskilling initiatives should consider

the diverse needs of workers, which vary according to their age, gender, professional profiles, and seniority. For example, in some regions, there is a higher demand for (and necessity of) early retirement schemes than for training initiatives.

Lastly, a relevant aspect worth debating is the underlying assumption present in almost all official documents that employment in green activities and green jobs – definitions of which are critically discussed in Section 3 – will inherently ensure better employment conditions and job quality. Currently, in contrast to many attempts to quantify the aggregate impact of the ecological transition, there is little evidence supporting these qualitative aspects. It will be worth monitoring this issue to avoid that poor quality jobs will be offered to affected workers.

Building on the results of this study, some policy recommendations also emerge.

It is evident that integrating active labor market interventions with other kind of policies -such as development and industrial, educational, R&D/science and technology policies- would be fundamental. This integration should account for territorial specificities, particularly issues related to youth migration, brain drain, and population aging. A larger and comprehensive regional development plan should thus be essential to address all the challenges effectively.

Furthermore, as some previous widespread skills become obsolete among workforces in transition regions, it would be important to primarily reinforce those general and basic skills that can provide a more solid foundation for the upskilling and reskilling initiatives. This may involve universities taking on a new role as regional development agents, ensuring that workers are better prepared for the evolving job markets.

Besides focusing on active policies, it would be necessary to incorporate social protection schemes into the JTF establishing minimum standards across the EU, beyond just the unemployment benefits that may be provided by individual member states. This is particularly important for situations where workers are unable to overcome the negative consequences of the transition. Ensuring more homogeneous safety nets for these individuals, regardless their location within the EU, is indeed crucial for a fair and inclusive transition.

Finally, the continuity of the JTF measures is essential because the green transition involves significant structural changes. The effects of these changes, especially the negative impacts on workers from dismantled polluting industries, will not be resolved in the short run. Ongoing support and sustained efforts will thus be necessary, also in the period after 2026, to address these long-term challenges.

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