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Green Jobs and Meaningful Work

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Abstract

We investigate the perceived meaning of green jobs. Theoretically, we extend the standard meaningful work framework, by introducing a social esteem component, which depends on both the green content of occupations and the socio-political awareness of environmental issues. To identify green jobs, we employ a task-based indicator based on ESCO data, which is then merged with individual-level data from the 2015 and 2021 waves of the European Working Conditions Survey. Moreover, we proxy the degree of environmental consciousness at the country level through the Environmental Policy Stringency index from the OECD. In line with our theoretical framework, we find that workers' perceptions of meaningful work increase with the green content of their occupation and are amplified in countries exhibiting higher levels of environmental consciousness. These results highlight the role of social esteem, derived from the contribution to what is considered a socially valuable objective (i.e. the fight against climate change), in shaping the experience of meaningful work. To allow a more 'causal' interpretation of the results, we employ an instrumental variable approach which corroborates the main findings.

Keywords: Meaningful Work, Green Jobs, Social Esteem, Green Transition, EWCS

JEL Codes: J24, J28, O31, O33, Q20, Q40

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1 Introduction

Climate change is one of the greatest threats humanity is facing. Adverse natural phenomena directly linked to it are having enormous impacts on all fronts of the economic, social and political life (Falk et al., 2021). This evidence has raised growing concerns about environmental issues in many segments of the global population (Andre et al., 2024). A recent poll by Eurobarometer (2021), for instance, reports that 93% of the European respondents think that climate change is a serious problem, and 18% view it as the most serious problem facing the world today. While such concerns, and the related emergence of pro-environmental norms and values, are expected to affect economic decisions along many dimensions (often going beyond standard variables such as prices and taxes, see Besley and Persson, 2023), the interest of researchers so far has focused primarily on studying these effects on consumption (Nyborg et al., 2006, Kotchen, 2006, Besley and Persson, 2019, Bezin, 2019). Much less attention, instead, has been devoted to investigate how pro-environmental attitudes shape individual orientations toward production activities, including work. For instance, we still know very little about how individuals value their involvement in work activities that can be beneficial to the environment and how such valuations are shaped by cultural and social norms.

This paper starts to fill this gap by studying whether the green content of occupations contributes to the individual perception of meaning at work. The idea that work means something more than the simple provision of labour services in exchange for a wage has a long tradition in political economy and institutional economics thinking. Marx (1967), for instance, originally viewed non-alienated work as a key activity to realize the full potential of human beings. Similarly, Veblen (1898) highlighted the importance of work in the development of human character and well-being.[1] After decades of reduced popularity, the concept of meaningful work has regained centrality in economic research both theoretically (Cassar and Meier, 2018) and empirically (Nikolova and Cnossen, 2020, Nikolova et al., 2024). Under the influence of contributions from social psychologists, most notably self-determination theory (Deci and Ryan, 1985), a growing number of authors have questioned minimalist views based on the simple trade-off be-

[1]For a discussion of the concept of work meaning in classical political economy see Spencer (2015).

tween (disutility of) work and leisure (Spencer, 2015). Rather, it has become common to see humans as having an innate need to make sense of work activity (Chater and Loewenstein, 2016), deriving intrinsic benefits from it (Kaplan and Schulhofer-Wohl, 2018, Akerlof and Kranton, 2005). Although in most of these contributions the sources of meaning are found primarily in specific dimensions of work organizations (Cassar and Meier, 2018), our focus is instead on the content of the occupations and the extent to which the latter receive social recognition for their contribution to fight climate change.

Theoretically, we build our argument by integrating two main streams of literature. We begin with the model proposed by Cassar and Meier (2018), which conceptualizes the meaningfulness of work as a function of various job design characteristics, including competence, relatedness, and autonomy in decision-making. This model has so far guided most empirical economic research on work meaningfulness (Burbano et al., 2023, Nikolova et al., 2024, 2023). To study the role of occupation's green content, we extend this original setting taking advantage of insights from the employment relations literature pointing at the relevance of drivers of work meaning that go beyond the design of individual jobs (Laaser and Karlsson, 2022). In particular, we rely on recognition theory (Honneth, 1995) to emphasize the role played by social esteem, i.e., the intersubjective acknowledgment of one's contribution to a common-valued project, in fostering individual perceptions of meaning at work. In our framework, jobs are viewed as key drivers of workers' experience of social esteem (Dejours et al., 2018, Honneth, 2012), and the fight against climate change constitutes the collectively valued project to which green occupations directly contribute.

More specifically, we put forward two main research hypotheses. First, we suggest that the self-perception of work meaning increases with the green content of occupations. Second, we argue that such a positive relationship varies depending on the green-related social norms that are prevalent in a given social context. In fact, following Honneth (1995), we suggest that what counts as a valuable and esteem-worthy project is the product of ongoing social and political struggles whose scope and results extend beyond the realm of specific organizations. In those contexts in which such struggles lead to the emergence of social orientations valuing the preservation of the environment as a political priority, we expect the green occupational content to exert

a stronger influence on work meaning than elsewhere.

We test these predictions by making use of a composite mix of data. In particular, we rely on three main data sources. Firstly, we develop an indicator of green jobs using the green skills information from the European Multilingual Classification of Skills, Competence and Occupation (ESCO). Secondly, we measure the individual perception of work meaning by relying on worker-level data available from the European Working Condition Survey (2015 and 2021) (for a similar approach see Nikolova and Cnossen, 2020). Finally, we use the country-level Environmental Policy Stringency Index from OECD (Kruse et al., 2022) as a proxy of environmental protection being a political priority across countries.

Our results show that an increase in the green content of occupations correlates positively with the perception of meaning at work. Moreover, once investigated in a broader social and political context, such association is in place only in countries with a higher incidence of environmental policy stringency. These results are broadly consistent with the idea that social esteem for green workers is a key driver of perceived work meaning, particularly in countries where society views the fight against climate change as a valuable social project. To further support our analysis in causal terms, we adopt an instrumental variable approach, using the incidence of tasks related to the evaluation of quality standards as an instrument for whether an occupation qualifies as a green job. The rationale is that green jobs may involve tasks related to implementation of standards directly linked with quality, either coming from regulatory frameworks - e.g. associated with the use of energy and materials - or from the assessment of environmental impact and carbon footprint of products and processes. For an average worker, quality checks should not directly affect the perceived work meaning. The results of our IV estimates confirm our main findings.

The paper contributes to two main streams of literature. First, it contributes to empirical studies on the perception of meaning at work. The literature has shown that perception of doing a meaningful work impacts on several measures of work performance, including effort and productivity (Ariely et al., 2008, Rosso et al., 2010), and is associated with later retirement decision, less absenteeism and increasing likelihood to participate in skill development training (Nikolova and Cnossen, 2020). While previ-

ous works have focused primarily on investigating the individual determinants of work meaning (Nikolova and Cnossen, 2020) or, using experimental settings, on how changes in the meaning of work activities affect effort, productivity and labour supply (Ariely et al., 2008), our study focuses instead on the relationship between occupation's green content and meaningful work. As mentioned by Eurofound (2024), this relationship is crucial to understanding the impact of the green transition on the workplace and to capture the motivation of workers in relation to it. Furthermore, by investigating how political factors moderate the individuals' perceptions of work meaning, this paper underpins the importance of taking into consideration the broader societal values when investigating meaningful work. In our setting, these broader societal values are captured by the introduction of explicit public interventions aimed at preserving the quality of the natural environment. From a policy viewpoint, our results are particularly relevant as they suggest that the perceived meaning of green occupations is partly shaped by the social and political contexts in which workers operate, thus opening important avenues for public interventions in this field.

Second, our work contributes to the literature by providing an application of ESCO-derived data to investigate EU(-wide) labour market features and dynamics, more particularly by looking at the distinctive characteristics of green jobs (Dierdorff et al., 2009, Consoli et al., 2016, Vona et al., 2018, 2021). Indeed, while the approach is not totally new but rather based on Vona et al. (2018), it is important to stress that only a few articles have engaged in the development of a green jobs indicator for Europe. Based on cross-referencing classifications at the occupational level, US O*NET data on green jobs have been applied in various contexts beyond the US, including for the Netherlands (Elliott et al., 2024), multiple European countries (Eurofound, 2024), and Latin America (Winkler-Seales et al., 2024). In a recent contribution Maldonado et al. (2024) compare how the classification of green jobs changes using O*NET or ESCO: compared to EU-based data and classification, O*NET over-represents green jobs with a high-skills content. We rely on a finely grained measure of green jobs (4-digit ISCO level), which allows us to provide a detailed analysis of the characteristics and distribution of green employment across Europe, and makes it possible the merger with a reference source of data to investigate the quality of work (i.e. the European Working

Condition Survey).

The remainder of the paper is structured as follows. Section 2 develops the conceptual framework. Section 3 discusses the various data sources employed. Section 4 focuses on the construction of the key variables. Section 5 outlines the empirical strategy, while Section 6 presents the main results along with robustness checks. Finally, Section 7 concludes.

2 Conceptual Framework

2.1 Meaningful work in the social sciences

Over the past decade, scholarly inquiry into the nature, implications, and future trajectories of meaningful work has expanded significantly, giving rise to heterogeneous and vibrant debates across the social sciences (Bailey et al., 2019, Yeoman et al., 2019, Laaser and Karlsson, 2022, Nikolova and Cnossen, 2020). This growing body of work has increasingly informed the agendas of international organizations, as reflected in the many campaigns advocating the creation of decent and purposeful jobs in modern economies (ILO, 2017). Despite such an upsurge in interest, however, the field remains relatively blurred as far as the definition and drivers of work meaning are concerned (Laaser and Karlsson, 2022).

Among economists, the concept of 'meaningful work' is usually associated with how purposeful and worthwhile individuals perceive their working activities (Nikolova and Cnossen, 2020) and how they search for the opportunity for self-development and personal fulfilment (Spencer, 2015). Being partly inspired by concepts originating in the field of organizational psychology (Rosso et al., 2010), this conceptualization represents a clear departure from the most standard economic approaches, which see work activities mainly as a source of dis-utility, valued primarily for its monetary compensation (Spencer, 2015). Against this background, scholars focusing on the meaning of work put forward the idea that humans have an innate need to make sense of the activities they perform (Chater and Loewenstein, 2016) and the output they produce (Besley and Ghatak, 2018, Ariely et al., 2008), with individual jobs that often become an integral part of the workers' own identity (Akerlof and Kranton, 2005). This alternative view is

significant not only for offering a more comprehensive framework to analyse individual motivation to work (Chadi et al., 2017), but also for its implications for the design of incentives within organizations (Kosfeld et al., 2017).

In terms of drivers, economic interpretations of meaningful work emphasise the extent to which job designs fulfil the three psychological needs at the basis of individual self-determination, namely autonomy, competence and relatedness (Deci and Ryan, 1985, 2000). Autonomy highlights the value of having control over tasks and decision-making within one's role. Competence emphasizes the importance of having a job that allows workers to express skills and knowledge. Relatedness underscores the significance of working in a positive environment, fostering strong relationships with peers and superiors (Cassar and Meier, 2018). By focusing on these three characteristics of job designs, Nikolova and Cnossen (2020) conducted an extensive empirical study using worker-level information for a variety of European countries, finding strong support for a positive association between these dimensions and the individual perception of work meaningfulness.

Although self-determination is clearly an important component of life meaning, and work organization has a direct impact on it, economic approaches to work meaning tend to limit the analysis of its determinants primarily to the features of job design. Such an approach contrasts with the views prevailing in other streams of the social sciences, which have emphasized the importance of drivers that extend beyond objective work and job conditions. In the field of humanities, for instance, several contributions highlight the inter-subjective nature of work meaning and the necessary match of workers' interests with broader societal needs that makes work purposeful, worthy and unifying (Laaser and Bolton, 2022). In this framework, the experience of meaningful work is viewed as an 'authentic connection between [...] work and a broader transcendent life purpose beyond the self', which is achieved whenever individuals perceive their work 'invokes the greater good in terms of societal or economic benefits' (Bailey and Madden, 2017, p. 4). Similar views also emerge in sociologically informed industrial relations contributions, which draw attention on enablers of the meaning of work operating at the regulatory and employment levels (Laaser and Bolton, 2022). For instance, Kalleberg and Marsden (2019, p. 45) conceptualize the meaning of work as 'opportunities to

exercise autonomy and to help others and society,' emphasizing the objective conditions that make the experience of meaning possible.

One particularly prominent approach linking work meaningfulness to the broader social context in which jobs are carried out is recognition theory. Based on the seminal contribution by Honneth (1995), this theory conceives self-realization, a precondition for a meaningful life, as depending on a set of interrelated patterns of recognition encompassing three domains of social relationships, namely love, respect and social esteem. While the former two pertain to domains of recognition associated with non-economic (e.g., familial) and right-based (e.g. legal) relationships, respectively, social esteem rests on the central role that waged work plays in the industrially organized division of labour, understanding work as one of its key determinants (Fraser and Honneth, 2003). In contrast to job design approaches, views grounded on recognition as social esteem relates work meaningfulness with the inter-subjective acknowledgment of individuals' particular traits, abilities and contributions to commonly valued projects. Which project counts as a valuable one and, as a consequence, which trait is esteem-worthy, is not given, but rather it is a by-product of on-going social and political dynamics within and beyond the specific organizations. In other words, it represents a contested field in which constant struggle for recognition is inherent (Honneth, 1995).

With respect to our analysis, recognition theory offers a valuable framework for understanding how individual involvement in green-related activities contributes to the perception of meaning at work. First, recognition theory enables us to consider the content of individual jobs, along with their design, among the key drivers of work meaningfulness. Indeed, for any given level of autonomy, competence and relatedness, recognition theory postulates that the individual perception of work meaning may vary depending on how the job-specific skills and abilities (i.e., job content) foster recognition as social esteem. Second, this theory links recognition as social esteem to the perceived contribution of individual jobs to what are generally conceived as socially valuable projects. The fight against climate change, along with many others, can be broadly considered as one of them, thus establishing a link between the green content of occupations and the perception of work meaning.

2.2 Green jobs, social esteem and work meaning

To further elaborate our argument, we integrate the job-design and the content-based views of work meaning into a single framework through the following function:

$$M = D(\boldsymbol{\alpha}, \mathbf{x}, e) + C(\boldsymbol{\beta}, s(g, p, \mathbf{z}), e), \tag{1}$$

where M is the perceived degree of meaning of work, while $D(\boldsymbol{\alpha}, \mathbf{x}, e)$ and $C(\boldsymbol{\beta}, s(g, p, \mathbf{z}), e)$ represent the job design and the job content components, respectively. Based on self-determination theory (Deci and Ryan, 1985) we assume the contribution of job design to depend on the three-dimensional vector $\mathbf{x}$ capturing the characteristics of the job in terms of autonomy, competences and relatedness. In our analysis, the latter are considered exogenously chosen by the employer and affect the perception of the meaning of work through the vector $\boldsymbol{\alpha}$ capturing the weight assigned by each worker to each of the job-design dimensions. Following recognition theory (Honneth, 1995), we assume the content-based component C to be an increasing function of social esteem $s(g, p, \mathbf{z})$ (i.e., $c_s > 0$), where g is the green content of the occupation, p is the incidence of policy measures and social norms fostering the fight against climate change as a socially valuable project and $\mathbf{z}$ is a vector of job-specific characteristics affecting social esteem on top of green-related attributes (e.g. skill level). $\boldsymbol{\beta}$ represents the individual-specific weight through which social esteem affects the meaning of work. Note that both D and C are assumed to depend on work effort e, reflecting the idea that work meaning is an intrinsic aspect of one's job—one that unfolds effectively only when work activities are actively carried out (for a similar approach see Cassar and Meier, 2018).[2]

Given this framework, we present a set of theoretical propositions on the relationship between s, g and p (see Figure 1). First, we suggest that, everything else equal, social esteem s increases with the green content of occupation g (i.e., $s_g > 0$). A variety of arguments provide support for this prediction. In the framework of recognition theory, for instance, Laaser and Karlsson (2022) highlight the intersubjective admiration and

[2]For the sake of simplicity we decided to model work meaning as an additive function of D and C. However, a more general model could obviously take a different approach, without gaining much in terms of our empirical analysis, which essentially aimed to estimate the contribution of g and p to the meaning of work.

appreciation at the horizontal level of skills and tasks involved in the labour process as key drivers of social esteem and, thus, meaning of work. Although these authors emphasize patterns of recognition occurring primarily among co-workers (as opposed to vertical recognition between supervisors and subordinates), it is reasonable to expect that for some jobs intersubjective admiration and appreciations may extend beyond the organization, involving the society at large. Along these lines, an extended literature in social psychology and behavioural economics has indeed documented that jobs to which society attributes a broadly recognized social mission are more likely to foster individuals' drive for social esteem and meaning of life, framing their actions as part of a bigger social context (see Cassar and Meier, 2018).

Based on these insights, we expect the individual involvement in occupations characterized by some positive degree of green content to be the source of admiration and appreciation by the society for their contribution in preserving the natural environment, which in turn fosters social esteem and thus the perception of work meaning. Also, we expect this positive association to hold regardless of the skill level of the occupation (i.e., controlling for $\mathbf{z}$). While this prediction may seem straightforward for certain jobs —for instance, high-skilled intellectual occupations such as environmental engineers involved in designing large-scale, high-visibility green projects (e.g., renewable energy farms, industrial recycling plants)— it may be less obvious for others. Indeed, a broad range of low-skilled manual occupations is characterized by direct involvement in green-related activities. However, these occupations are usually granted with a lower degree of social visibility, which may reduce the chances to receive direct acknowledgment for their contribution to the greening of the economy.

On this respect, however, some evidence from qualitative case studies helps to support our proposition also for low-skilled green jobs. In a recent study of a group of English refuse collectors, for instance, Bailey and Madden (2017) show that awareness of their occupation's contribution to the preservation of the natural environment plays a key role in shaping workers' perceptions of social esteem and the meaningfulness of their work. Although they perform largely unskilled manual labour, with job design features such as lack of competence and autonomy in decision making, refuse collectors do report a sense of pride in performing a job that is perceived as contributing to the

common good (for example, one worker is reported to say 'I'm actually doing something for the public and for the environment', p. 8). Moreover, they place particular emphasis on recognition patterns that go beyond the workplace, ultimately extending across multiple generations of society.[3] These insights point to the green content of the occupation as a factor that is perceived as shaping social esteem and work meaning *per se*, over and above the contribution stemming from the skill level and job design characteristics of the profession.

At the same time, however, the extent to which being involved in a green job is worthy of social esteem does not depend only on the perceptions of the individual workers. Rather, it depends on the recognition of his/her job as contributing to a project that is considered valuable also by the rest of the society. Far from being granted, such recognition is often the result of political and social processes through which green-related interventions manage to achieve a sufficient degree of public legitimacy. For this reason, the second proposition that we put forward is that the positive contribution of occupation's green content to social esteem and work meaning varies depending on the context. More specifically, we expect it to be more relevant in those contexts in which the high incidence of green-related policy measures promotes the fight against climate change as a commonly valued social project (i.e., $s_{gp} > 0$).

Once again, we ground this proposition on a set of theoretical considerations. First, as emphasized by a long tradition of research in electoral competition and political economics (Persson and Tabellini, 2002), there exists a link between the adoption of specific policy measures at the country level and the importance that specific issues have for the underlying population of voters. In these views, the emergence of a political commitment toward the pursuing of a specific policy agenda is often considered an indication that the underlying policy issue ranks high among the set of social priorities. With reference to climate mitigation policies, for instance, Brennan et al. (2020) establish an explicit link between their introduction at the macro level and a set of pro-environmental pressures and actions operating at the micro level, which ultimately contribute to shape the commitment of national authorities to address climate change.

[3]For instance, when asked about the meaningfulness of his work one refuse collector is reported to say: 'Every day you are doing something for the environment ... I still feel it's important that I contribute [by recycling] because I've got grandchildren who are going to have grandchildren. It affects [the] next generation coming up.' (Bailey and Madden, 2017, p. 11).

On this basis, it is reasonable to expect that where environmental policies are more stringent, the social recognition of climate mitigation as a valuable social endeavour is stronger. Consequently, also individual participation in green jobs is more likely to be regarded as worthy of social esteem, thus fostering its association with work meaning.

Second, it is important to acknowledge that the positive association between the commitment of policy makers to green policy interventions and the perceived contribution of green occupations to social esteem and work meaning can be further reinforced by the gradual adaptation of social norms and individual preferences to emerging policy frameworks. Indeed, a growing number of recent studies explicitly account for the processes through which pro-environmental norms and values consolidate in populations that are recurrently exposed to changes in climate-related policy regimes. In a dynamic model of cultural evolution, for instance, Besley and Persson (2023) relate the acquisition of green attitudes and values in a population of consumers to the economic incentives introduced by green policy initiatives and the firm choices implemented within the economy. Mattauch et al. (2018) takes a similar approach in examining the impact of climate policy-induced changes on consumers' values. More generally, Besley and Persson (2019) model environmentalism as a cultural phenomenon that co-evolves with policies aimed at protecting society from the climate risks. Based on these contributions, it is reasonable to expect that not only green attitudes and social norms may influence pro-environmental policymaking, but also the reverse may hold. Namely, increasing political commitment to environmental protection may foster the spread of green values across society, reinforcing the recognition of green jobs as worthy of social esteem. This may ultimately strengthen the related perception of work meaning.

3 Data

3.1 Overview

To test our theoretical predictions we rely on three main data sources. The first is the European Working Condition Survey (EWCS), which provides comprehensive worker-

level information and a detailed occupational classification at the ISCO 4-digit level[4]. The latter is used to build an indicator of green jobs relying on the European multilingual classification on Skills, Competence, and Occupation (hereafter ESCO), which contains information about green skills at the occupation level. Lastly, to investigate the role of the policy context, we use the Environmental Policy Stringency Index (hereafter EPS), a country-level indicator, produced by the OECD. In the following subsections, we provide some further details for each of these sources.

3.2 EWCS

The EWCS is a well-known database for studying working conditions and job quality in Europe (see, for example, Aleksynska, 2018, Nikolova and Cnossen, 2020, Belloc et al., 2022, Nikolova et al., 2024). Conducted every five years since 1990, the EWCS is an interview-based survey that covers a representative sample of workers, comprising roughly 44,000 observations per wave. One of its key advantages is that it provides harmonized cross-country information on working conditions, individual attributes, task environment and occupational codes. This allows us to compute individual-level indexes of job meaning and relate them to occupation-specific measures of green content.[5]

In this study, we consider only the last two waves of the EWCS, namely 2015 and 2021. This choice is motivated by the need to minimize the time gap between the classification of green jobs based on ESCO (see below) and the measurement of work meaning. While the previous editions (including the 2015) were carried out through face-to-face interviews, the 2021 survey, due to COVID-19, was conducted via the telephone.[6] This implies that caution is needed when combining data from these two waves. Following Nikolova et al. (2024), we address potential distortions arising from differences in survey methods by including year fixed effects. Moreover, we account for differences in sample size across waves and countries by including post-stratification weights as well as country sample size weights in some of our regressions (see below).

[4]We are grateful to Eurofound for granting access to a secure version of the survey including the 4-digits ISCO codes.

[5]To ensure the representativeness of the working population, EWCS uses complex sample strategy for the selection of workers which ensure the randomness of the selection. Each individual has the same non-zero probability to be selected (Eurofound, 2016, 2022*b*).

[6]For more details see Eurofound (2022*a*).

To enhance the reliability of our results, we conduct data cleaning and apply sample restrictions based on sectoral and occupational criteria prior to empirical analysis. More precisely, we exclude the agriculture and public administration sectors, along with their related occupational categories (Consoli et al., 2016), as well as the sector of extra-territorial activities and defence-related occupations. Moreover, we refine the sample by focusing only on an age range that better includes the active population: from 18 to 70 year old people. Finally, we focus on countries surveyed in both waves. The final sample amounts to roughly 75,000 individual level observations distributed among 34 countries, all the EU-27 countries plus the UK, Norway, Switzerland, Albania, Serbia, North Macedonia and Montenegro. Table A1 shows the number of observations per country and year.

3.3 ESCO - Green Skills

ESCO works as a dictionary to describe, identify and classify professional occupations and skills that are relevant for the EU labour market (ESCO, 2019). It provides very detailed information on about 3,000 occupations, which are defined as sets of "jobs whose main tasks and duties are characterized by a high degree of similarity". ESCO occupations are organized hierarchically based on the International Standard Classification of Occupations (ISCO) and they are subdivided into several levels from five to eight digits. Each occupation is characterized by an extremely rich set of skills, representing abilities "to apply knowledge and know-how to complete tasks and solve problems".[7]

In this study, we use two versions of ESCO, specifically the first version launched in April 2018 (v1.0.3) and the latest version launched in the early 2022 (v1.1.0).[8] The latter provides a list of skills labelled as "green" aligning with the necessity for the EU Commission to map the presence of green jobs within the EU area following the launch of the European Green Deal Plan in 2019 (ESCO, 2022).[9] To classify skills as green,

[7] ESCO includes another construct, i.e. "knowledge", which is defined as "the body of facts, principles, theories and practices that is related to a field of work and study". We exclude knowledge from the analysis because it does not capture any effective tasks. Indeed, while every occupation might require knowledge that can be considered "green", this does not imply that such green competences are then also applied.

[8] https://esco.ec.europa.eu/en/about-esco/escopedia/escopedia/esco-v1

[9] https://esco.ec.europa.eu/en/about-esco/escopedia/escopedia/esco-v11

ESCO followed a multiple-steps procedures starting from the 'operationalization' of the Cedefop (2012) definition of green skill as "the knowledge, abilities, values and attitudes needed to live in, develop and support a society which reduces the impact of human activity on the environment" (ESCO, 2022). Overall, in the 2022 ESCO version, 384 skills are labelled green, representing approximately 3,5% of the total. When we apply the same definition of green skills to the 2018 ESCO version, we are able to identify 269 skills amounting to 2.5%. Table A2 in the Appendix shows a list of the most frequently occurring green skills across occupations.

3.4 Environmental Policy Stringency Index

The final data source that we use is the Environmental Policy Stringency Index (EPS), which provides a proxy for the incidence of policy measures that promote the fight against climate change as a socially valuable project in countries. EPS is produced by OECD to facilitate cross-country comparisons while considering the multifaceted aspects related to environmental policies. It is a unique composite indicator that combines market, non-market, and policy-based aspects related to environmental protection (Kruse et al., 2022).[10] Since its creation, it has been used in several empirical studies (Martinez-Fernandez et al., 2010, Marin and Vona, 2019, Benatti et al., 2024, Hassan et al., 2024). Figure 2 shows the evolution from 1990 to 2020 of the indicator using a restricted group of countries. Interestingly, the graph shows how EPS has increased during the last decades, particularly between 2000 and 2010, confirming the growing concerns of governments within the OECD area for environmental issues. Also, starting from 2010, there emerges a stable heterogeneity across countries in terms of environmental policy stringency, which can supposedly reflect different attitudes toward environmental protection in these countries. We exploit this heterogeneity to investigate the role of the policy context in shaping the relationship between green jobs and work meaning.

[10] Taxes and trading schemes systems on pollution are example of market-based instruments. Emissions limits and standards on nitrogen, sulphur and particulate are examples of non-market measures. Finally, public expenditure in R&D and support for renewable energy such as solar and wind, in clean technologies and their adoption are examples of policy-based dimensions.

4 Variables

4.1 Occupation's green content

Our first variable of interest is the green content of occupations, which we measure following a task-model approach à la Vona et al. (2018). In this approach, occupations are conceptualized as a "bundle of tasks" and serve as a primary unit of analysis to identify what workers do in their job. Green jobs are identified by measuring the 'greenness' of the occupation, which is expressed as the ratio of green skills to the total skills. We begin by computing this indicator at the 5-digit ESCO level. This gives us a highly detailed classification that covers a total of 1,682 and 1,761 occupations in 2018 and 2022, respectively.[11] To enable a merge with EWCS data, we then aggregate this indicator at the 4-digit ISCO level, exploiting the direct correspondence between the ESCO and ISCO classifications. More specifically, for any given set of 5-digit occupations within a 4-digit ISCO group, we compute the average greenness (g) as follows:

$$g_{i_{(4dig)}} = \frac{1}{n} \sum_{i_{(5dig)}=0}^{n} g_{i_{(5dig)}} \tag{2}$$

where n is the number of 5-digit occupations included in the higher order 4-digit group.

Our final indicator captures the average green content of the ISCO 4-digit occupations. Following Vona et al. (2018), we interpret these metrics as a proxy for the relevance of job-related activities that reduce the impact of human activity on the environment. While we acknowledge the limitations of this approach, particularly the aggregation from 5- to 4-digit classifications, we contend that it delivers one of the most detailed green job indicators currently available for the European context. In this regard, a study we are aware of that uses a measure of greenness at the 4-digit level is Elliott et al. (2024). However, the latter study identifies green jobs relying on the O*NET classification, raising concerns about the validity of using green metrics computed on US data to study the European context Maldonado et al. (2024). The

[11] For comparison, the O*NET database, one of the most commonly used sources to compute task-based metrics in the US, includes around 1,000 occupations at its most detailed 8-digit level.

existence of institutional differences between the US and Europe undermines the possibility of directly inferring occupational content based on data collected in another country.

Table A3 in the Appendix shows the 20 occupations with the highest green score. Overall, out of the total of 426 occupations, 215 have at least one green skill. Among the occupations with the highest green score we have 'elementary' occupations such as waste sorters and collectors, 'professionals' such environmental engineers; 'technicians and associated professionals' such as incinerator and water treatment plant operators, as well as manufacturing managers; and 'craft and related trade workers' such as building structure cleaners. Figure 3 reports the distribution of the green score across macro occupational groups.

4.2 Work meaning and additional controls

Our main empirical goal is to relate occupation's green content to the perception of work meaning. To measure the latter, we follow Nikolova and Cnossen (2020) and perform a polychoric principal component analysis (PCA) on two questions of the EWCS asking respondents to state whether the following two statements best describe their work: a) your job gives you the feeling of work well done and b) you have the feeling of doing useful work. The first statement captures the individual source of fulfillment with the working activity, while the second one is a proxy of the social 'utility' perspective. After the PCA, we extract the first component that accounts for the 86 % of the variation and, for easing the interpretation, we rescale it from 0 (low) to 100 (high).

In addition to the green content of the occupation, the perception of the meaning of work is affected by the characteristics of job design, which can be broadly associated with the features emphasized by self-determination theory. To account for the latter, we refer again to Nikolova and Cnossen (2020) and build a set of metrics capturing the dimensions of autonomy, competence and relatedness. While we are able to follow integrally the approach used in the original paper using EWCS 2015 data, we need to adopt some adjustments for the EWCTS 2021 version. All details of the changes are explained in Table 1.

A series of other controls, summarized in Table 2, complement the analysis. In

line with the model developed in Cassar and Meier (2018), which postulates that the meaning of work depends on effort, we include the log of weekly hours worked as a proxy for labour supply. Subsequently, we control for the extrinsic rewards of work, including career perspective, individual recognition and the monetary compensation.[12] With respect to our main regressor, these controls help to attenuate concerns regarding the sorting of workers into green jobs. For instance, being in high demand, green jobs might offer greater career prospects as well as wage premia.[13] Both aspects could also be correlated with the perception of the meaning of work. Finally, the inclusion of a variable capturing individual recognition—constructed from the survey question "I receive the recognition that I deserve from my work"—allows us to control for one's preference for being recognized in the workplace.

A set of standard worker-level controls is also included, capturing key sociodemographic characteristics such as age, biological sex, tertiary education achievement, and work tenure. These variables have been widely used in prior studies on meaningful work (Nikolova and Cnossen, 2020, Burbano et al., 2023), and are essential in this context for several reasons. First, green jobs are held predominantly by men; second, younger generations tend to show greater environmental awareness (see, e.g., Eurofound, 2024, Maldonado et al., 2024); and third, green jobs typically demand higher levels of human capital, both in terms of formal education and work experience (Consoli et al., 2016). In addition, we include controls for firm size and private ownership. The former acknowledges potential concerns that environmental regulations tend to be more stringent for larger companies (Calel and Dechezleprêtre, 2016, Borghesi et al., 2020), while the latter rule out the possibility that individuals who are more environmentally conscious are disproportionately employed in the non-private sector, such as public and non-profit organizations (Besley and Ghatak, 2018). Finally, we include occupations (ISCO 1-digit level), industry (NACE rev2.2 at 2-digit), country and year fixed effects. We use occupation at 1-digit to remove the common broader occupational characteristic, allowing to have a cleaner green skills - work meaning relationships, while avoiding the risk that a more detailed classification could result in numerous groups with either

[12] Unfortunately, the latter is available only for EWCS 2015.

[13] Some descriptive evidence from US suggest a wage premium (Vona et al., 2019). A more recent paper finds a green wage premium for Japan (Kuai et al., 2025).

no or only green occupations. Industry controls are crucial to capture the differences in environmental regulations, which are often specific to the industrial sectors and the output produced (Brennan et al., 2020, Eurofound, 2024). Finally, countries dummies help to rule out any potential aspect related to differences in broader labour market institutions. Table 3 presents the summary statistics.

5 Empirical strategy

The empirical analysis consists of two main parts. First, we explore whether our theoretical prediction on the existence of a positive association between occupation's green content and the perception of work meaning is supported by the data. Second, we investigate the extent to which such an association gets comparatively stronger in contexts characterized by higher incidence of policy measures promoting the protection of the environment as a valuable social goal. In both cases, we rely on standard linear probability models with clustered standard errors at the occupation 4-digit level.

More precisely, we begin by estimating the following model:

$$M_{ijct} = \gamma + X'_{ijct}\alpha_1 + \alpha_2 e_{ijct} + \beta_1 g_{occ} + Z'_{ijct}\beta_2 + \Delta_{ijct} + \varepsilon_{occ} \tag{3}$$

where subscripts i, j, c and t denote the individual, industry, country and time, respectively; M_{ijct} is the measure of work meaning; X_{ijct} is a vector capturing the features of job design in terms of autonomy, competences and relatedness; e_{ijct} is the work effort; g_{occ} is the occupation's green content; Z_{ijct} is a vector accounting for extrinsic rewards (career perspective, individual recognition, monetary compensation), individual-level socio-demographics and firm-level characteristics, Δ_{ijct} refers to a battery of fixed effects and ε_{occ} is the error term clustered at the occupation 4-digit level.

In the second part of the analysis, we explore the heterogeneity of the effect associated with g_{occ} across countries with varying incidence of green-related policy measures. We begin by splitting the countries into two groups depending on the value of the EPS index (p). EPS is high (low) when the mean value of the country for the three years before the EWCS wave is higher (lower) than the sample mean. We decided to make the average over multiple years because we acknowledge that environmental regulations

might take years to implement. Figure 4 shows a map of the countries based on the high vs. low EPS split. To investigate the heterogeneous effect of g_{occ} we re-estimate model (1) on the two country groups separately. Since EPS data are not available for all the countries included in the EWCS, in running these estimates we experience a slight reduction in the number of observations compared to the baseline.

Notwithstanding the inclusion of a set of controls drastically reduces the sorting concerns, some endogeneity concerns still remain. These relate to unobservable characteristics that drive sorting as well as some potential measurement errors, which may derive from the aggregation from 5 to 4 digit occupations when creating a green score that is amenable for EWCS data (see Section 4.1). To mitigate these issues, we conclude the analysis by resorting to an instrumental variable approach. We build an occupation-level (4-digit ISCO) instrument that captures the probability for an occupation to follow precise quality standards. Quality standards find application across sectors, occupations, and objectives (e.g., security and safety, product certification). In recent years, multiple environmental management schemes and connected certification have also become more common. See, for instance, European Management and Auditing Schemes or ISO 14001 (Jiang and Bansal, 2003, Rennings et al., 2006, Iraldo et al., 2009) whose general scope is to improve the firm environmental performance and monitoring into the organization and operations of firms. We contend that, ceteris paribus, in light of the aforementioned management practices and due to regulatory push/pull effects (Rennings, 2000), green-oriented workers are more engaged in quality checks, being associated with the use of materials and energy, or considerations on the environmental impact and footprint of products and processes. For an average worker, quality checks should not be directly associated with meaningfulness gains, unless sector and occupation specificities (which we partially account for) command higher esteem for workers that are directly engaged in quality controls; see, for instance, the case of luxury brands or goods.

6 Results

6.1 Baseline

Table 4 reports the results of the baseline estimation, employing pooled data from the two waves of the EWCS survey, that is, 2015 and 2021. We progressively include controls in the different specifications. Aligned with the conceptual framework, we first assess whether an occupation's green content exerts an effect on work meaning on top of the standard components of self-determination theory, namely autonomy, competence and relatedness. In this specification, we also control for a proxy of work effort through weakly hours worked. We find that greenness has a positive and significant effect. Columns 2 and 3 proceed by adding further controls, that is, those associated with external rewards (i.e. career opportunities and individual recognition) and individual and firm-level controls (see Section 4.2), respectively. In both cases, the association between greenness and the meaning of work remains positive and significant.

We test the robustness of these baseline results in different ways. First, we make sure that the findings remain valid when employing weights in our regressions. Specifically, we re-estimate the most complete specification reported in Table 4 using post-stratification weights to account for the nonresponse rate and different probability selection (Eurofound, 2016, 2022*b*). Moreover, we repeat the same exercise using the inverse of the country size as weight to remove the concern that the results are driven by sample size differences (see Nikolova and Cnossen, 2020). The results are reported in Table 5 (columns 1 and 2, respectively). Once again, we find a positive and statistically significant association between the green content of the occupation and the perceived meaning at work. The magnitude of this effect is consistent with that observed in the baseline estimates.

Another potential issue in the baseline specification is the omission of information on individual wage, which may introduce bias due to its correlation with both perceived meaning of work (Hu and Hirsh, 2017) and, potentially, the green content of occupations (Vona et al., 2019, Kuai et al., 2025). Unfortunately, data on hourly wages are not available for the 2021 wave of the EWCS. As a result, the most feasible approach is to replicate the analysis using the 2015 wave alone, incorporating hourly wages as

an additional control. The results of this empirical exercise are reported in Table 6. Following the same step-wise strategy as before, we introduce control variables sequentially. Across all specifications, the coefficient associated with the green content of the occupation remains positive and statistically significant, reinforcing our confidence in the positive relationship between greenness and perceived work meaning. In line with some extant evidence (Hu and Hirsh, 2017), and the notion that workers may accept a lower wage to carry out meaningful jobs (Cassar and Meier, 2018), wage level becomes negatively associated with the meaning of work in the fully specified model (column 4).

6.2 Heterogeneity across green policy regimes

As argued above, our theoretical framework postulates that the positive association between occupation's green content and work meaning is driven by social esteem and that the latter tends to be stronger in contexts characterized by the recognition of the fight against climate change as an important social goal. To test for this mechanism, we conduct a heterogeneity analysis that takes advantage of the cross-country variation in green policy regimes. Our underlying assumption is that stronger policy interventions in this field reflect the presence of greater pro-environmental social norms and attitudes within the population. These, in turn, are likely to enhance the social esteem of individuals employed in green occupations, thereby increasing their sense of the meaning of work.

In more detail, we proceed by splitting the sample into two subsets according to the incidence of EPS, as explained above (Section 5). In our theoretical framework, this policy difference captures parameter p (see Figure 1). Then, we re-estimate the full model specification separately for each country group under three different scenarios: a) using pooled data from the 2015 and 2021 waves, without controlling for individual wages; b) using only the 2015 wave, again without wage controls; and c) using only the 2015 wave, this time including controls for individual wages. The corresponding results are presented in Table 7, Columns 1–2, 3–4, and 5–6, respectively. In line with our theoretical framework, we find that the association between occupation's green content and perceived work meaning is not uniform across countries. Specifically, in countries with high EPS, the relationship remains positive and statistically significant

across all specifications, regardless of the dataset used or the inclusion of wage controls. In contrast, in countries with low EPS, the association is consistently null. [14]

6.3 Endogeneity

Given that the exogeneity of occupation's green content in our baseline specifications may be compromised by sorting on unobservables and measurement error, we now turn to the results of our instrumental variable (IV) estimation strategy. Table 8 reports the results of regressions in which we use the incidence of tasks related to meeting quality standards across occupations as an instrument for occupation's green content. In all estimated models, we consider the full set of control variables including the individual wage, thus limiting the analysis to the 2015 wave, to avoid incurring in omitted variable bias. Column 1 shows the IV results for the whole sample, while in Columns 2 and 3 we split the countries between high and low EPS, as discussed above. In line with our priors, in the first-stage regressions we find a positive association between quality standards and occupation's green content. Moreover, we note the relevance of the instrument: indeed, across all specifications, the F statistics is well above conventional values. Regarding the second-stage results, we find that, when considering the whole sample, the green content of the occupation positively affects the perception of the meaning of work. An intuition on the magnitude of the effect is the following: An increase of one standard deviation in the green content leads to a 6 percentage points higher meaningfulness. To put this into perspective, this effect is comparable in size to that of relatedness and twice as large as the effect of autonomy.

Finally, when we repeat the IV analysis by splitting the sample between high- and low-EPS countries, we obtain further evidence corroborating our theoretical framework. Specifically, in countries with a high incidence of pro-environmental policy, occupation's

[14] One potential limitation of the above analysis is that all the estimated models rely on partially distinct survey questions to measure the components of self-determination theory. Since these components are major drivers of the meaning of work, their mismeasurement can bias the results. To further substantiate our findings, we carry out an additional robustness check addressing this issue. Specifically, we generate three variables that capture the main components of self-determination theory (i.e., autonomy, competence and relatedness), using only the same questions available in both waves of the EWCS (for details, see Table A4 in the Appendix). To ensure consistency, the responses to these questions are transformed into dummy variables. Then, we re-estimate all the models of interest using these variables as controls. Results are reported in Table A5, in the Appendix. Our main findings are confirmed across the board.

green content has a positive and statistically significant effect on perceived work meaning. In contrast, in countries where such policy interventions are less prominent, the effect is not statistically different from zero. These patterns are broadly consistent with the idea that the social context matters in shaping the relationship between green jobs and the meaning of work. Whenever the defence of the environment is perceived as a relevant social goal, as proxied by the presence of dedicated policy effort, workers in green occupations are more likely to be seen as worth of social esteem, thereby enhancing their perception of work meaning.

7 Conclusion

This paper set out to investigate whether workers intrinsically value their involvement in occupations that promote the protection of the natural environment, using the lens of meaningful work. The literature on the engagement of individuals in the green transition and their reaction to norms and values has heavily emphasized the role played by consumption-side behavior (Besley and Persson, 2019). Instead, the production side, and specifically the motivational dimensions of workers engaged in green jobs, has received comparatively little attention. Building on the foundational framework developed by Cassar and Meier (2018), we extend the concept of meaningful work by incorporating a social esteem component, drawing from recognition theory (Honneth, 1995). This expanded model enables us to link the green content of occupations, measured by the incidence of green skills, with broader contextual factors that shape the social recognition of green jobs, such as the implementation of pro-environmental policy initiatives and the emergence of societal norms and attitudes related to it. Together, these elements reinforce the social esteem attached to green occupations, thereby enhancing the perceived meaningfulness of work for those employed in them.

Our empirical findings support the proposed theoretical framework. Drawing on individual-level data from the European Working Conditions Survey (EWCS) and the country-level Environmental Policy Stringency (EPS) index, we find that the occupation's green content is positively associated with the perception of work meaning. However, this effect is not uniform across countries. In particular, it is higher in mag-

nitude and statistically significant only in countries that attribute more value to the fight against climate change as a valuable social goal, proxied by the adoption of more stringent environmental policies. To reinforce the causal interpretation of our results, we perform an instrumental variable approach, which delivers consistent results.

We acknowledge some limitations of our study. First, the lack of longitudinal data prevents us from exploiting time variations to identify the effect of occupation's green content on the perception of work meaning. Although the use of an IV approach helps mitigate this issue, causal inferences would be strengthened if this method was combined with the use of panel data. Second, the lack of information about the distribution of finely grained occupational groups partially undermines the aggregation process that we used to obtain green scores to be merged across different data sources. Once again, the IV strategy helps mitigate some of the bias arising from such measurement errors. However, future research could integrate our results by leveraging more granular occupational data and improving linkage across datasets.

Our findings have important implications for both academic research and policy design. From a research perspective, the expanded framework that we propose for analysing the drivers of meaningful work, by integrating occupational content with contextual dimensions such as social norms and public policy, offers a valuable foundation for future empirical and theoretical research in this field. Whereas much of the existing economic literature tends to focus on individual job characteristics or intrinsic task features when assessing work meaningfulness, our study demonstrates that the broader societal context also plays a crucial role. Exploring how different institutional settings, policy regimes, or public narratives shape the meaning individuals attach to their work represents a promising direction for future research.

In terms of policy design, our findings underscore the potential for mutually reinforcing synergies between environmental goals and labour market strategies. Green jobs not only contribute to ecological sustainability but also generate social value by enhancing the meaningfulness of work. This occurs when workers perceive their roles as contributing to widely recognized societal objectives, such as addressing climate change. Policymakers should therefore recognize that ambitious environmental regulations can yield important co-benefits for worker motivation, especially when such policies help

reinforce pro-environmental social norms. However, these synergies are not automatic. They rely on the degree of social esteem attributed to green occupations, which itself can be shaped through targeted policy efforts. Public awareness campaigns, sustainability education programs, and employer branding initiatives that highlight the social relevance of environmental commitments can all help cultivate a narrative in which green jobs are seen as socially valuable and purpose-driven. Such interventions may be especially effective in fostering greater commitment to green employment among the workforce, facilitating the recruitment of younger workers and individuals seeking careers that align with their values.

Authorship contribution statement

Fabio Landini - Conceptualization, Investigation, Methodology, Writing - Original Draft, Supervision. **Davide Lunardon** - Conceptualization, Methodology, Software, Formal analysis, Investigation, Resources, Data curation, Writing - Original Draft, Project administration. **Alberto Marzucchi** - Conceptualization, Methodology, Formal Analysis, Investigation, Writing - Original Draft, Supervision.

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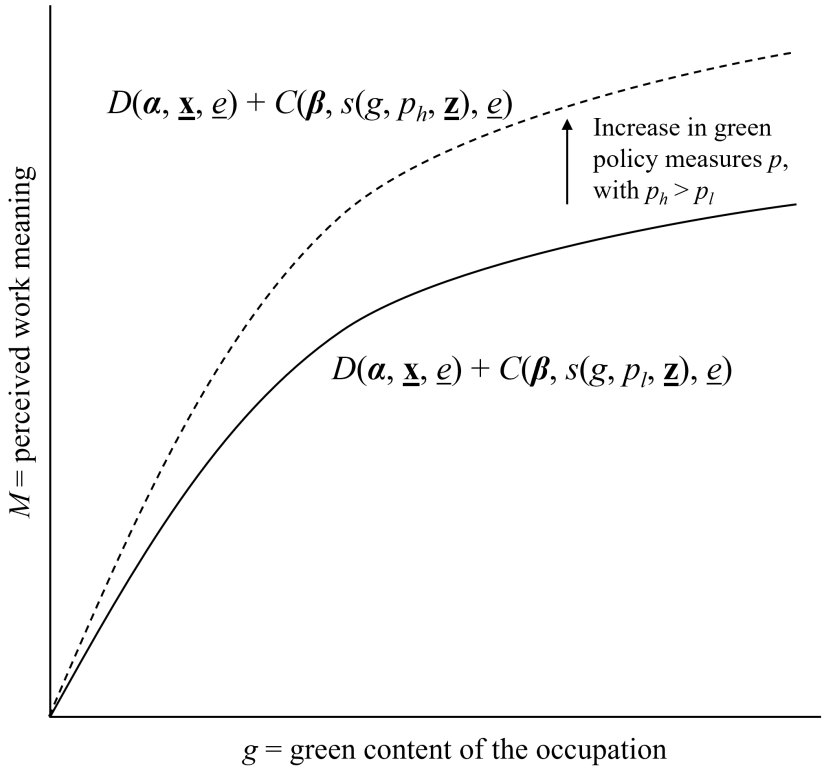
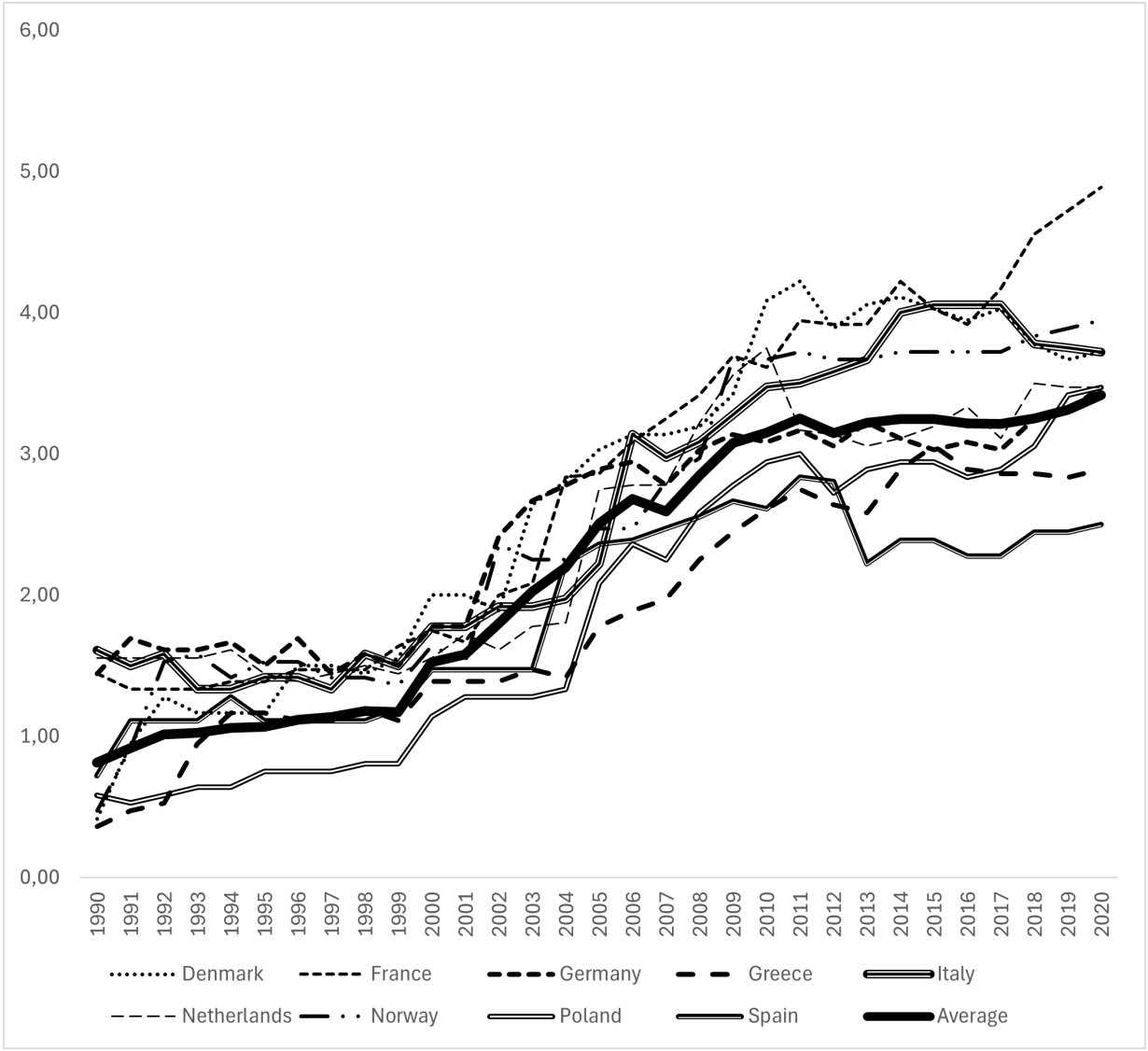
Figures and tables

Figure 1: Meaningful work, green occupational content and climate-mitigation policy



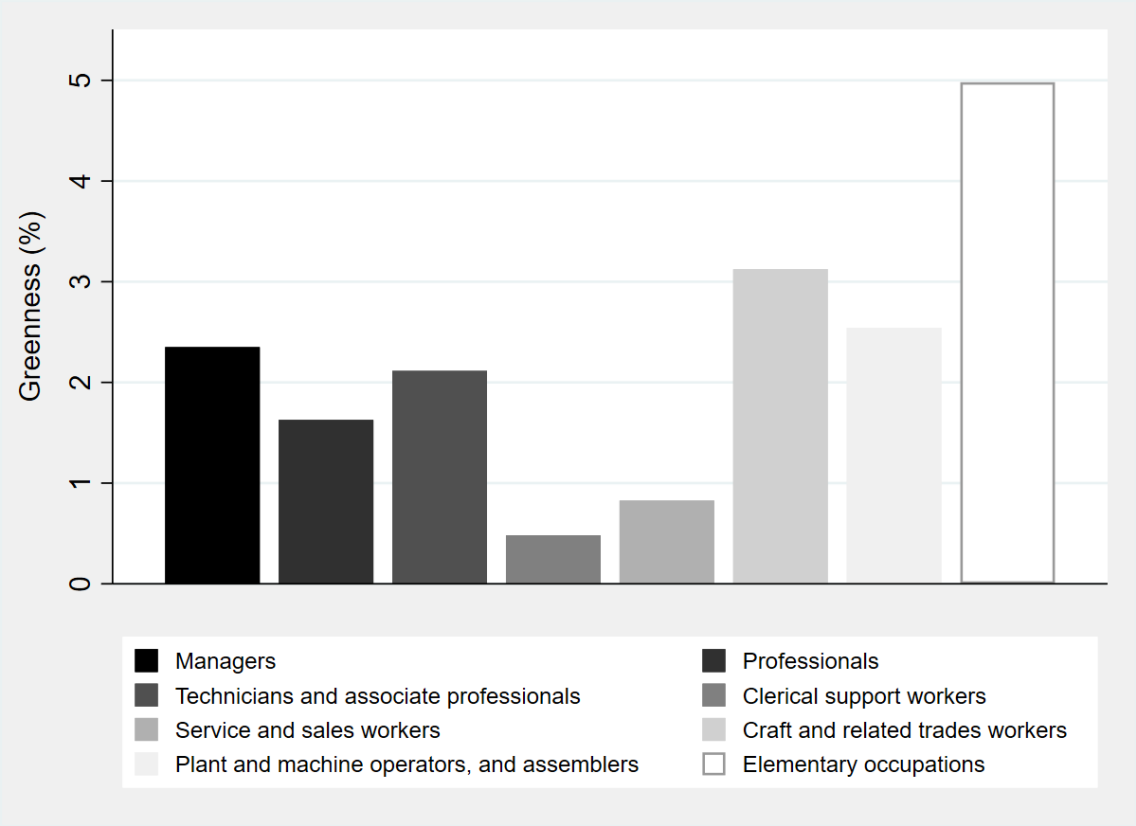
Notes: The figure shows the hypothesized relationship between perceived work meaning (M), social esteem (s), occupation's green content (g) and intensity of green policy measures, for any given level (lower bar) of the other variables ($\mathbf{x}$, e, $\mathbf{z}$, e). The larger the green content of the occupation, the higher the recognized social esteem ($s_g > 0$) and thus the greater the perceived work meaning. Moreover, we suggest the increase in social esteem and work meaning associated with a marginal increase in green content is larger, the higher the incidence of green policy measures (i.e., when p increases from p_l to p_h.

Figure 2: Evolution of EPS across countries, 1990-2020



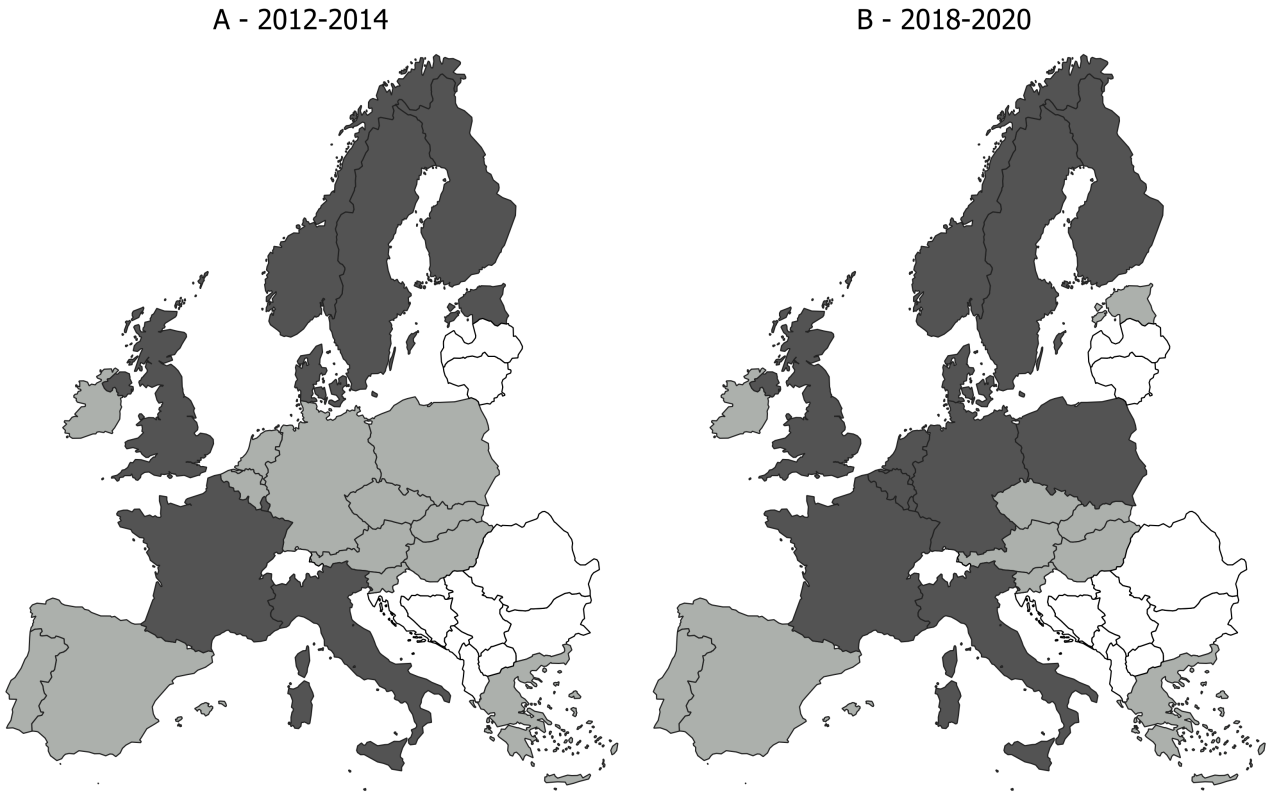
Notes: Own elaboration on OECD data. The EPS index captures a composite set of interventions combining market, non-market and policy based aspects related to environmental protection. For more detail see Kruse et al. (2022). For the sake of clarity, the analysis is restricted to a selected gorup of countries.

Figure 3: Incidence of green content across occupational groups



Notes: Owns elaboration on EWCS and ESCO data. Grenness is measured as the share of green skills over the total number of skills associated with the occupation. This measure is first computed at the 5-digit ESCO level and then aggregated at the 4-digit ESCO and ISCO level. The praph reports the mean value of this greenness indicator across macro (1 digit) occupational groups.

Figure 4: Heterogeneity of EPS: high vs. low incidence across countries



Notes: Own elaboration based on OECD data. High EPS countries (dark grey) are those with mean value for the three years before the survey larger than the sample mean. Conversely, low EPS country (light grey) are those with mean value lower than the sample mean. Panel A reports the country classification for the period 2012-2014 (i.e., prior EWCS 2015). Panel A reports the country classification for the period 2018-2020 (i.e., prior EWCS 2021). Grey areas refers to country with no available information.

Table 1: Self-determination theory (SDT)

SDT	EWCS questions	Methods
Autonomy		
2015	(1) Are you able to choose order to tasks? (1 = Yes, 0 =No), (2) Are able to chose or change methods? (1 = Yes, 0 =No); (3) Are able to choose or change speed? (1 = Yes, 0 =No); 4) Assessing yourself quality? (1 = Yes, 0 =No); 5) You can take a break when you wish? (from never to always 1 - 5); 6) Are you able to apply your own ideas in your work? (from never to always 1 - 5).	PCA
2021	(1) "Are able to choose methods?" (from strongly disagree to strongly agree 1 - 5) and 2) Are you able to influence decision that are important for you? (from strongly disagree to strongly agree 1 - 5).	PCA
Competence		
2015	1) Does the respondent have the appropriate skills to handle current or more demanding duties? The answer are rescale 1 = Yes, and have more than required skills; 0 = No) 2) Does your main job involve: "Solving unforeseen problems on your own? (1 = Yes; 0 = No) 3) Learning new things? (1 = Yes; 0 = No).	PCA
2021	1) Does the respondent's job involve learning new things? From strongly disagree to strongly agree 1-5; 2) Do you have enough opportunity to use their knowledge and skills in their current job? From strongly disagree to strongly 1-5).	PCA
Relatedness		
2015	1) Your colleagues support you (from strongly disagree to strongly agree 1-5) 2) Your manager support you (from strongly disagree to strongly agree 1-5)	PCA
2021	1) Your colleagues support you. The answer is rescaled from 0 (strongly disagree) to 100 (strongly agree)	

Notes: All the index are rescaled from 0 to 100. Given the categorical nature of the underlying variables, the estimation applies Polychoric Principal Component Analysis (PCA). For a similar approach, see Nikolova and Cnossen (2020).

Table 2: Variables

Variables	Description
Weakly hours worked	Natural log of worked hours per week
External rewards	
Career	My job offers goof prospects for career advancement (1 - Strongly agree and agree; 0 = remaining options
Individual recognition	I receive the recognition I deserve from my work (1 - Strongly agree and agree; 0 = remaining options
Hourly wage	We divide the adjusted net monthly salary per 4 (weeks). We further divide by hour worked per week. We use only workers with a minimum hour of 20 and a maxium of 70 per week. We take the natual log. Available only for 2015.
Individual and firm controls	
Age intervals	Age groups: 1 = 18-35; 2= 36-45; 3) 45-60; 4) 60 - 70
Biological sex	1= Female; 2= Male; 3= other and missing information
Human capital	1 = Having a tertiary degree (ISCED 6, 7, 8), 0 = No Tertiary degree (ISCED 0, 1, 2, 3, 4, 5)
Tenure interval	Number of years in the same company/organization. Tenure interval; 1= less than one year; 2 = from 1 to 5; 3 = more than 5 years
Firm size	Company size indicator (1 = <= 250 employees; 0 = >= 250 employees
Private ownership	1 = Firm is private; 0 = Firm is public or other ownership forms
Group controls	
Occupation	ISCO 08 1-digit
Industry	NACE rev 2.2 2-digit
Country	34 European country
Year	Survey waves (2015, 2021)

Table 3: Summary statistics

	Obs	Mean	Std. Dev.	Min	Max
Meaningful work	74842	75.656	23.687	0	100
Autonomy	73210	61.659	26.249	0	100
Competence	74128	63.705	24.956	0	100
Relatedness	62992	74.483	25.958	0	100
Loghours	74839	3.583	.448	-1.469	4.248
Green content (g)	74842	1.974	4.535	0	61.09
Houraly wage	30114	2.066	.657	-.675	4.535
Career	71757	.49	.5	0	1
Individual recognition	73775	.689	.463	0	1
Sex	74836	.496	.5	0	1
Age intervals	74842				
18-34		.3	.458	0	1
35-45		.265	.441	0	1
46-60		.376	.484	0	1
More than 60		.059	.236	0	1
Tertiary education	74562	.497	.5	0	1
Tenure intervals	74272				
Less than 1 year		.122	.328	0	1
1 to 5		.368	.482	0	1
More than 5		.509	.5	0	1
Firm size	72227	.218	.413	0	1
Private	71882	.731	.444	0	1
Years	74842				
2015		.471	.499	0	1
2021		.529	.499	0	1

Notes: Own elaborations on ESCO and EWCS data. For all the variables except *hourly wage*, the reported statistics refer to pooled data from the 2015 and the 2021 waves of the EWCS. For *hourly wage*, due to information unavailability, the statistics refers to EWCS 2015 only.

Table 4: Occupation's green content and meaningful work, 2015-2021

	(1)	(2)	(3)
Autonomy	0.1880***	0.1635***	0.1632***
	(0.0066)	(0.0064)	(0.0060)
Competence	0.1507***	0.1269***	0.1340***
	(0.0048)	(0.0047)	(0.0046)
Relatedness	0.2351***	0.1954***	0.1996***
	(0.0062)	(0.0053)	(0.0054)
Weakly hours worked	-1.9793***	-1.4215***	-1.4445***
	(0.2590)	(0.2677)	(0.2800)
Green content (g)	0.0698***	0.0671***	0.0606***
	(0.0248)	(0.0244)	(0.0220)
Career		2.4968***	3.5342***
		(0.2124)	(0.2255)
Individual recognition		7.6301***	7.1823***
		(0.2722)	(0.2703)
Individual and firm controls	No	No	Yes
Group controls	Yes	Yes	Yes
Constant	34.1645***	31.8657***	
	(4.1026)	(4.5455)	(5.3962)
Obs.	61,249	59,857	55,721
R-squared	0.2162	0.2420	0.2603

Notes: Own elaborations on ESCO and EWCS data. Estimates obtained from linear probability models with clustered standard errors in parentheses. Individual and firm controls account for age, biological sex, tertiary education, work experience intervals, firm sizes, private vs other ownership forms. Group controls include occupation, industries, countries and year dummies. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Weighted regressions, 2015-2021

	(1)	(2)
	Post-stratification	Country sample size
Green content (g)	0.0777***	0.0740***
	(0.0274)	(0.0246)
Self-determination theory	Yes	Yes
Weakly hours worked	Yes	Yes
External rewards	Yes	Yes
Individual and firm controls	Yes	Yes
Group controls	Yes	Yes
Constant	29.3744***	33.4382***
	(5.3057)	(5.0452)
Obs.	55,721	55,721
R-squared	0.2571	0.2574

Notes: Own elaborations on ESCO and EWCS data. Estimates obtained from weighted linear probability models with clustered standard errors in parentheses. Self-Determination Theory refers to job design controls (autonomy, competence and relatedness), external rewards account for career prospects and individual recognition. Group controls include occupation, industries, countries and year dummies. Individual and firms controls account for age, biological sex, tertiary education, work experience intervals, firm sizes, private vs other ownership forms. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Controlling for hourly wage, 2015

	(1)	(2)	(3)	(4)
Autonomy	0.1654***	0.1617***	0.1353***	0.1323***
	(0.0095)	(0.0091)	(0.0089)	(0.0089)
Competence	0.0385***	0.0370***	0.0354***	0.0433***
	(0.0064)	(0.0074)	(0.0073)	(0.0073)
Relatedness	0.2871***	0.2800***	0.2271***	0.2324***
	(0.0087)	(0.0088)	(0.0082)	(0.0082)
Weakly hours worked	-1.4313***	-1.2426***	-1.0731**	-1.7498***
	(0.3766)	(0.4396)	(0.4434)	(0.5019)
Green content (g)	0.1006***	0.1097***	0.1085***	0.1023***
	(0.0359)	(0.0380)	(0.0385)	(0.0370)
Hourly wage		0.5648	-0.1698	-0.8893**
		(0.3529)	(0.3608)	(0.3999)
Career			2.4794***	3.3596***
			(0.3471)	(0.3909)
Individual recognition			8.2516***	7.8699***
			(0.3864)	(0.4048)
Individual and firm controls	No	No	No	Yes
Group controls	Yes	Yes	Yes	Yes
Constant	41.0739***	40.4041***	40.6808***	42.3279***
	(3.8150)	(4.6351)	(5.1539)	(6.1888)
Obs.	27,114	23,766	23,138	20,869
R-squared	0.2224	0.2166	0.2465	0.2575

Notes: Own elaborations on ESCO and EWCS data. Estimates obtained from linear probability models with clustered standard errors in parentheses. Individual and firm controls account for age, biological sex, tertiary education, work experience intervals, firm sizes, private vs other ownership forms. Group controls include occupation, industries, countries and year dummies. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Heterogeneity across countries: high and low EPS (p)

Waves	2015-2021		2015		2015	
	(1)	(2)	(3)	(4)	(5)	(6)
	High (p)	Low (p)	High (p)	Low (p)	High (p)	Low (p)
Green content	0.1007***	0.0516	0.1766***	0.0606	0.1910***	0.0510
	(0.0373)	(0.0327)	(0.0628)	(0.0485)	(0.0622)	(0.0546)
Self-determination theory	Yes	Yes	Yes	Yes	Yes	Yes
Weakly hours worked	Yes	Yes	Yes	Yes	Yes	Yes
Hourly wage	No	No	No	No	Yes	Yes
Other external rewards	Yes	Yes	Yes	Yes	Yes	Yes
Individual and firms controls	Yes	Yes	Yes	Yes	Yes	Yes
Group controls	Yes	Yes	Yes	Yes	Yes	Yes
Obs	18,896	21,241	6,293	10,144	5,864	8,579
R-squared	0.2577	0.2687	0.2487	0.2766	0.2432	0.2676

Notes: Own elaborations on ESCO, EWCS and OECD data. Estimates obtained from linear probability models with clustered standard errors in parentheses. In columns 1, 3 and 5 the analysis is restricted to countries with EPL index higher than the sample mean. In columns 2, 4 and 6 the analysis is restricted to countries with EPL index lower than the sample mean. Self-determination theory refers to job design controls (autonomy, competence and relatedness). Other external rewards accounts for career prospects and individual recognition. Individual and firm controls account for age, biological sex, tertiary education, work experience intervals, firm sizes, private vs other ownership forms. Group controls include occupation, industries, countries and year dummies. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: IV specification: full sample and high vs. low EPS (p) split, 2015

	(1)	(2)	(3)
	All	High (p)	Low (p)
First stage: green content (g)			
Quality standards	0.0384***	0.04434***	0.0324***
	(0.0031)	(0.00599	(0.0051)
F	153.74	54.76	39.53
	(1, 20726)	(1, 5748)	(1, 8459)
P>F	0.0000	0.0000	0.0000
Second stage: work meaning			
Green content (g)	1.3367***	1.6702**	0.4330
	(0.4440)	(0.6854)	(0.8251)
Self-determination theory	Yes	Yes	Yes
Weakly hours worked	Yes	Yes	Yes
Hourly wage	Yes	Yes	Yes
Other external rewards	Yes	Yes	Yes
Individual and firm controls	Yes	Yes	Yes
Group controls	Yes	Yes	Yes
Obs.	20,867	5,863	8,578
R-squared	0.2182	0.1736	0.2637

Notes: Own elaborations on ESCO, EWCS and OECD data. Estimates obtained from Instrumental Variable (IV) models with clustered standard errors in parentheses. In column 1 the analysis considers the whole sample of countries. In columns 2 the analysis is restricted to countries with EPL index higher than the sample mean. In columns 3 the analysis is restricted to countries with EPL index lower than the sample mean. Self-determination theory refers to job design controls (autonomy, competence and relatedness). Other external rewards accounts for career prospects and individual recognition. Individual and firm controls account for age, biological sex, tertiary education, work experience intervals, firm sizes, private vs other ownership forms. Group controls include occupation, industries, countries and year dummies. *** p<0.01, ** p<0.05, * p<0.1.

Online Appendix

A Supplementary Tables and Figures

Table A1: Country sample size

	2015	2021
Belgium	2207	2500
Bulgaria	906	1046
Czech Republic	885	1177
Denmark	867	1098
Germany	1806	2458
Estonia	839	1042
Greece	856	1076
Spain	2849	1745
France	1300	1865
Ireland	864	1052
Italy	1190	1887
Cyprus	870	825
Latvia	767	1018
Lithuania	837	1128
Luxembourg	878	751
Hungary	831	1056
Malta	908	932
Netherlands	890	1039
Austria	890	1067
Poland	940	1729
Portugal	790	1145
Romania	841	1085
Slovenia	1383	1617
Slovakia	881	1090
Finland	831	1088
Sweden	848	1005
United Kingdom	1414	1249
Croatia	756	1056
fyrom	756	663
Norway	895	1864
Albania	750	569
Montenegro	729	699
Switzerland	871	749
Serbia	738	720
Total	34863	41090

Table A2: List of Green Skills (ESCO)

Green Skills	2015
Ensure compliance with environmental legislation	63
Follow health and safety procedures in construction	62
Ensure compliance with environmental legislation in food production	59
Dispose of hazardous waste	47
Dispose food waste	40
Dispose of non-hazardous waste	30
Replace defect components	30
Dispose waste	28
Report pollution incidents	27
Monitor the welfare of animals	26
Advise on animal welfare	23
Assess environmental impact	23
Promote environmental awareness	23
Manage waste	22
Analyse environmental data	21
Follow procedures to control substances hazardous to health	21
Monitor water quality	19
Ensure correct goods labelling	18
Execute disease and pest control activities	17
Advise on pollution prevention	16
Green Skills	**2021**
Ensure compliance with environmental legislation	68
Follow health and safety procedures in construction	65
Ensure compliance with environmental legislation in food production	61
Dispose of hazardous waste	51
Dispose food waste	40
Dispose of non-hazardous waste	31
Replace defect components	31
Dispose waste	28
Report pollution incidents	27
Promote environmental awareness	27
Monitor the welfare of animals	26
Assess environmental impact	25
Advise on animal welfare	23
Follow procedures to control substances hazardous to health	22
Manage waste	22
Analyse environmental data	22
Monitor water quality	19
Ensure correct goods labelling	18
Execute disease and pest control activities	17
Educate on sustainable tourism	16

Notes: The table presents the most commonly used green skills, with the reported figures indicating the total number of occupations in which each skill is applied.

Table A3: Greeness - ISCO 4 digit

ISCO 1 digit (2015)	ISCO 4 digit	Occupations	Greenness	Tot-Skills
Elementary occupations	9612	Refuse Sorters	61,1	23,5
Elementary occupations	9611	Garbage and Recycling Collectors	57,9	19,0
Professionals	2143	Environmental Engineers	54,4	28,0
Professionals	2133	Environmental Protection Professionals	47,5	28,3
Technicians and associated	3132	Incinerator and Water Treatment Plant Operators	37,8	28,3
Elementary occupations	9215	Forestry Labourers	30,0	30,0
Managers	1311	Agricultural and Forestry Production Managers	26,7	30,0
Craft and related trade workers	7133	Building Structure Cleaners	26,4	23,4
Technicians and associated	3112	Civil Engineering Technicians	24,9	23,1
Professionals	2142	Civil Engineers	21,5	172,0
Professionals	2132	Farming, Forestry and Fisheries Advisers	21,4	29,5
Elementary occupations	9214	Garden and Horticultural Labourers	19,4	36,0
Technicians and associated	3143	Forestry Technicians	16,7	30,0
Professionals	2263	Environmental and Occupational Health and Hygiene	16,4	21,5
Managers	1321	Manufacturing Managers	16,3	196,0
Service and sales workers	5411	Firefighters	14,6	48,0
Technicians and associated	3257	Environmental and Occupational Health Inspectors	14,0	29,7
Technicians and associated	3113	Electrical Engineering Technicians	13,5	34,5
Craft and related trade workers	7544	Fumigators and Other Pest and Weed Controllers	12,5	16,0
2021				
Elementary occupations	9612	Refuse Sorters	61,1	23,5
Elementary occupations	9611	Garbage and Recycling Collectors	57,9	19,0
Professionals	2143	Environmental Engineers	55,0	28,5
Professionals	2133	Environmental Protection Professionals	43,9	37,1
Technicians and associated	3132	Incinerator and Water Treatment Plant Operators	37,8	28,3
Elementary occupations	9215	Forestry Labourers	31,0	29,0
Managers	1311	Agricultural and Forestry Production Managers	27,6	29,0
Craft and related trades workers	7133	Building Structure Cleaners	26,4	23,4
Technicians and associated	3112	Civil Engineering Technicians	23,3	23,8
Professionals	2142	Civil Engineers	20,9	206,0
Professionals	2132	Farming, Forestry and Fisheries Advisers	19,3	34,2
Elementary occupations	9214	Garden and Horticultural Labourers	17,7	37,0
Technicians and associated	3143	Forestry Technicians	17,2	29,0
Professionals	2151	Electrical Engineers	16,7	66,0
Professionals	2263	Environmental and Occupational Health and Hygiene	16,3	24,6
Professionals	2144	Mechanical Engineers	15,4	208,0
Professionals	2161	Building Architects	15,3	59,0
Technicians and associated	3257	Environmental and Occupational Health Inspectors	15,0	30,0
Service and sales workers	5411	Firefighters	14,6	48,0
Elementary occupations	9213	Mixed Crop and Livestock Farm Labourers	14,3	21,0

Notes: The table lists the occupation with the highest green score for both years 2015 and 2021.

Table A4: Variables SDT reduced

Variables	Description
Autonomy	"Are you able to choose or change methods of work?" In 2015 EWCS surveys, this question has two possible responses: yes or no. Differently, in the 2021 survey, there are five response options: always, often, sometimes, rarely, and never. To maintain consistency, we group always, often, and sometimes as yes and categorized rarely and never as no (where 1 = Yes, 0 = No).
Competence	"Learning new things". In 2015 EWCS surveys, this question has only two possible responses: yes or no. Differently, in the 2021 survey, there are five response options: from strongly disagree to strongly agree. To maintain consistency, we group strongly agree and agree as 1 and the rest as 0. For survey waves 2010 and 2015, this indicator is calculated by extracting the first component after a PCA on the following questions: 1) respondent has the appropriate skills to cope with current or more demanding duties; 2) main jobs involves "solving unforeseen problems on your own"; 3) main paid jobs involves "learning new things". For survey 2021, a PCA is performed on two questions: 1) learning new things and 2) I have enough opportunities to use my knowledge and skills in my current job
Relatedness	"Do your colleagues help and support you?" The question are rescaled to 1 (strongly agree and agree) and 0 (the remaining options)

Table A5: Baseline 2015-2021 - Reduced SDT indicators

	(1)	(2)	(3)	(4)	(5)
		Rob check		EPS	
Meaningful work	Baseline	Post-strat.	Country size	High	Low
Autonomy (d)	3.9789***	3.9485***	4.0102***	4.0714***	4.5085***
	(0.2115)	(0.2660)	(0.2273)	(0.3383)	(0.3671)
Competence (d)	5.0051***	4.8902***	5.0271***	5.1845***	4.9476***
	(0.2401)	(0.2749)	(0.2647)	(0.3959)	(0.3821)
Relatedness (d)	6.9129***	7.2850***	6.7688***	5.4862***	7.7560***
	(0.2798)	(0.3175)	(0.2967)	(0.4542)	(0.4452)
Weakly hours worked	-1.2044***	-1.0940***	-1.1976***	-0.9382*	-1.2554**
	(0.2948)	(0.3341)	(0.3242)	(0.4783)	(0.5011)
Green content (g)	0.0622***	0.0711**	0.0814***	0.1091***	0.0568*
	(0.0226)	(0.0280)	(0.0243)	(0.0370)	(0.0336)
Career	5.5965***	5.2385***	5.1532***	5.0593***	5.3468***
	(0.2384)	(0.2775)	(0.2798)	(0.3485)	(0.3872)
Individual recognition	10.4196***	10.4718***	10.5806***	10.7610***	10.8590***
	(0.2973)	(0.3319)	(0.3152)	(0.4490)	(0.3836)
Individual and firm controls	Yes	Yes	Yes	Yes	Yes
Group controls	Yes	Yes	Yes	Yes	Yes
Constant	49.0973***	46.0417***	50.9643***	46.7843***	50.2706***
	(5.5085)	(5.4575)	(5.1226)	(8.3660)	(6.0405)
Obs.	58,807	58,807	58,807	19,654	22,494
R-squared	0.1898	0.1885	0.1843	0.1813	0.1964

Notes: Own elaborations on ESCO, EWCS and OECD data. Estimates obtained from linear probability models with clustered standard errors in parentheses. Columns 1 reports estimate for the baseline specification. Columns 2 and 3 shows the results of weighted regressions. Columns 4 and 5 reports the results when distinguishing countries depending of the incidence of ESP. Individual and firm controls account for age, biological sex, tertiary education, work experience intervals, firm sizes, private vs other ownership forms. Group controls include occupation, industries, countries and year dummies. *** p<0.01, ** p<0.05, * p<0.1.