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How the three Ds affect firm pricing, markups and productivity

Will labour shortages and skills mismatches throw sand in the gears of the green transition in Belgium?

by Mikkel Barslund, Wouter Gelade and Geoffrey Minne

Editorial

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Will labour shortages and skills mismatches throw sand

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Abstract

A significant reallocation of labour towards “green” jobs will be crucial for the transition to a decarbonised economy. Skills mismatches challenge the feasibility of this reallocation, particularly with many developed countries also facing substantial labour shortages. This paper analyses the factors that facilitate transitions into green shortage jobs in Belgium, with a particular emphasis on skills and the skill distance between workers’ profiles and the skills required for these jobs. Our data combines longitudinal data of the labour force surveys, international classifications for green jobs, and regional classifications for shortage jobs. Half of green employment is in shortage occupations, underlining that this category may be pivotal both for economic development and for the achievement of climate objectives. Technical skills emerge as key across all education levels. Furthermore, we find that skills mismatches with respect to green shortage jobs are large, but the observed transitions to these jobs tend to involve less skill disruption than the green transition might require. Transitions from inactivity or unemployment to a green shortage job present even greater challenges and necessitate upskilling. Green shortage jobs are shown to differ significantly from other categories in terms of income, required skills, sector of activity, and training needs. Promoting labour mobility and vocational or on-the-job training is expected to yield substantial economic benefits in both the short and long term.

Keywords: Green jobs, Labour shortage, Skills, Occupational mobility
JEL Codes: J23, J24, J62, Q52

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Introduction

The green transition is underpinned by a global political commitment to mitigate the environmental externalities of economic activities, which is expected to spur a rapidly growing demand for green skills. This demand is particularly pronounced in Europe, driven by initiatives such as the European Green Deal (EGD) which aim to make the EU climate-neutral by 2050. The European Centre for the Development of Vocational Training (Cedefop 2021) projects that by 2030, employment growth in the EU will be approximately 1.2% higher — translating to about 2.5 million additional jobs — compared to a scenario in which EGD emission targets are not met. While the associated net job creation remains limited, achieving a clean energy transition will, above all, require substantial qualitative changes in the labour market, including in terms of the skills required and the restructuring of existing roles. However, reallocating labour towards green jobs can be costly, due to factors such as institutional barriers, skills mismatches, and the time required for workers to acquire new competences.

Many advanced economies, including Belgium, are currently experiencing significant occupational labour and skills shortages. According to the European Investment Bank (EIB, 2024), seven out of ten Belgian companies identify the scarcity of skilled workers as a long-term impediment to investment. This challenge extends beyond the immediate needs of green jobs; the global demand for green skills is expected increasingly to surpass the available supply of appropriately skilled workers. The green transition is closely tied to these labour shortages, as ongoing technological advances and regulatory shifts necessitate the development of new skills and the reconfiguring of existing tasks within the workforce (Dierdorff *et al*., 2009; Dierdorff *et al*., 2011; Vona *et al*., 2015). Without timely and effective adjustments in the labour market, the transition to a decarbonised economy may be significantly hindered.

This paper addresses two critical questions: what are the characteristics of the individuals transitioning into green jobs, and how do occupational shortages impact this process? Skills are central to this discussion, particularly given the role of innovation and the implementation of new technologies in sectors such as renewable energy and energy-efficient construction. As Cedefop (2023) aptly notes, "[t]he green transition calls for an inclusive skilling revolution involving all workers […]". Our study seeks to identify the key factors that facilitate or hinder transitions into green jobs, with a particular emphasis on skills acquisition and the alignment between workers' skills and the requirements of green jobs. In this context, occupational shortages are likely to constrain further job-to-job transitions into green jobs, potentially exacerbating existing labour market mismatches.

To investigate these issues from an empirical standpoint, we utilise longitudinal data from the Belgian Labour Force Survey (LFS), which we supplement with the classifications of green jobs from O*NET and regional lists of occupations facing recruitment challenges, referred to as "critical functions". The datasets are merged using four-digit ISCO occupation codes, allowing for the detailed categorisation of occupations. Green jobs are identified through a task-based approach. Belgian regional public employment services (Actiris, Forem, and VDAB) identify shortage occupations through a three-step procedure that involves data analysis and both internal and external expert judgement. This methodological framework enables us to trace labour transitions into and out of green and non-green jobs, as well as shortage and non-shortage jobs, over the 2017-2023 period. The explanatory factors and control variables in our analysis are drawn from O*NET classifications and LFS data, including demographic characteristics, educational attainment, job-related skills, and sectors of employment.

This paper highlights the distinct nature of green shortage jobs compared with other occupations. Approximately one third of Belgian workers are employed in roles involving at least one green task, with about half of these jobs also experiencing labour shortages. Green shortage jobs are predominantly occupied by men (around 80%), and educational attainment varies significantly between green shortage and non-shortage jobs. Over half of the workers in green shortage jobs have a medium level of educational attainment (ISCED 3-4), while only 31% have a high level, compared to 61% in green non shortage jobs and the sample average of 50%. Additionally, irrespective of whether they are in shortage, green jobs generally offer higher wages, with a wage premium of approximately 10%, which is even more pronounced for individuals with lower educational attainment.

As anticipated, most workers remain within their existing occupational categories, with only 1.6% transitioning from non green and/or non-shortage jobs to green shortage jobs. These transitions are predominantly undertaken by younger, by

male, and by workers based in Flanders or Wallonia. Transitions into green shortage jobs are relatively compartmentalised by sector: they are less common among workers initially active in non-market services but more frequent among those initially employed in the construction and industrial sectors.

Technical skills are essential for such transitions across all worker groups, while resource management skills are particularly critical for highly educated individuals making the shift into green shortage occupations. The inactive and unemployed constitute a large reservoir of people who could potentially take up green shortage jobs, and indeed represent almost half of those who start such jobs. However, many of them also lack the necessary technical skills, and their skill profiles are, in general, not sufficiently aligned with the requirements of green shortage jobs.

Job-to-job transitions into green shortage jobs are expected to be more disruptive, involving significant changes in skills, tasks, or sectors. More specifically, the mismatch between the skills possessed by workers and those required for their closest green shortage jobs is larger than the mismatch with respect to non-green or non-shortage jobs. However, when analysing the transitions that took place between 2017 and 2023, it becomes evident that current transitions to green shortage jobs are characterised by a narrower skill distance than transitions to other job categories. This suggests a bias in the decisions to transition to a green shortage job. In addition to the lower number of transitions into green shortage jobs, there is thus also a qualitative issue, as there appears to be an underrepresentation of transitions to jobs demanding a greater disruption of skills.

Our paper explores the factors affecting labour mobility into occupations central to the green transition in Belgium, bridging the literature on green jobs and that on shortage jobs. Extensive research has focused on the static estimation of green job numbers (Vona *et al*., 2018; Bowen *et al*., 2018; Bowen and Hancke, 2019; Valero *et al*., 2021; OECD, 2023), and highlighted the prevalence of technical and manual jobs but also highly educated workers. Our study deals with the dynamic analysis and emphasises the transitions of individuals into these jobs. This approach aligns with research on occupational mobility (Bachmann *et al*., 2019) and several recent studies on transitions to green jobs (EBRD, 2023; Apostel *et al*., forthcoming; Causa *et al*., 2024, Curtis *et al*., 2024). Our paper also introduces occupational shortages as a categorical variable, adding to the literature on labour and skills shortages and their economic impacts (e.g. Le Barbanchon *et al*., 2023 ; Frohm, 2021; European Labour Authorities, 2024; Groiss and Sondermann, 2024). Most papers highlight the significant effect of labour shortages on wages and employment dynamics. Although the environmental sector's demand for skilled labour is well acknowledged, empirical studies linking labour shortages to green jobs are limited (Horbach, 2014; Sato *et al*., 2023). Belgium is particularly relevant due to its significant structural labour shortages and the EU's climate targets driving stronger measures to reduce emissions (EIB, 2024). Moreover, the Belgian labour market is more static than most European labour markets, with less frequent job transitions, both from inactivity or unemployment to employment, and from job to job. (Adalet McGowan *et al*., 2020).

As public authorities increasingly prioritise decarbonisation, the demand for green jobs is expected to grow significantly. However, there is a risk that the labour supply may not keep pace with this rising demand. For example, the widespread deployment of heat pumps and solar panels will necessitate a greater number of skilled installers, plumbers, and electricians. Recent survey data indicates that the shortage of skilled workers is already a significant barrier to private investment in green technologies across the EU (EIB, 2023), underscoring the urgent need to address both green job transitions and occupational shortages.

In Belgium, the slow pace of transitions into green shortage jobs can be attributed to both limited occupational mobility and a deficiency in critical technical and resource management skills. Addressing these challenges requires a concerted policy effort to promote job-to-job transitions, facilitate skills acquisition, and adapt the training infrastructure to the higher demand for technical skills, ensuring that the workforce is adequately prepared to meet the demands of the green transition.

The paper is structured as follows: in Section 1, we describe the dataset, and the way occupations and skills are classified. Section 2 provides descriptive statistics. Sections 3 presents the results related to occupational mobility and to mobility from inactivity or unemployment. Section 4 sets out our findings and Section 5 presents our conclusions.

1. Data, definitions and classifications

Our empirical analysis draws on survey data and on the Belgian LFS in particular. The latter is a quarterly household survey conducted among individuals aged 15 and older residing in Belgium and is carried out by the Belgian Statistical Office (Statbel). It contains information about individuals' characteristics and sheds light on the labour market status of the respondents and on the types of occupation of workers, but also provides data on job characteristics, wages, and employment conditions.

To address the question of the transition to green jobs, we need survey data from the same respondents over consecutive periods. Since 2017, the Belgian LFS includes a rotating panel, in which individuals participate four times. More precisely, individuals take part in the survey for two consecutive quarters (measurements 1 and 2). Thereafter, they do not participate for two consecutive quarters. They then participate in the survey for another two consecutive quarters (measurements 3 and 4). We will focus on yearly transitions by comparing people's labour market situation at measurements 1 and 2 with that at measurements 3 and 4, respectively. Our analyses focus on data from 2017-2023, which bring together around 150 000 observations on workers and 88 000 observations on inactive or unemployed people. To ensure representativeness, we weight our data for all analyses using the weighting factors provided by Statbel.

The matching of Belgian LFS observations to the classifications of shortage occupations, of green jobs and of skills takes place at the level of the self-declared four-digit level of the International Standard Classification of Occupations (ISCO). This is a four-level hierarchically structured classification which contains 436 occupations, 3 of which concern the army and are not used in our study. In contrast to our approach, most empirical analyses have used the LFS data with a less detailed occupation classification – i.e. the three-digit occupation codes containing 130 categories of occupations. Such an aggregated approach risks ignoring differences in the status of green/non-green and shortage/non-shortage occupations at four-digit level. To illustrate, consider the three-digit category “313 - Process control technicians” (Table 1), which consists of a variety of occupations spanning these dimensions: for example, the category “3132 - Incinerator and water treatment plant operators” is classified as a green occupation, while the category “3135 – Metal production process controllers” is not. In turn, this latter category is in shortage, whereas another non-green occupation, “3134 - Petroleum and natural gas refining plant operators”, is not. A sufficiently detailed classification structure is key to our empirical approach, as this allows us to distinguish both green jobs and jobs in shortage.

Table 1. Examples of classification of green/non-green and shortage/non-shortage occupations within a three-digit ISCO structure

ISCO code	Occupation label	Green job	Shortage job (in atleast one region)
313	Process control technicians		
3131	Power production plant operators	Y	Y
3132	Incinerator and water treatment plant operators	Y	N
3133	Chemical processing plant controllers	Y	N
3134	Petroleum and natural gas refining plant operators	N	N
3135	Metal production process controllers	N	Y
3139	Process control technicians not classified elsewhere	N	Y

Source: ISCO, O*NET, and the regional lists of shortage occupations

1.1.1. Green jobs

Green jobs are intrinsically connected to activities or tasks aimed at mitigating the impact of humans on the climate. This encompasses economic activities aimed at reducing fossil fuel consumption, lowering pollution and greenhouse gas

emissions, enhancing energy efficiency, recycling materials, and developing and adopting renewable energy sources (Dierdoff *et al*., 2009).[1] In our methodology, we identify green jobs at the four-digit level of the ISCO by using the Occupational Information Network (O*NET) classification of green occupations from the US Standard Occupational Classification (SOC) system. This process is combined with a crosswalk between the ISCO classification system and the more granular eight-digit SOC classification. Our approach builds upon the methodology in Consoli *et al*. (2016). However, instead of categorising green jobs into three distinct groups — namely, “Green New and Emerging”, “Green Enhanced Skills”, and “Green Increased Demand” — we consolidate these into a single group of green jobs to maintain focus on the issue of labour shortages. A rise in demand for green jobs is anticipated, driven by the ongoing green transition.

The initial classification of green jobs is anchored in the detailed US SOC codes and follows the O*NET’s Green Economy programme. As part of the Green Economy programme, the 905 occupations at the SOC eight-digit level have been assessed via a combination of surveys, case studies and expert judgement to determine the extent to which green activities and new green technologies increase demand for each occupation (Dierdoff *et al*., 2009; Consoli *et al*., 2016).

To accurately map SOC-based green occupations to ISCO four-digit codes, we first aggregate the classifications from the eight-digit SOC level down to the six-digit SOC level, applying a simple averaging method.[2] Following this aggregation, we establish a link between the SOC codes and the corresponding ISCO four-digit codes. This linkage is facilitated using a conversion table provided by the Bureau of Labor Statistics, which was developed under the auspices of the Standard Occupational Classification Policy Committee (SOCPC) (Bureau of Labor Statistics, 2015).

Given that a single ISCO four-digit code can correspond to multiple six-digit SOC codes, we further aggregate the data to the ISCO four-digit level, again employing an averaging technique. This process allows us to calculate a "greenness" share for each occupation at the ISCO four-digit level, reflecting the proportion of green SOC occupations within each ISCO occupational category. Finally, to simplify our analysis, we introduce a binary classification of ISCO occupations into green or non-green categories. In our main analysis, an occupation is classified as green if the greenness percentage, calculated based on the SOC averages, is greater than zero. This implies that our measure (at the ISCO level) constitutes a "broad view" of green occupations. In the annex, we provide the results from a more restricted definition to test the robustness of our findings, and illustrate specifically (see Figures A.1-3 and Table A.3) that binary classifications based on "greenness" percentages of 10%, 25% and 50% do not qualitatively change our findings.[3]

1.1.2. Occupational shortages

An occupational shortage can be defined as "a sustained market disequilibrium between supply and demand in which the quantity of workers demanded exceeds the supply available and willing to work at a particular wage and working conditions, at a particular place and point in time" (Barnow, Trutko and Piatak, 2013). Most studies focusing on labour shortages and labour market tensions rely on longitudinal data on the volume of job vacancies or on a ratio between the labour reserve and vacancies in order to identify the occupations for which companies are confronting greater recruitment difficulties. Even where that data provides a broad picture of changes in demand and supply for a particular occupation, it may provide a limited view of the potential reasons behind the shortages facing employers. Qualitative shortages are largely overlooked, and labour mismatches can complicate empirical analysis, because the jobseekers available may not meet the required standard in terms of work experience or skills.

Our indicator of labour shortage relies on the lists of critical occupations that the three Belgian regions establish on a yearly basis (Actiris, Forem and VDAB)[4] and takes stock of the local and bottom-up expertise of the regional public employment services. An occupation is considered critical when filling job vacancies is less easy, and the recruitment process is deemed

[1] See Apostel and Barslund (2024) for an overview of the measurement of green jobs.

[2] The averaging method implicitly assumes an equal distribution of (more detailed) sub-codes (and workers) within each more aggregated six-digit SOC code and each ISCO four digit code. For example, the broad occupation category "Electronics engineering technicians" (2010 SOC code 17-3023, equal to the ISCO four-digit code 3114) consists of three specific occupations: Electrical and Electronic Engineering Technicians (17-3023.00), Electronics Engineering Technicians (17-3023.01), and Electrical Engineering Technicians (17-3023.03). Since two out of these specific occupations are green (17-3023.01 and 17-3023.03) and one is non-green (17-3023.00), our estimate of green employment in this broad occupation is two-thirds of the total employment in "Electronics engineering technicians" (17-3023). This averaging approach is frequently used in the literature see e.g. Bowen *et al*. (2018), Vona *et al*. (2018), and Apostel *et al*. (2024) for instances of this approach being applied to Belgium.

[3] A higher greenness threshold lowers the share of people employed in green occupations (around 18% of green jobs with a 50% greenness cutoff) but the relative distributions across regions and shortage/non-shortages stay mostly unchanged.

[4] The German-speaking community also establishes its own list, but we do not take this list into account due to the limited size of the labour force in this area and to the weight of commuter workers within the proximity of the German, the Dutch and Luxemburgish borders.

to be taking too long. Difficulties in recruiting can have very diverse causes and can be quantitative and/or qualitative and related to conjunctural and/or structural factors. Public employment services have a legal duty to establish these lists, based upon which an inventory of training courses and educational pathways is drawn up. Unemployed jobseekers are authorised, under certain conditions, to follow a training course targeted at one of these professions, while retaining part of their unemployment benefit. To establish these lists, each region is allowed to follow its own methodology, however, in practice, there is a clear overlap between the methodologies used. The three lists result from a comparable three step procedure:

- **Statistical analysis of the number of jobseekers and the number of job vacancies**. The employment services receive, on the one hand, notification of vacancies from recruiters and on the other, applications from jobseekers to claim social security (e.g. unemployment benefits, childcare benefits) and to receive support with job-seeking or training. These inputs are classified according to occupation to derive a ratio between the labour reserve and the number of vacancies – also named the tension index – which can be used as an indicator of labour shortage. Occupations for which the tension index is less than 1.5 are considered as being in shortage. Nevertheless, for many occupations, hard data is incomplete and survey data is used in lieu. For instance, in Wallonia, the satisfaction rate with respect to a recruitment process is used and compared to the median for the whole set of occupations.

- **Internal expert judgement**. The members of their own staff with responsibility for analysing employers, sectors of activity, and training, give then their opinion on the origin of any difficulties identified. These staff members handle the job vacancies that are submitted to the employment services and maintain regular contact with employers, enabling them to identify and clarify the causes of any tensions identified.
- **External expert judgment**. Finally, the public employment services submit their lists to representatives of sectoral training funds or of employers' federations, whose knowledge and experience enable them to complete, qualify or enrich the results and also add in specific occupations to their lists.

The regional lists of critical occupations do not use the same occupational classifications. For our study, the lists established in 2024, based on data from 2023, were converted into ISCO classifications by the regional services so that they could be merged with the LFS data. The occupational classifications used at the regional level are more detailed than the ISCO four-digit classifications. The conversion to ISCO classification leads to a reduction in the number of distinct occupations, thereby decreasing the overall number of occupations identified as being in shortage. Just as for green jobs, we use an inclusive approach to classify shortage occupations: an ISCO code is classified in shortage in a particular region if at least one of its sub-components is listed as a critical function in the regional shortage lists. Following the ISCO classification, 149 occupations are affected by shortages in Flanders, 105 in Wallonia and 73 in Brussels.[5] The urban nature of the Brussels region makes it a special case, and the occupations in shortage are more concentrated in services and office activities. The lists differ between regions, but some occupations, such as those related to construction, healthcare, education, or catering are common to all three lists.

The reasons behind occupational shortages are multi-faceted, can be mutually reinforcing and are often difficult to identify. Shortages can be related to, among other things, difficult working conditions, stringent requirements concerning education and experience, low remuneration, skills mismatches and education, and analyses of the labour market at the regional level in Belgium show that we cannot reduce the labour shortage issue to a single explanatory factor (High Council for Employment, 2024).[6] The underlying reasons for the various occupational shortages are not the focus of our study; we concentrate simply on whether difficulties are encountered in filling shortages. Our indicator of occupational shortage is a binary variable, and could be considered as being broad given that an occupation is deemed to be affected by a shortage if at least one of its sub-categories appears in the list of critical functions.

Over the last decade, labour market tensions have increased in Europe and more importantly in Belgium, which ultimately hinder business production and job creation. Many sectors experienced significant labour shortages in the aftermath of the COVID-19 crisis as the economic recovery was associated with a rapid and temporary expansion of aggregate demand

[5] Within their own classifications, the number of critical occupations or jobs in short supply is 162 in Wallonia, 241 in Flanders and 102 in Brussels. However, these lists are more detailed than the ISCO four-digit codes, resulting in many occupations sharing the same ISCO code.

[6] Our data tends to confirm the large diversity of underlying factors and, for instance, that the share of occupations in shortage in the tail of the distributions regarding wage level, working conditions or requirements, are relatively similar.

(Coppens *et al*., 2021; Causa *et al*., 2022). That said, most shortages are of a structural nature and the regional lists of critical occupations include many occupations that feature repeatedly year after year. The European Labour Authority (2024) found that Belgium ranks among the top three European countries with the highest number of shortage occupations, confirming significant labour shortages in the country. As the High Council for Employment (2024) noted, Belgian occupational shortages are caused by various factors: insufficient worker qualifications, difficult working conditions, unattractive salaries, an ageing population, or the impact of digitisation. The decarbonisation of the economy is a factor that can lead to occupational shortages as it requires new skills and increases aggregate demand for certain economic activities.

2. Descriptive statistics

2.1.1. Green jobs and occupational shortages

Using our definitions of green jobs and jobs in shortage, we can allocate each individual in the Belgian LFS with an ISCO four-digit occupation code (i.e. people currently employed, and people not currently employed but for whom there is information on past employment) to one of four occupational categories: green shortage, green non-shortage, non-green shortage and non-green non-shortage. In Belgium, 52.5% of workers are employed in occupations that are designated as shortage occupations, and some 34% of all workers in Belgium are in occupations which have green elements (Figure 1). The share of people in green occupations varies regionally, with 37% of jobs in Brussels involving green elements, 35% in Flanders and 32% in Wallonia.

Slightly more than half of all green employment is in shortage occupations (17.5% of total employment). The share of green occupations in shortage is slightly lower than for non-green jobs, where 53% of employment is in shortage jobs.[7]

Figure 1: Share of employment by occupational category, and by region (2023)

100
90
80
70
60

50
40
30
20
10
0

Brussels Flanders Wallonia Belgium Green shortage Green non-shortage Non-green shortage

Non-green non-shortage Source: Authors' own calculations based on the list of shortage occupations, O*NET classifications and LFS

(2023).

[7] Whether a green occupation is designated as being in shortage or not is unrelated to its greenness share. Occupations with a low greenness share or high greenness share are equally likely to be in shortage.

2.1.2. Demographic dimensions

Table 2 provides a detailed comparison of the demographic breakdown of green and non-green jobs, further segmented by whether these jobs are in shortage or not. A substantially higher proportion of those employed in green jobs are male, particularly in shortage occupations, where 87% of workers are male compared to 70% in green non-shortage jobs and about 40% in non-green jobs.

Age distribution is relatively consistent across all categories, with workers of prime working age (30-59) making up the majority. However, there is a slight overrepresentation of workers under 30 in non-green shortage jobs.

There is a significant difference in educational attainment between workers in green shortage occupations and in non shortage occupations. More than half of the workers in green shortage jobs have a medium level of educational attainment (ISCED 3-4), contrasting with only 30% in green non-shortage jobs. In green non-shortage occupations, a majority hold higher education qualifications (ISCED 5+).

Table 2 also highlights that green jobs, particularly those in shortage, are predominantly full-time positions. Workers in these roles tend to have spent a slightly shorter length of time with their current employers than those in non-green jobs. Additionally, the share of workers with permanent contracts is higher in green shortage jobs (84%) than in green non shortage jobs (72%), indicating greater job stability in the former category.

The regional distribution of employment shows a higher concentration of green jobs in Flanders, while Brussels has a relatively lower share of green jobs in shortage, reflecting regional differences in employment patterns.

Table 2: Demographic breakdown of green/non-green and shortage/non-shortage occupations (2023)

	(1)	(2)	(3)	(4)	(5)
	Full sample	Green shortage	Green non shortage	Non-green shortage	Non-green non shortage
Male	0.53	0.87	0.70	0.37	0.43
Age in years	41.41	41.76	42.16	40.99	41.29
Age ≤29	0.19	0.18	0.16	0.21	0.19
Age 30-59	0.52	0.51	0.54	0.51	0.52
Age 50+	0.29	0.31	0.30	0.28	0.28
ISCED 0-2	0.12	0.17	0.09	0.13	0.09
ISCED 3-4	0.38	0.52	0.30	0.39	0.35
ISCED 5+	0.50	0.31	0.61	0.48	0.56
Working full-time	0.77	0.92	0.89	0.65	0.76
Years with current employer	10.59	10.57	10.52	10.45	10.81
Born in BE	0.79	0.79	0.74	0.78	0.83
Brussels	0.10	0.06	0.16	0.07	0.12
Flanders	0.60	0.66	0.57	0.66	0.53
Wallonia	0.30	0.28	0.27	0.27	0.35
Permanent contract	0.78	0.84	0.72	0.79	0.77
Received formal training	0.04	0.02	0.03	0.05	0.05
Observations	16 989	2 883	2 819	5 876	5 411

Source: Authors' own calculations based on the list of shortage occupations, O*NET classifications and LFS (2023). Note: 2023 data, shares unless mentioned otherwise

2.1.3. Wages and the earnings premium for green jobs

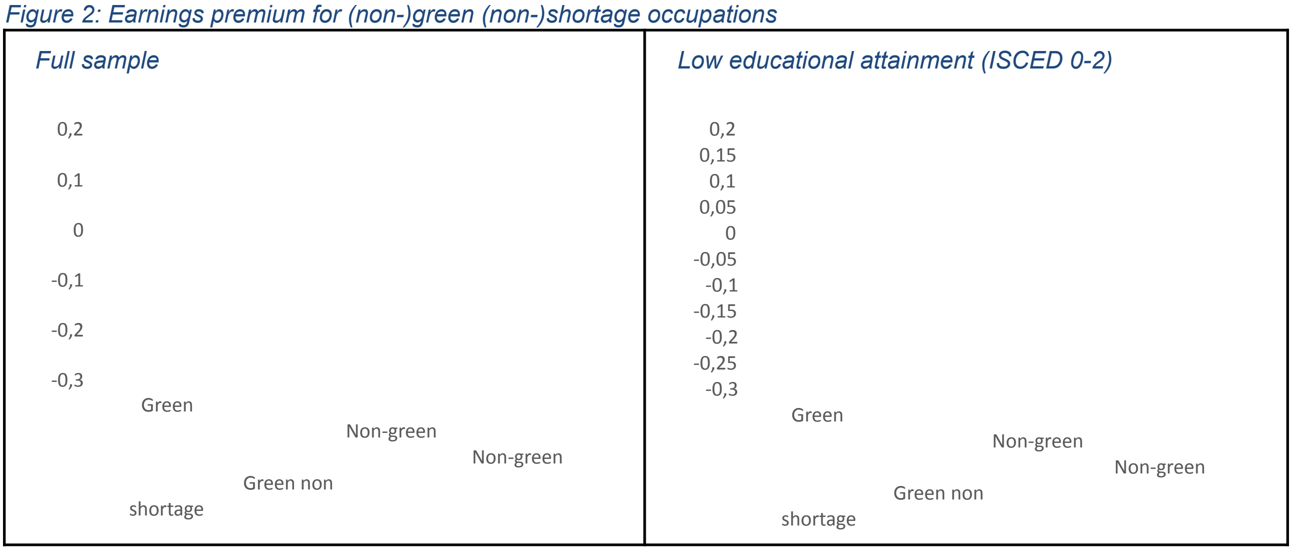
Wages tend to be higher for green jobs compared to non-green jobs, particularly for non-shortage occupations. For instance, the average gross monthly wage for workers in green non-shortage jobs is €4 010, which is significantly higher than the €3 649 earned by workers in non-green non-shortage jobs.[8] Higher levels of educational attainment correspond to higher wages across all occupation categories (green/non-green, shortage/non-shortage). Workers with a high level of educational attainment (ISCED 5+) earn the most, with those in green non-shortage jobs receiving the highest average gross monthly wage of €4 620 per month. In contrast, those with a low level of educational attainment (ISCED 0-2) in non green shortage jobs earn the least, with an average monthly wage of €2 425.

Green jobs in shortage, while offering a small wage premium compared to their average non-green counterparts, offer slightly lower wages than green non-shortage jobs to workers with medium and high levels of educational attainment. For example, workers with a medium level of educational attainment (ISCED 3-4) in green shortage jobs earn €3 213 per month, whereas those in green non-shortage jobs earn €3 233. However, workers with a low level of educational attainment earn the most in green shortages jobs (€2 903). Non-green shortage jobs offer the lowest wages of all to those with low and medium levels of educational attainment. This is particularly evident for workers with a low level of educational attainment, where the wage for non-green shortage jobs (€2 425) is significantly lower than for other categories. These numbers are consistent with findings for green and non-green jobs in Apostel *et al*. (2024).

Figure 2 further explores earnings in each of the four categories. It presents the regression coefficients for earnings using green shortage occupations as the baseline category. The analysis controls for several factors, including age, region of residence, length of time with current employer, gender, and other relevant variables. The figure is divided into four graphs: the full sample, low educational attainment (ISCED 0-2), medium educational attainment (ISCED 3-4), and high educational attainment (ISCED 5+). In all four graphs there is an earnings premium for green jobs relative to non-green jobs, though this is not always statistically significant.

[8] Monthly gross wages (in full-time equivalents in cases of part-time work). Detailed numbers are available in Table A.1. in Annex 2.

Figure 2: Earnings premium for (non-)green (non-)shortage occupations



shortage
shortage
non-shortage

shortage
shortage
non-shortage

Medium educational attainment (ISCED 3-4)

0,2
0,15
0,1
0,05
0
-0,05
-0,1
-0,15
-0,2
-0,25
-0,3
Green
Non-green
Non-green
Green non
shortage
shortage
shortage
non-shortage

High educational attainment (ISCED 5-6)

0,2
0,15
0,1
0,05
0
-0,05
-0,1
-0,15
-0,2
-0,25
-0,3
Green
Non-green
Non-green
Green non
shortage
shortage
shortage
non-shortage

Source: Authors' own calculations based on the list of shortage occupations, O*NET classifications and LFS (2023).
Note: The figure shows coefficient estimates and 95% confidence intervals from a regression of the logarithm of gross monthly wages on dummy variables of job categories green shortage (baseline), green non-shortage, non-green shortage, and non-green non-shortages. Additional controls include age (one year dummy variables), three education categories (where applicable), tenure with current employer and tenure squared, regional dummies, fulltime (vs. part time) dummy, permanent contract (vs. temporary contract) dummy, and an indicator for being born in Belgium.

2.1.4. Occupation-specific skills

Skills in our analysis are defined at the occupational level and are based on O*NET data. In the O*NET classification, skills are defined as developed capacities that either facilitate learning and the rapid acquisition of knowledge or enhance the performance of tasks across various jobs. It includes seven broad skill categories: content, process, social, complex problem-solving, technical, systems, and resource management skills. Each category comprises several dimensions and in total there are 35 sub-categories of skills; technical skills, for example, include installation, equipment maintenance, repair, and quality control analysis, among others.[9]

Concretely, we use the importance score assigned to each skill category at the occupational level. These scores represent an average across the sub-categories and the ratings range from "Not Important" (1) to "Extremely Important" (5). To integrate these indicators into the LFS data, we apply the same methodology used for the classification of green jobs, associating the skill importance scores to each respondent via their self-declared four-digit ISCO code.

Descriptive statistics reveal that green shortage jobs exhibit significantly higher importance scores for technical skills, but lower scores for content, process, and social skills compared to other job categories. However, caution is needed when interpreting these average scores, as educational attainment influences both job categories and skill sets. For example, a large share of green shortage jobs are held by individuals with low or medium levels of education, whereas highly educated individuals are overrepresented in green non-shortage jobs.

[9] The different sub-categories are further explained in Annex 1.

Figure 3: Average importance score for each skill category for (non) green jobs (not) in shortage (1 = Not important, 5 = Extremely important)

4
3,5
3

2,5

2

1,5

1

Content skills Process skills Social skills Complex problem-solving

Technical skills Systems skills Resource management skills

skills

Green shortage Green non-shortage Non-green shortage Non-green non-shortage Source: Authors' own calculations based on the list of shortage occupations, O*NET classifications and LFS (2023).

2.1.5. Occupational transitions

The sustainability of the green transition crucially depends on workers transitioning to green shortage jobs. There will be an increasing demand for green jobs as the transition picks up speed, and those green jobs that are already in shortage pose the greatest risk of slowing it down due to a lack of workers. To analyse job-to-job transitions, we rely on the occupational ISCO code declared by each respondent in the initial quarter and compare it to the ISCO code declared by the same respondent one year later. This approach focuses on changes in occupation, irrespective of whether they occur within the same company or sector. Modifications of the tasks linked to an occupation do not represent a change in occupation. For instance, if a building architect alters his or her specialisation from industrial to residential projects, this would not be classified as a change in occupation. Table 3 shows the share of workers transitioning between these different categories over a period of one year. Most remain within the same occupation: 88% of workers retain the same ISCO code over the one-year period. Even more, 94%, remain within the same job category.

Overall, transitions to green shortage jobs are less common than transitions to green non-shortage jobs, even though there are a similar number of such jobs. Workers with a non-green shortage or non-shortage job have a 1.2% and 2.1% probability, respectively, to transition to a green non-shortage job, but only a 0.9% and 1.3% probability, respectively, to move to a green shortage job.

Workers already holding a green job are most likely to transition to a green shortage job. Those with a green non-shortage job have a 2.6% probability of making this transition, more than double the probability for people in non-green jobs.

Table 3: Yearly transitions between occupational categories

All workers (140 580 observations)

	Type of job one year later			
	Green	shortage	Green non	shortage

Type of reference job in quarter	Green shortage	Green non-shortage	Non-green shortage	Non-green non-shortage	Total
Green shortage	**93.7%**	**2.5%**	1.7%	2.1%	100%
Green non-shortage	**2.6%**	**92.0%**	1.8%	3.5%	100%
Non-green shortage	0.9%	1.2%	**95.1%**	**2.8%**	100%
Non-green non-shortage	1.3%	2.1%	**2.9%**	**93.7%**	100%

Only workers who change profession (12 940 observations)

Type of reference job in quarter	Type of job one year later: Green shortage	Green non shortage	Non-green shortage	Non-green non-shortage	Total
Green shortage	**36.7%**	**25.9%**	16.1%	21.3%	100%
Green non-shortage	**22.5%**	**30.6%**	17.9%	29.0%	100%
Non-green shortage	10.5%	14.1%	**44.4%**	**31.0%**	100%
Non-green non-shortage	12.0%	19.6%	**28.3%**	**40.1%**	100%

Source: Authors' own calculations based on the list of shortage occupations, O*NET classifications and LFS (2017-2023).

This pattern holds more generally as people in non-green jobs are more likely to stay in non-green jobs, and people in green jobs are more likely to remain in green jobs, though to a slightly lesser extent. This tendency becomes even more pronounced when examining individuals who change occupations, specifically those transitioning to a job with a different ISCO code, as shown in the lower table in Table 3. Among those who change occupation, only about 3 out of 10 workers with a non-green job switch to a green job, and within those transitions, shortage jobs are underrepresented. Moreover, green-to-green transitions are more likely across a wide variety of demographic groups. When disaggregating these results by gender, education level, region, or age, in each case people in non-green jobs are only about half as likely to move to a green shortage job than people in green non-shortage jobs.

Green-to-green transitions can help to achieve a low-emission economy, since switching to a green shortage occupation can relieve immediate constraints linked to shortages. Since demand is expected to increase for many green jobs, notably under the impetus of the European Green Deal, this however offers only a partial solution. Without sufficient inflows from workers currently in non-green jobs, the problem of worker shortages is at risk of simply being displaced rather than solved by green-to-green transitions. It is thus important to understand which factors can help, or hold back, transitions into green shortage occupations.

3. Green shortage jobs: transitions and skill distance

3.1. Transitions to green shortage jobs

Various factors influence the likelihood of occupational mobility. To isolate those that significantly influence workers' decisions, we use a regression framework aimed at identifying what may lead to a greater number of workers to enter green shortage occupations.

To do so, we exploit the panel structure of the LFS. Firstly, we focus on individuals who are already employed and determine whether they changed jobs one year later. We run the following regression:

[illegible] = [illegible] + [illegible] + [illegible] + [illegible]

Here, *change to green shortage job* equals 1 if the person moved to a green shortage job from another type of job. Job changes only concern occupational mobility. A change of company or sector of activity is not included if the occupation remained unchanged. The explanatory variables contain the skills required by the initial job and a set of demographic variables including age, education, gender, region of residence, nationality, and household size. Variables linked to the professional situation include whether the current contract is permanent and/or full-time, professional status, whether the worker undertook training in the preceding four weeks, and the sector of occupation as per five broad groups (primary & utilities, manufacturing, construction, business services, and non-market services). These variables are measured in the initial quarter and are thus observed prior to a potential transition. Overall, these results should be taken as associational rather than causal, albeit conditional on a rich set of control variables.

We run the same regression for transitions into other types of jobs (green jobs not in shortage, and non-green jobs in shortage and not in shortage) with the outcome variable equalling 1 if the worker transitions to the job type. The population of interest is all workers not already working in this type of job during the initial quarter.[10] Few people transition to a new type of job. For example, 1.6% of those not already in a green shortage job move into such a job. For this reason, as recommended by Cameron and Trivedi (2005), we use a complementary log-log regression that accounts for the fact that there is a large imbalance in the number of 0- and 1-outcomes.[11]

The regression results in Table 4 (and those split by level of education in Table 5) are as expected regarding demographic characteristics. Consistent with the significant share of low- and medium-skilled green shortage jobs, low- and medium educated workers are slightly more likely to switch to green shortage jobs, though these differences are not statistically significant. Low- and medium-skilled jobs are proportionally more common among jobs in shortage, whether green or non green, which affects the associated transitions positively. Transitions to green non-shortage jobs are much more likely to involve highly educated workers.

As men are overrepresented in green jobs, they are also more likely to transition to them, whether these jobs are in shortage or not. Younger workers are not overrepresented in green shortage jobs, but they are more likely to transition to them, as is the case for other types of job, simply because people are more likely to switch jobs at the beginning of their careers. This is true across education levels and makes young people, even after having begun their professional careers, a group with significant potential to fill green shortage jobs. From a regional perspective, the transition into a green shortage job is more likely in Flanders and is less likely in Wallonia than in Brussels. The fact that industrial occupations account for a relatively large proportion of the occupations in shortage in non-urban areas, and that both unemployment and inactivity rates are lower in Flanders are key reasons for this.

Table 4: Probability of transitioning to a (non-)green (non-)shortage job

	To a green shortage job	To a green non shortage job	To a non-green shortage job	To a non-green non-shortage job
Level of education (omitted cat.: high):				
- Low	0.002	-0.006 ***	0.016 ***	-0.003
	(0.002)	(0.002)	(0.005)	(0.003)
- Medium	0.002	-0.008 ***	0.002	0.000
	(0.002)	(0.002)	(0.002)	(0.003)
Content skills	0.015 ***	0.006	-0.031 ***	0.009
	(0.004)	(0.005)	(0.007)	(0.006)
Process skills	-0.008	-0.009	0.021 **	-0.026 ***
	(0.005)	(0.008)	(0.009)	(0.009)

[10] Since the population excludes those already employed in this type of job, the population size of the regressions for the different types of jobs differs (see Table 4).

[11] Probit regressions would produce almost identical results. These results are available upon request.

Social skills	-0.002	-0.004	-0.006	0.010 *
	(0.003)	(0.004)	(0.006)	(0.005)
Complex problem-solving skills	-0.003	0.005	-0.005	-0.008
	(0.005)	(0.005)	(0.006)	(0.007)
Technical skills	0.008 ***	-0.002	-0.018 ***	-0.009 **
	(0.002)	(0.002)	(0.004)	(0.003)
Systems skills	-0.008 *	0.004	0.009	0.017 **
	(0.005)	(0.006)	(0.007)	(0.007)
Resource management skills	0.011 ***	0.009 ***	0.003	0.007 *
	(0.003)	(0.003)	(0.004)	(0.004)
Age category (omitted cat.: <30Y)				
- 30-49Y	-0.006 ***	-0.007 ***	-0.020 ***	-0.021 ***
	(0.002)	(0.002)	(0.004)	(0.003)
- 50-64Y	-0.011 ***	-0.015 ***	-0.029 ***	-0.030 ***
	(0.002)	(0.002)	(0.004)	(0.003)

Male 0.013 *** 0.008 *** -0.009 *** -0.007 *** (0.001) (0.002) (0.002) (0.002)
Household size (omitted cat.: 1)
2 0.000 0.002 -0.001 -0.001 (0.002) (0.002) (0.003) (0.003)
3 0.002 -0.002 0.002 -0.003 (0.002) (0.002) (0.003) (0.003)
4+ 0.000 -0.002 0.001 -0.003 (0.002) (0.002) (0.003) (0.003)
Nationality (omitted cat.: BE)
- EU non-BE 0.002 0.002 0.003 -0.001 (0.003) (0.003) (0.004) (0.004)
- Non-EU 0.008 * 0.009 * 0.006 -0.007 (0.005) (0.005) (0.005) (0.004)
Region (omitted cat.: Wallonia)
- Brussels -0.007 *** 0.003 0.007 ** 0.010 ** (0.001) (0.003) (0.003) (0.004)
- Flanders 0.003 ** 0.000 0.012 *** -0.002 (0.001) (0.002) (0.002) (0.002)

Permanent contract -0.006 ** 0.000 -0.010 ** -0.009 ** (0.003) (0.004) (0.004) (0.004)

Working full-time -0.001 0.005 -0.009 ** -0.007 * (0.003) (0.004) (0.004) (0.003)
Professional status (omitted cat.: Employee)
- Civil servant -0.001 -0.002 -0.008 *** 0.004 (0.003) (0.003) (0.003) (0.003)
- Self-employed -0.009 *** -0.005 *** -0.010 *** -0.016 *** (0.001) (0.002) (0.003) (0.002)
- Other 0.006 0.019 0.005 0.018 (0.009) (0.012) (0.010) (0.016)

Training in the past four weeks 0.004 * 0.007 *** 0.018 *** 0.013 *** (0.002) (0.003) (0.003) (0.003)
Initial sector of activity (omitted cat.: non market services)

- Primary & utilities 0.012 *** 0.019 *** -0.008 0.018 ** (0.004) (0.005) (0.006) (0.008)
- Manufacturing 0.021 *** 0.021 *** -0.008 ** 0.007 ** (0.003) (0.003) (0.003) (0.004)
- Construction 0.010 *** 0.009 *** -0.006 -0.009 *** (0.003) (0.003) (0.004) (0.003)
- Business services 0.012 *** 0.014 *** 0.004 0.012 *** 13

Baseline probability of transitioning to this
(0.002) (0.002) (0.003) (0.002)

1.6 % Yes 119 809	2.0 % Yes 121 00

job type 3.1 % Year dummies Yes Obs. 99 926

Source: Authors' own calculations based on the list of shortage occupations, O*NET classifications and LFS (2017-2023). Probability of transitioning to a given job category one year later. The population contains all people aged 18-64 in employment, excluding workers already employed in that job category. For example, the first column estimates the probability of transitioning to a green shortage job for all people in employment, excluding those already employed in a green shortage job in the initial quarter considered. Job-related characteristics such as sector, type of contract and skills are based on the job held before the transition. Average marginal effects based on a complementary log-log regression, with standard errors in bracket. Sample weights are used, and standard errors are clustered at the individual level *** p<.01, ** p<.05, * p<.1

In Table 5 we have run the regression on transitions to green shortage jobs, while distinguishing observations according to level of education. Looking at differences in skills from a general standpoint, these, however, seem to have a smaller effect for the low- and medium-educated.

Technical skills are key to filling green shortage jobs. A one-point increase in technical skills on the five-point Likert scale is associated with a 0.8 percentage point increase in the probability of switching to a green shortage job, which represents a 50% increase from the 1.6% base rate. In contrast, for green non-shortage jobs, there is no such effect. Technical skills are known to be important for green jobs (Vona *et al.*, 2015) and technical and manual occupations are overrepresented in green jobs (Consoli *et al.*, 2016). The occupations requiring technical skills thus appear to be mostly concentrated within shortage occupations, potentially causing additional bottlenecks for the green transition.

Repairing, troubleshooting and equipment maintenance appear to be the most important technical skills required to transition to green shortage jobs.[12] Among the latter, low-educated workers with sufficient technical expertise often take up carpenter, electrician, or logistics-related occupations. For instance, the transitions from being an accounting and bookkeeping clerk (ISCO 4311) to a carpenter and joiner position (ISCO 7115), or from being a waiter (ISCO 5131) to a building and related electrician position (ISCO 7411) both involve a large difference in technical skills. In both cases, the importance scores of the repairing, troubleshooting and equipment maintenance skills categories are upgraded by between 1.2 and 2.1 on the five-point Likert scale. For high-educated workers, transitions may concern industrial and production engineers, construction supervisors or jobs in resource management, and the technical skills to be developed are technology design and operations analysis. For these workers, moves more frequently involve a different set of skills (i.e. a decreased importance for some skills and an increased importance for others) whereas for low-educated workers, transitions imply a levelling up in most skill categories. Though not significant for the medium-educated,[13] technical skills are positively associated with transitions to green shortage jobs at all education levels.

Resource management skills - defined as the capacities used to allocate resources efficiently - also seem to influence transitions to green shortage jobs, and mostly so at high skill levels. This is significant and positive for highly educated workers, insignificant but positive for medium-educated workers, and insignificant and negative for low-educated workers.[14] Skills such as the management of personnel and material resources are particularly important for jobs requiring higher qualifications. The green shortage occupations requiring strong resource management skills to which highly educated individuals commonly transition include roles in generic managerial positions[15] (e.g. trade manager or managing director) or in the construction sector (e.g. building architect, construction manager, or house builder).

Content skills also play a key role in the filling of green shortage jobs. These content skills contain a broad range of foundational skills for acquiring domain-specific expertise, such as reading comprehension, speaking, mathematics and science. The point estimate is the biggest for low- and high-educated workers, though it is imprecisely estimated and insignificant for the low-educated. This implies that high-educated workers in jobs that do not require strong content skills are less likely to move to green shortage jobs.

[12] Based on a regression (not shown) similar to that in Table 4, containing all 35 sub-categories of skills instead of the seven large categories of skills (see Annex 1 for the full list of sub-skills).

[13] The differences between the effects for low-, medium- and high-educated are not significant.

[14] The difference between the effects for high-educated and low-educated is significant, but the difference between high- and medium-educated is not. [15] Generic managerial positions are associated with green tasks for two reasons: a large variety of the tasks performed (among other green tasks such as “implementing sustainability programs addressing issues such as recycling, conservation, or waste management” or “managing the movement of goods into and out of production facilities to ensure [the] sustainability of operations”) and the aggregation of different sub-categories of management position (e.g. chief sustainability officer or green marketer).

Finally, systems skills – defined as the capacities to understand, monitor, and improve socio-technical systems – have a significant negative marginal effect. These skills, which are crucial for decision-making and systems evaluation, are more common in management roles such as chief executive or human resource manager and are less relevant to green jobs.

Having followed a training course in the past four weeks is significantly associated with a transition to all job categories, though the coefficient is the smallest for transitions to green shortage jobs. The latter effect is mostly driven by the low educated. We should be careful in interpreting these findings, among other things because of reverse causality. However, this is compatible with the low-educated requiring more upskilling to take up middle-skilled green shortage occupations.

Workers’ gross wages (prior to a transition) are not included in the main specification because of missing values. However, Table A.4 in the Annex 2 shows that they do not have a significant impact on transitions to green shortage jobs and that including them has little impact on the other coefficients in the regression.

Workers in non-market services are the least likely to transition to green shortage jobs, which is expected given the low proportion of green jobs within this sector. However, this is also true in the business services sector, and these workers do have a higher likelihood of making such transitions. Given that the majority of workers are employed in these service sectors in Belgium, while many green shortage jobs are in non-service sectors, these transitions are particularly important.

Table 5: Probability of transitioning to a green shortage job: by level of education

	All levels of education	Low-educated	M	High-educated
Level of education (omitted cat.: high):				
- Low				
- Medium				

0.002	0.
(0.002)	(0
0.002	-0
(0.002)	(0
0.015 ***	0.
(0.004)	(0
-0.008	
(0.005)	0.
-0.002	(0
(0.003)	0.
	(0
-0.003	0.
(0.005)	(0
0.008 ***	
(0.002)	-0.
-0.008 *	(0
(0.005)	
0.011 ***	
(0.003)	

Content skills 0.019 *** (0.005)
Process skills -0.008 (0.007)
Social skills -0.002 (0.004)
Complex problem
solving skills -0.005 (0.006)
Technical skills 0.006 ** (0.003)
Systems skills -0.007 (0.006)
Resource management
skills 0.012 *** (0.003)
Probability of
transitioning to green
shortage job 1.6 % 2.0 % 2.0 % 1.2 % Demographic and
professional controls
(see Table 4) Yes Yes Yes Yes Year dummies Yes Yes Yes Yes Obs. 119 809 14 470 41 803 63 536

Source: Authors' own calculations based on the list of shortage occupations, O*NET classifications and LFS (2017-2023). Probability of transitioning to a green shortage job one year later. The population contains all people aged 18-64 in employment, excluding workers already employed in a green shortage job. Job-related characteristics such as sector, type of contract and skills are based on the job held before the transition. Average marginal effects based on a complementary log-log regression, with standard errors in bracket. Sample weights are used, and standard errors are clustered at the individual level *** p<.01, ** p<.05, * p<.1

The transition to a low-carbon economy necessitates not only an increase in absolute occupational mobility but also a proportional shift, with a higher share of labour transitions directed towards green jobs. To analyse the relative transition towards green jobs that are also in shortage, we concentrate on workers engaged in occupational mobility. Our objective is to identify the factors that enhance the likelihood of an occupational change towards green shortage jobs, while accounting for the fact that certain categories of workers exhibit a higher job-switching frequency. Unlike before, the sample here is limited to respondents involved in occupational mobility or, in practice, to those who have declared two different ISCO codes for their main occupation within a year. We continue to exclude from the sample occupational changes within categories. In our sample, 12 942 transitions were registered in a year in the longitudinal survey, from which between 2 266 and 4 277 observations are withdrawn as they occurred within a single category.

We then estimated the probability of transitioning to (non-)green (non-)shortage jobs, based on a sample of only those respondents who have experienced occupational mobility (See Table A.6 in Annex 2). The probability of transitioning to a green shortage job is lower than for other job categories: 13.8% of the transitions from a non-green and/or non-shortage job are to a green shortage job whereas the comparable statistics reach between 19.1% and 29.5% for other categories of transition.

The analysis of explanatory variables aligns broadly with the previous models, as the effects of gender, education level, skill set, and sector of activity remain consistent. In contrast, age, length of current contract and professional status no longer display coefficients significantly different from zero. Younger people, workers with temporary contracts and wage earners are more mobile, in absolute terms, but in relative terms those factors do not significantly influence transitions to green shortage jobs. Similarly, the difference between Flanders and Wallonia is no longer statistically significant.

3.2. Skill distance with respect to green shortage jobs

Occupational mobility is also influenced by the nature of the change and the associated costs or difficulties of a transition, notably with respect to skills acquisition. Transitions to jobs requiring similar skills are generally easier and quicker, whereas those involving different skills tend to be more disruptive. To what extent does a larger skill distance hinder transitions to green jobs in shortage? In this section, we examine the significance of skill distances between the current working population and green jobs in shortage, analysing both potential (i.e. job transitions that a worker can potentially make) and observed transitions (between 2017 and 2023).

3.2.1. Measuring skill distances

To analyse these questions, we measure the skill distance between a worker and their potential new job using an approach derived from the one used by the OECD (2024). As before, we use the skills required for a worker's current job as a proxy for their skills and determine an importance score (using a five-point Likert scale) associated with the seven categories of skills as discussed above. The skill distance thus becomes the distance between the skills required by a worker's current job *i* and those required by a new job *j*, and is defined as follows:

7-, where ������������ – ������ – ��������,��,�� =Σ |�� ��,��−��??,?? ??=1| ,...,�� ?? ����
?????????? – ???????????????? ??,?? =Σ ???????????–??????–?????? ??=1,...7 ??,??,??

Here, ������������ – ������ – ��������,��,�� is the skills gap between jobs *i* and *j* for category *c*, calculated as the average of the absolute distance between the importance of the sub-categories of skills within this category (denoted ����,��). Each category c contains ���� subskills. For example, the skills gap for the category "resource management skills", is the average difference in importance of the sub-skills time management, management of financial resources, management of material resources and management of personnel resources. See Annex 1 for the list of categories and the sub-skills within each category. The ���������� – ����������������??,?? between jobs *i* and *j* is then simply the average of all skill distances across all categories. Since the importance of each sub-skill is measured on a Likert scale ranging from one to five, the skill distance ranges from zero to four.

3.2.2. Skill distances of potential transitions

To gauge the *potential* transitions, we proceed in two directions from our measure of skill distance. The first, illustrated in the left-hand graph in Figure 4, is based on the ten "closest" green jobs in shortage for each worker, i.e. the ten jobs with the lowest skill distance for any worker.[16] On average, for all workers not already in a green shortage job, the skill distance to the ten closest green shortage jobs is 0.31. Applying the same analysis to the three other job categories, we find that skill distances are largest for jobs in shortage, regardless of whether they are green or not. This is unsurprising because imbalances between the supply and demand of skills, though by no means the only cause of recruitment difficulties for a company, are a key driver of the increase in the number of hard-to-fill vacancies for many occupations (Cedefop, 2024).

Skill distances are also larger for green jobs, irrespective of whether they are in shortage. Putting together these two observations, skill distances are the largest for green jobs in shortage, and the lowest for non-green jobs not in shortage.[17] These differences are all significant. The average skill distance with respect to the closest green shortage jobs is about 1/3; for the other categories it is about 1/4. This would be compatible with a third of skills having a skill distance of one point (for example the difference between "important" and "very important") for green shortage jobs, against a fourth of skills with such a gap for other types of jobs.

These results indicate that green jobs in shortage occupy a specific niche in the labour market, one that is more difficult to access for workers without specific training, upskilling, or on-the-job experience. They possess a strong technical dimension and, in relative terms, are more frequently filled by medium-educated workers. According to the same measure, the skill distance with respect to green shortage jobs is slightly narrower for medium-educated workers. However, even for this group, the skill distance to the nearest green shortage jobs is, on average, greater than that to the other job categories.

As a second measure of skill distance for potential transitions, we quantify the share of jobs for which the skill distance is limited (see right-hand graph in Figure 4), again based on the skill distance between a worker and a (non-)green job (not) in shortage. To determine a norm or a threshold, we consider workers who moved to a different job category and calculate the median skill distance between the original and new job (0.37). Jobs for whom the “skill distance is limited” are those whose skill distance is lower than this threshold. According to this second measure, on average, 21% of green shortage jobs align with the current skill sets of workers. In contrast, this percentage increases to between 25% and 27% for other job categories.

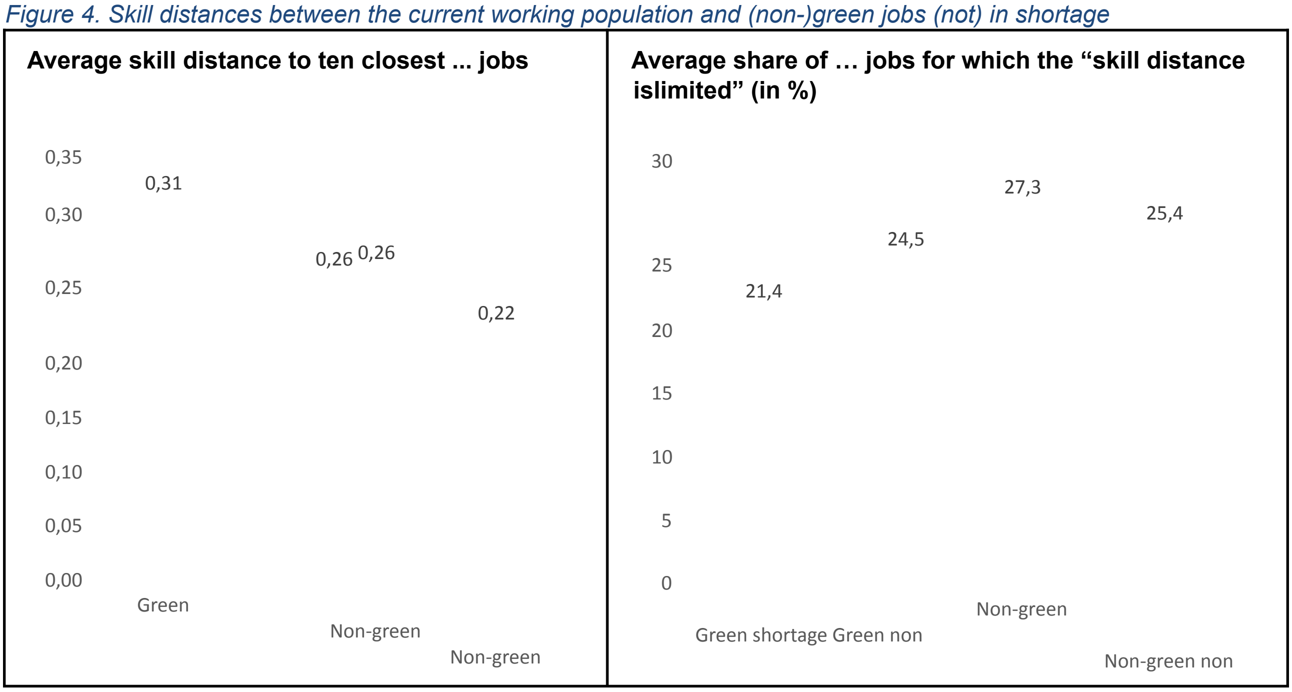
Clearly, a limited skill distance does not imply that a transition is easy because additional, external factors could be influential (e.g. occupational licensing rules) or because one missing skill is critical. For example, the skill distance between an ICT installer (ISCO 7422) and an electrical engineering technician (ISCO 3113) only amounts to 0.19 as they have similar requirements for repairing, equipment maintenance and resource management skills, but a transition would require a substantial amount of training to upgrade programming, mathematics and science skills.[18] Here, our focus is on basic and cross-functional skills, but accredited degrees, expertise, and knowledge in specific domains can also be decisive for a transition to occur.

The main result of interest – that there is a larger skill distance for potential transitions to green shortage jobs – holds, irrespective of the approach, and these two measures thus broadly paint the same picture. The only difference is for non green jobs, where this measure indicates that the distance towards non-shortage jobs is larger than for shortage jobs. This reflects a difference between the two measures: the tail of the distribution has a greater influence on the skill distance to the closest jobs, while the second measure covers a broader range of jobs that might be accessible. Within the category of non-green jobs, a larger share of non-shortage jobs thus seems to be accessible to workers, but there are fewer shortage jobs for which the skill distance is very small.

[16] Choosing one or five of the closest jobs instead of ten as the threshold does not alter the results.

[17] These are simple (unconditional) averages. However, correcting for demographic differences between groups yields very similar results. [18] According to the O*NET classifications on required training, in 46% of the cases, an ICT installer job typically require six months or more of on-the-job training to be effective, while the share reaches 65% in the case of an electrical engineering technician.

Figure 4. Skill distances between the current working population and (non-)green jobs (not) in shortage



Green non shortage shortage shortage non-shortage	shortage shortage shortage

Source: Authors' own calculations based on the list of shortage occupations, O*NET classifications and LFS (2017-2023).Both graphs show skill distances between the working population and different job categories. The left-hand graph shows that the average skill distance with respect to the ten closest green shortage jobs, averaged over all workers not already in a green shortage job, is 0.31. The right-hand graph shows that, again averaged over all workers not already in a green shortage job, the "skill distance is limited" for 21.4% of green shortage jobs. We say that the skill distance is limited if it is smaller than the median observed in actual transitions. Confidence intervals are not shown because they are very small (e.g. a standard error of the order of 0.0005 in the left-hand graph). All differences between groups are statistically significant.

Do these skill distances hold back transitions to green shortage jobs? To test this, we add these skill distance variables to the regression on transitions to (non-)green jobs (not) in shortage (see Table 6). Transitions to green shortage jobs are much more likely when a worker has a job for which skill distances to these jobs are lower. For example, a worker for whom the skills distance to the closest green shortage jobs is half a point lower (on the 4-point scale), would have a 2.5 percentage points higher probability to transition to such a job. By comparison, the baseline probability of such a transition is 1.6%, a figure that would more than double if skills were aligned.

This result also holds for the other job categories and is robust to using our second measure on skill distance (the share of jobs for which skill distances are limited – see Table A.5 in Annex 2). These coefficients should not be interpreted causally. For example, workers for whom the skill distance to green non-shortage jobs is higher, are also less likely to take up green shortage jobs. However, these results do suggest that skill distances impede transitions and that our (theoretical) construct does capture skills mismatches.

Table 6. Probability of transitioning to a (non-)green job (not) in shortage: regression with additional explanatory variables on skill distances

	To a green shortage job	To a green job non-shortage	To a non-green shortage job	To a non-green non-shortage job
Average skill distance to ten closest				

-0.050 ** **(0.020)**	0.018 (0.023)	0.141 *** (0.026)	0.019 (0.023)	0.015 (0.022)	**-0.220 ***** **(0.029)**
-0.069 *** (0.022)	**-0.084 ***** **(0.025)**	0.166 *** (0.039)	0.087 *** (0.030)	0.087 *** (0.031)	-0.064 (0.042)

Average skill distance to ten closest green shortage jobs	-0.080 *** (0.028)
Average skill distance to ten closest green non-shortage jobs	-0.047 * (0.028)
Average skill distance to ten closest non-green shortage jobs	0.178 *** (0.029)
non-green non-shortage jobs	**-0.073 **** **(0.037)**

Baseline probability of transitioning to this job type 1.6 % 2.0 % 2.8 % 3.1 % Demographic and professional controls (see Table 4) Yes Yes Yes Yes Year dummies Yes Yes Yes Yes Obs. 119 809 121 001 94 204 99 926

Source: Authors' own calculations based on the list of shortage occupations, O*NET classifications and LFS (2017-2023). Probability of transitioning to a green shortage job type one year later for the population of all people aged 18-64 in employment, excluding workers already employed in a green shortage job. Job-related characteristics such as sector, type of contract and skills are based on the job held before the transition. Average marginal effects based on a complementary log-log regression, with standard errors in bracket. Sample weights are used, and standard errors are clustered at the individual level *** p<.01, ** p<.05, * p<.1

3.2.3. Skill distances of observed transitions

The distance tends to be larger on average if a worker contemplates a transition to a green shortage job, but were the skill distances wider for the job-to-job transitions into green shortage jobs that occurred between 2017 and 2023? In other words, is there a bias in the job-to-job transitions that workers effectively go through and were some categories of transition *de facto* unachievable or avoided. To answer these questions, we consider two indicators: average skill distance between the initial job and the subsequent job, and the percentage of transitions for which skill distance is limited.

The skill distance links the skills required by a worker's initial job and those of the job they hold one year later. The indicators for observed transitions follow the same methodology as for potential transitions. The observed job-to-job transitions are characterised by a significantly *lower* skill distance between the two jobs when pertaining to a transition to a green shortage job. Transitions to a green job in shortage have an average distance of 0.39 per skills category, while for transitions to other job categories this ranges from 0.41 to 0.45 (Figure 5).[19] These differences are statistically significant. For green jobs there is a large difference depending on whether the job is in shortage or not, similarly for transitions to non-green jobs. Aggregating transitions to green jobs without considering the shortage dimension could thus lead to the conclusion that transitions to green and non-green jobs do not differ. When breaking down skill distance by skills category, all show a lower score in transitions to green jobs in shortage except for technical skills. Distances in terms of technical skills remain consistent across different transition categories, suggesting that technical skills are proportionally more important for moving to a green job in shortage.

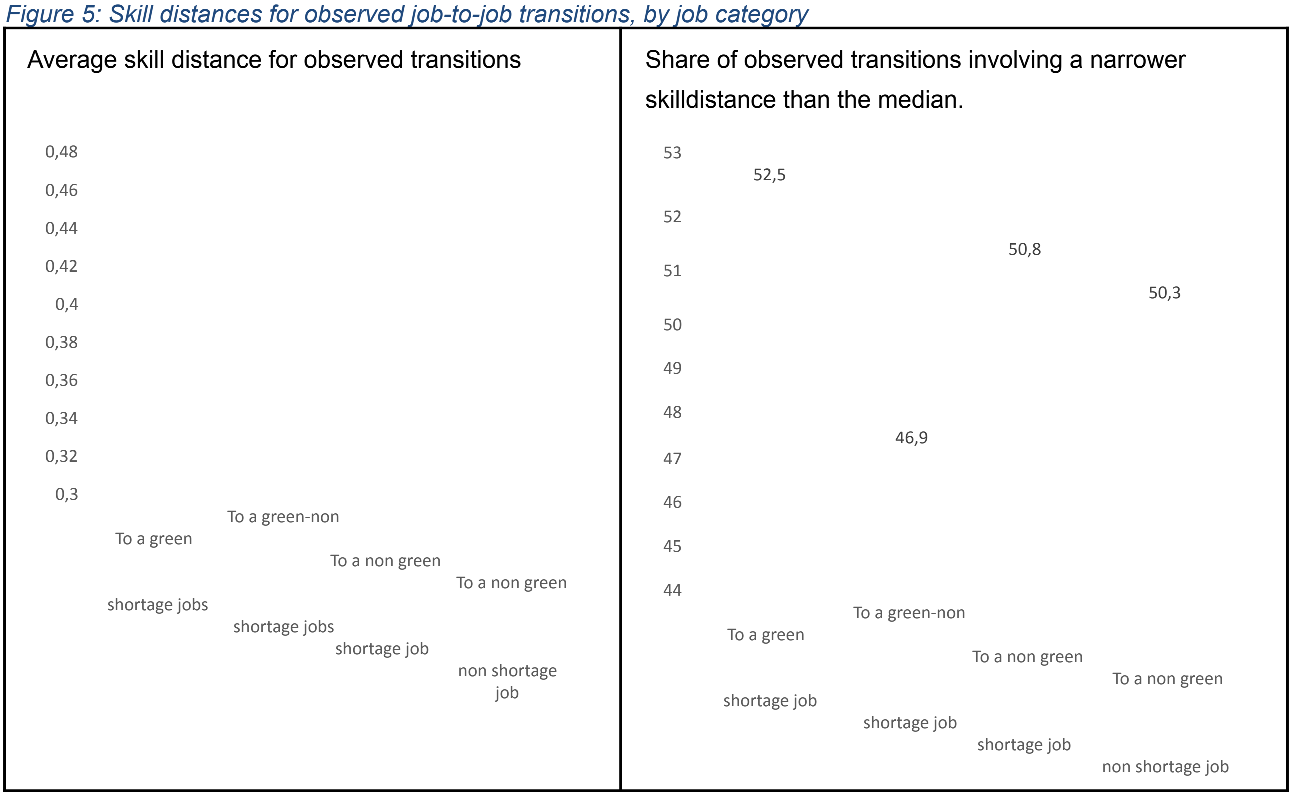
Our second indicator – the share of transitions for which the skill distance is limited – confirms that transitions to jobs for which skills are more aligned represent a larger share of the transitions to green shortage jobs than in other cases. 52% of the transitions to green shortage jobs involve a narrower skill distance than the median whereas it reaches 47% for transitions to green non-shortage jobs and slightly above 50% for transitions to non-green jobs. If we were to focus on the

[19] These are simple (unconditional) averages. However, correcting for demographic differences between groups would only affect the results at the margin. For the green shortage job category, the value would decrease from 0.393 to 0.390.

tail of the distribution (i.e. percentiles 25 and 10) instead of taking the median as a threshold, the conclusion would be similar: namely an overrepresentation among the transitions to green shortage jobs requiring a comparable skill set. The difference between green shortage jobs and green non-shortage jobs is relatively large, highlighting the importance of combining the two dimensions when analysing job-to-job transitions. To provide a concrete example, there is a proportionally greater initiation of transitions to the green shortage occupation of transport clerk (ISCO 4323) by workers initially active in clerical support (37%) and whose skills tend to offer a better overlap. In contrast, there is proportionally less initiation of transitions to the occupation of general office clerk (ISCO 4110) – that is neither in shortage, nor a green job – by workers initially active in clerical support (26%), which is consistent with transitions to jobs with a greater skill distance.

These conclusions are at odds with expectations that the shift to a decarbonised economy will tend to favour a more disruptive reallocation of labour and the development of new or different skills.[20] We observed that skill distances for the workforce are largest for green shortage jobs, while the opposite prevails in empirical results on observed transitions. The difference between potential and observed transitions could endorse a tendency to favour transitions that can be easily completed at the expense of those requiring a more radical or longer process of acquiring skills. Transitions involving a greater skill distance are expected to occur more frequently for green shortage jobs but those transitions are *de facto* avoided by workers or are unachievable. This implies not only that the number of transitions to green shortage jobs is lower in absolute terms, but that among the ones that do occur, the more disruptive job-to-job transitions are underrepresented. From a labour market perspective, the green transition could therefore be slowed down by both qualitatively and quantitatively elements.

Figure 5: Skill distances for observed job-to-job transitions, by job category



Source: Authors' own calculations based on the list of shortage occupations, O*NET classifications and LFS (2017-2023). Note: Data are weighted, and 95% confidence intervals are added. For the right-hand graph, using the percentiles 75 or 90 as thresholds would lead to the same conclusion and lead to similar differences between transition categories.

[20] Looking beyond skills, on the sectoral dimension transitions are *de facto* more disruptive and job-to-job transitions to green shortage jobs involve more sectoral changes. About

27% of transitions to a green shortage job involve sectoral changes, compared to 22% for green jobs that are not in shortage and 25% for non-green jobs.

3.3. Mobility from inactivity or unemployment to a green job in shortage

As the green transition picks up speed, all demographic groups will need to contribute to fill green jobs. Young people, who are currently in education, will have to be a key part of the solution. Among the working age population, which is the focus of this paper, the currently unemployed and inactive will also need to play an important role.

While the unemployment rate is not especially high in Belgium (5.6% for the population aged 15-64 in 2023), the inactivity rate (29.5%) is among the highest in the EU. The inactive and unemployed thus form a large reservoir of people who could potentially move into green jobs, especially since occupational mobility for people already at work is low in Belgium. Indeed, almost half (45%) of people who take up a green shortage job were inactive or unemployed one year earlier.

Moreover, the overall level of education of these groups better matches the requirements of green shortage jobs than those of other types of jobs. Many inactive and unemployed people are not highly educated (46% medium-educated and 34% low-educated), but neither are people working in green shortage jobs: 52% and 17% of these jobs are currently occupied by medium- and low-educated persons, respectively.

Despite this, the inactive and unemployed are less likely to move into green shortage jobs. About 14% of jobs newly taken up by the inactive and unemployed are green shortage jobs, while the latter account for 17% of total employment.

Large skill distances with respect to green shortage jobs can be a significant barrier for the inactive and unemployed. As a proxy for their skills, we use the skills required for the last job they held in the preceding seven years.[21] The average distance between the skills of the inactive/unemployed and the skills required for the ten closest green shortage jobs is larger than the distance with respect to the ten closest non-green or non-shortage occupations (see the left-hand graph of Figure A.4 in Annex 2). This holds across education levels. These large skill distances with respect to green shortage jobs are broadly similar to those among people already in employment.

Our second measure of skill distance paints a slightly different picture. The share of green shortage jobs for which the skill distance is limited (lower than the median observed skill distance) indicates that the distance to green non-shortage jobs is the largest for the inactive and unemployed, followed by the skill distance to green shortage jobs (see the right-hand graph of Figure A.4 in Annex 2). This is a broader measure than that based on the ten closest occupations. Given that the education level of education of the inactive and unemployed better matches that of green shortage jobs, there are (slightly) more jobs that are broadly accessible to them.

However, upskilling still appears to be an important prerequisite to fill these jobs. This is also apparent when we look at the overall level of skills of the inactive and unemployed.

Figure *6* shows that for all types of skills, the skill levels of the inactive and unemployed return a lower score than those of the employed population. For most skill types, except for social skills, most inactive and unemployed people do not meet the requirements for green shortage jobs. The gap is the largest for technical skills, for which all groups – employed, inactive and unemployed – lack the necessary skills.

The lower general level of education of the inactive and unemployed partially explains these gaps. However, even within each category of educational attainment (low, medium, and high), they are on average lower skilled than the employed. Moreover, the skill requirements of the last jobs held by the workers in these groups are used as a proxy for their skills, and it is likely that, if no training is undertaken, these skills will have depreciated during the workers' periods of absence from the labour market. This is of particular concern in Belgium, where not only the inactive, but also the unemployed are often without a job for extended periods of time.

[21] People who have not worked in the last seven years, or who have never worked, are thus excluded. After an absence of seven years, the probability of returning to the labour market is low, and skills are likely to have substantially depreciated.

Figure 6: Skill requirements of green shortage jobs versus the skills of the inactive/unemployed and employed population

content skills
3,5
3
resource management skills systems skills 1,5 1
process skills social skills
2,5 2
technical skills complex skills
Green shortage jobs Inactive/Unemployed Employed

Source: Authors' own calculations based on the list of shortage occupations, O*NET classifications and LFS (2017-2023).

4. Discussion and prospects

Our analysis is primarily based on transitions to green jobs in shortage. However, the explanatory factors we analyse are survey-based; despite our efforts to control for most individual aspects, transitions could be further affected by factors beyond skills, such as individual or job-related characteristics. This section highlights some additional elements that could be considered when addressing this topic.

Firstly, individual factors may add complexity to occupational transitions and deter both working and non-working populations from choosing green shortage jobs. For instance, preferences regarding the environmental impact of a job or company, individual awareness of environmental issues, or job-related stereotypes could potentially influence a worker's employment choices. Unfortunately, the LFS does not measure respondents' perceptions of these factors. The financial dimension is also difficult to measure. Although we have introduced gross pay as a control variable in some specifications, tackling this subject is more complex since financial wealth and wage expectations can have a great impact on decisions concerning occupational transitions. These dimensions are difficult to measure and have a large number of explanatory factors, which further complicates empirical analysis.

Secondly, job-related factors – other than skills requirements – may also influence occupational mobility. Labour demand leads to a pronounced heterogeneity in labour shortages (Groiss and Sondermann, 2023), and drives substantial labour reallocation towards green jobs (Vandeplas *et al*., 2022). Factors such as difficult working conditions, high requirements for experience and training, and inadequate ways of working can prevent labour mobility. A causal relationship between these demand-related factors and occupational mobility is difficult to establish as we do not observe a refusal to transition to a given job. That said, thanks to O*NET data, we can highlight the fact that green jobs and jobs in shortage have specific characteristics and tend to be different across many dimensions. These are briefly described in Annex 1. Green occupations tend to require more extensive experience and longer on-site training, to be associated with greater exposure to hazardous conditions or contaminants, and are more oriented towards analytical thinking and less towards social contact or collaboration (see Table 7) Most of these characteristics suggest that green shortage jobs are, ceteris paribus, more difficult to fill. Moreover, these jobs are not more likely to be automatised than other categories of job.

Table 7: Weighted average of job-related scores for Belgian workers, by occupational category

		Green shortage	Green non shortage	Non-green shortage	Non-green non shortage
Required years of experience (% of respondents)	Over two years	48.2	60.9	28.3	38.1
Required on-site or in-plant training (% of respondents)	Over six months	36.9	32.8	21.1	23.9
Working conditions (five-point scale)*	Exposed to hazardous conditions	2.5	1.8	1.6	1.5
	Exposed to contaminants	3.3	2.3	2.6	2.3
	Degree of automation	2.2	2.2	2.1	2.2
Working style (five-point Likert scale)	Analytical thinking	3.8	4.1	3.7	3.7
	Concern for others	3.7	3.7	4.1	4.0

Source: Authors' own calculations based on the list of shortage occupations, O*NET classifications and LFS (2017-2023). * Categories for the exposition to hazardous conditions or to contaminants: 1 = never; 2 = once a year or more but not every month; 3 = once a month or more but not every week; 4 = once a week or more but not every day; 5 = every day. Categories for the degree of automation: 1 = not at all automated 2 = slightly automated; 3 = moderately automated; 4 = highly automated; 5 = completely automated.

Green occupations require more technical skills and longer on-site or in-plant training. From an economic policy standpoint, this suggests that favouring on-site training on specific equipment could represent an interesting path when seeking to address the shortage of green jobs. Workers may be being deterred from pursuing transitions to such jobs due to increased investment in training, whether in terms of time or financial resources, and stringent requirements concerning experience or accreditations, highlighting the need for action on the training system.

Finally, expectations could also shape a worker's decision to transition to a green shortage job. Uncertainty about socio economic developments, political reforms or the expansion of climate-friendly economic activities is currently high and could be a decisive factor with regard to moving to a green occupation. On the one hand, this uncertainty concerns the labour force and the scale of inactivity. According to current Cedefop projections, employment in Belgium is expected to increase by 8.3% between 2022 and 2035, with approximately one-third of this increase in green job categories following our classification. In the latest population projections from the Belgian Federal Planning Bureau (2024), the working-age population is expected to grow by 0.3% over the same period. A strong increase in the labour force would then be required, but data suggest that the current inactive population does not have the right skills to fill green shortage jobs.

As the demand for products and services that are more climate-friendly is expected to increase, so too is the demand for green skills. The Cedefop have forecast the sectoral and occupational shifts in the EU that could be expected if the 50- 55% emission reduction target in the EGD is to be fully met by 2030 (Cedefop, 2021). Their framework is based on ISCO two-digit classifications. Applying these projections to Belgium,[22] our estimations suggest that a strict application of the EGD plan would imply an additional 70 000 jobs compared to the baseline. The average share of green jobs reaches one third of the gain in both scenarios, suggesting that if a greening of occupations is expected to happen, it will be within categories of occupations rather than between them. Some occupational categories that are central to the green transition, such as construction and electro-engineering workers (ISCO 71, 74) and science and engineering technicians (ISCO 31), combine a large share of occupations currently in shortage and a large expectation of job creation.[23] Occupations with a score above the median value for those two dimensions have high technical skills requirements.

[22] The application consists of multiplying the employment gains by the Belgian share of total EU employment.

[23] A graph showing all occupations exceeding the median on the two dimensions is provided in Annex 2.

5. Conclusion

What characterises a transition to a green job, and how do occupational shortages affect this process? Answering these questions is of importance from both policy and research perspectives, as reallocating labour towards green jobs is a key prerequisite for the transition to a decarbonised economy. The demand for green skills is expected to rise as the reduction of emissions increasingly becomes a priority for both public authorities and private companies. However, labour supply is relatively rigid in the short term, and the green transition is likely to encounter challenges related to occupational shortages and skills mismatches.

Our paper highlights that green shortage jobs represent a distinct category, both as regards their composition and the transitions leading to them. In Belgium, green shortage jobs tend to be better paid and are more likely to be occupied by individuals with low or medium levels of education than other categories of employment. Transitions into green shortage jobs depend crucially on skill types, with technical and resource management skills playing a central role. We find that skills mismatches for potential transitions – between the workforce and green shortage jobs – are large. Nonetheless a significant proportion of actual transitions are relatively similar in this respect, suggesting a tendency for workers to favour transitions that can easily be completed at the expense of those requiring a more radical or longer process of acquiring skills. Given the limited number of job-to-job transitions to green shortage jobs, one might expect that inactive or unemployed individuals would fill the gap. However, they lack the necessary skills with respect to the requirements of green shortage jobs, offering only a limited solution in the short term.

As the green transition increasingly ranks higher among policy objectives in Europe, jobs that are both in shortage and strongly defined by green tasks should be prioritised in training programmes. Technical skills emerge as decisive in most statistical analyses, and thus, fostering an interest in the development of these skills should be encouraged for all (future) workers. On-site or in-plant training appears to be a suitable stepping stone to promote labour reallocation towards green jobs, facilitating reskilling or upskilling for both workers and inactive or unemployed individuals.

However, it is important to acknowledge some limitations in our empirical analysis. The definition of green shortage jobs and the use of a crosswalk to merge international classifications of occupations and skills types with survey data introduce some uncertainty. The development of classifications of occupations tailored for the European labour markets and a harmonised definition of occupational shortages would be valuable for our research, but both remain in the early stages of development. A second limitation concerns the establishment of causal relationships between skills and labour transitions. Data on decisions not to transition to another job are lacking, making it impossible to distinguish between failed transitions and a lack of interest in changing employment. An experimental approach could be a promising avenue for future research.

Annexes

Annex 1: O*NET database

Basic and cross-functional skills

The O*NET dataset contains 35 skills which are divided into basic skills and cross-functional skills. Basic skills are "developed capacities that facilitate learning or the more rapid acquisition of knowledge" and gather together content skills (e.g. reading comprehension, writing, or mathematics) and process skills (e.g. critical thinking or active learning). Cross functional skills are "[d]eveloped capacities that facilitate [the] performance of activities that occur across jobs" and contain five sub-categories of skills: social skills, complex problem-solving skills, technical skills, systems skills, and resource and management skills. The different sub-categories are then further broken down, and are ranked and defined as follows.

1. **Basic skills:**
    a. **Content skills** – basic foundation needed to work with and acquire more specific skills in a variety of different domains.
        i. *Reading comprehension* - understanding written sentences and paragraphs in work-related documents.
        ii. *Active listening* - giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.
        iii. *Writing* - communicating effectively in writing as appropriate for the needs of the audience.
        iv. *Speaking* - talking to others to convey information effectively.
        v. *Mathematics* - using mathematics to solve problems.
        vi. *Science* - using scientific rules and methods to solve problems.
    b. **Process skills** - procedures that contribute to the more rapid acquisition of knowledge and skills across a variety of domains.
        i. *Critical thinking* - using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.
        ii. *Active learning* - understanding the implications of new information for both current and future problem-solving and decision-making.
        iii. *Learning strategies* - selecting and using training/instructional methods and procedures appropriate for the situation when learning or teaching new things.

iv. *Monitoring* - monitoring/assessing one's own performance, and that of other individuals or of organisations in order to make improvements or take corrective action.

2. **Cross-functional skills**:
   a. **Social skills** - developed capacities used to work with people to achieve goals.
      i. *Social perceptiveness* - being aware of others' reactions and understanding why they react as they do.
      ii. *Coordination* - adjusting actions in relation to others' actions.
      iii. *Persuasion* - persuading others to change their minds or behaviour.
      iv. *Negotiation* - bringing others together and trying to reconcile differences.
      v. *Instructing* - teaching others how to do something.
      vi. *Service orientation* - actively looking for ways to help people.
   b. **Complex problem-solving skills** - developed capacities used to solve novel, ill-defined problems in complex, real-world settings.
      i. *Complex problem-solving* - identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.
   c. **Technical skills** - developed capacities used to design, set-up, operate, and correct malfunctions involving the application of machines or technological systems.

i. *Operations analysis* - analysing needs and product requirements to create a design.

ii. *Technology design* - generating or adapting equipment and technology to serve user needs. iii. *Equipment selection* - determining the kind of tools and equipment needed to do a job.

iv. *Installation* - installing equipment, machines, wiring, or programs to meet specifications. v. *Programming* - writing computer programs for various purposes.

vi. *Operation monitoring* - watching gauges, dials, or other indicators to make sure a machine is working properly.

vii. *Operation and control* - controlling the operation of equipment or systems.

viii. *Equipment maintenance* - performing routine maintenance on equipment and determining when and what kind of maintenance is needed.

ix. *Troubleshooting* - determining the causes of operating errors and deciding what to do about it. x. *Repairing* - repairing machines or systems using the necessary tools.

xi. *Quality control analysis* - conducting tests and inspections of products, services, or processes to evaluate quality or performance.

d. **Systems skills** - developed capacities used to understand, monitor, and improve socio-technical systems.

i. *Judgment and decision-making* - considering the relative costs and benefits of potential actions to choose the most appropriate one.

ii. *Systems analysis* - determining how a system should work and how changes in conditions, operations, and the environment will affect outcomes.

iii. *Systems evaluation* - identifying measures or indicators of system performance and the actions needed to improve or correct performance, relative to the goals of the system.

e. **Resource management skills** - developed capacities used to allocate resources efficiently. i. *Time management* - managing one's own time and the time of others.

ii. *Management of financial resources* - determining how money will be spent to get work done, and accounting for these expenditures.

iii. *Management of material resources* - obtaining and seeing to the appropriate use of the equipment, facilities, and materials necessary to do certain work.

iv. *Management of personnel resources* - motivating, developing, and directing people as they work, identifying the best people for the job.

Occupational analysts provide importance scores regarding the skills associated with different occupations following a set of standardised steps for reviewing and interpreting data. The importance rating scale is established as follows: 1 = not important; 2 = somewhat important; 3 = important; 4 = very important; 5 = extremely important.

Required experience and in-plant or on-site training

The O*NET data also contain indicators regarding the work-related experience and training an occupation typically requires. These are intended to measure the degree to which a newly-hired worker would need a certain level of work related experience or training before being able to execute certain types of work tasks. The data are based on either the responses of incumbent job-holders or the analysis of occupational experts.

This domain includes information about the typical experience-related background of workers in an occupation or group of occupations including data on certifications, accreditations, and training. For example, information about the professional or organisational certifications required for entry to and advancement in an occupation, the preferred education or training, and any apprenticeship requirements are documented by this part of the model. The indicators are based on the distribution of the jobs for each occupation code and expressed in percentages. The categories of experience or training requirements range from no required experience/training to more than ten years of work-related experience (eleven categories) or training (nine categories). In our analysis, we aggregated the categories to obtain binary indicators:

1. Work-related experience: high = two years or more / low = no or less than two years.
2. In-plant or on-site training: high = six months or more / low = no or less than six months 26

Working conditions (i.e. work context) and working styles

Work context is defined by O*NET as the physical and social factors that influence the nature of work. It contains variables related to interpersonal relationships (e.g. communication methods, occurrence of conflictual contacts), physical working conditions (e.g. job hazards, environmental conditions) and other structural job characteristics (e.g. level of competition, duration of typical work week, degree of automation). In total, there are 57 indicators in the O*NET data that use a five point scale (the “work schedules” and “duration of typical work week” dimensions use a three-point scale) Scores are determined either by incumbent job holders or by occupational experts. In our analysis, we focused on three dimensions for which differences between job-to-job transitions were found: exposure to hazardous conditions, exposure to contaminants and degree of automation.

Working styles are personal characteristics that can affect how well someone performs a job and cover dimensions such as attention to detail, analytical thinking, leadership, initiative, adaptability, stress tolerance, and concern for others. In total, 16 indicators are defined in O*NET data. Each occupation receives a score on a five-point importance scale (1 = not important at all; 5 = extremely important) either by incumbent job holders or by occupational experts. In our analysis, we focused on two dimensions for which differences between job-to-job transitions were found: analytical thinking and concern for others.

Annex 2: Additional tables and graphs

Table A.1: Gross monthly wages (in euro) by level of educational attainment and job category

Level of educational attainment	Green shortage	Green non shortage	Non-green shortage	Non-green non-shortage	Total
Low (ISCED 0-2)	2 903	2 745	2 425	2 568	2 598
Medium (ISCED 3-4)	3 213	3 233	2 738	3 135	3 020
High (ISCED 5+)	4 498	4 620	4 299	4 177	4 332
Total	3 544	4 010	3 398	3 649	3 585

Source: Authors' own calculations based on BE-LFS (2023).

Table A.2: Probability of transitioning to a green shortage job: by level of education [full version of Table 5]

	All levels of education	Low-educated	Medium-educated	High-educated
Level of education (omitted cat.: high):				
- Low	0.002			
	(0.002)			

	(1)	(2)	(3)	(4)
- Medium	0.002			
	(0.002)			
Content skills	0.015 ***	0.014	0.003	0.019 ***
	(0.004)	(0.019)	(0.008)	(0.005)
Process skills	-0.008	-0.024	0.004	-0.008
	(0.005)	(0.018)	(0.011)	(0.007)
Social skills	-0.002	0.019	-0.004	-0.002
	(0.003)	(0.012)	(0.007)	(0.004)
Complex problem solving skills	-0.003	0.013	-0.001	-0.005
	(0.005)	(0.021)	(0.008)	(0.006)
Technical skills	0.008 ***	0.015 *	0.006	0.006 **
	(0.002)	(0.009)	(0.004)	(0.003)
Systems skills	-0.008 *	0.005	-0.010	-0.007
	(0.005)	(0.014)	(0.009)	(0.006)
Resource management skills	0.011 ***	-0.017 *	0.009	0.012 ***
	(0.003)	(0.010)	(0.006)	(0.003)
Age category (omitted cat.: <30Y):				
- 30-49Y	-0.006 ***	-0.014 **	-0.008 **	-0.002
	(0.002)	(0.007)	(0.003)	(0.002)
- 50-64Y	-0.011 ***	-0.017 ***	-0.010 ***	-0.009 ***
	(0.002)	(0.006)	(0.004)	(0.002)
Male	0.013 ***	0.026 ***	0.022 ***	0.006 ***
	(0.001)	(0.004)	(0.003)	(0.002)
Household size (omitted cat.: 1)				
2	0.000	-0.002	0.003	0.000
	(0.002)	(0.006)	(0.004)	(0.003)
3	0.002	0.009	0.005	-0.002
	(0.002)	(0.007)	(0.004)	(0.003)
4+	0.000	0.000	0.004	-0.003
	(0.002)	(0.006)	(0.004)	(0.003)

	(1)	(2)	(3)	(4)
Nationality (omitted cat.: BE)				
- EU non-BE	0.002	0.002	0.002	0.002
	(0.003)	(0.008)	(0.005)	(0.004)
- Non-EU	0.008 *	0.011	0.021	0.002
	(0.005)	(0.010)	(0.015)	(0.005)
Region (omitted cat.: Wallonia)				
- Brussels	-0.007 ***	-0.008 *	-0.009 ***	-0.006 ***
	(0.001)	(0.004)	(0.003)	(0.002)
- Flanders	0.003 **	0.009 **	0.005 **	0.000
	(0.001)	(0.004)	(0.003)	(0.002)
Permanent contract	-0.006 **	0.000	-0.009 **	-0.006 *
	(0.003)	(0.012)	(0.004)	(0.003)
Working full-time	-0.001	0.029	-0.002	-0.002
	(0.003)	(0.029)	(0.006)	(0.004)
Professional status (omitted cat.: Employee):				
- Civil servant	-0.001	-0.017 ***	0.006	-0.002
	(0.003)	(0.004)	(0.007)	(0.003)
- Self-employed	-0.009 ***	-0.008	-0.011 ***	-0.008 ***
	(0.001)	(0.006)	(0.003)	(0.002)
- Other	0.006	0.000	0.028	-0.008 *
	(0.009)	(0.016)	(0.021)	(0.004)
Training in the past four weeks	0.004 *	0.017 *	0.002	0.001
	(0.002)	(0.010)	(0.004)	(0.002)
Initial sector of activity (omitted cat.: non market services)				
- Primary & utilities	0.012 ***	0.007	0.008	0.014 ***
	(0.004)	(0.017)	(0.006)	(0.005)
- Manufacturing	0.021 ***	0.006	0.019 ***	0.025 ***
	(0.003)	(0.008)	(0.005)	(0.004)
- Construction	0.010 ***	-0.007	0.008 *	0.025 ***
	(0.003)	(0.007)	(0.005)	(0.007)
- Business services	0.012 ***	0.004	0.012 ***	0.013 ***
	(0.002)	(0.006)	(0.003)	(0.002)
Probability of transition to this type of category	1.6 %	2.0 %	2.0 %	1.2 %
Year dummies	Yes	Yes	Yes	Yes
Obs.	119 809	14 470	41 803	63 536

Source: Authors' own calculations based on the list of shortage occupations, O*NET classifications and LFS (2017-2023). Probability of transitioning to a given job type one year later for the population of all people aged 18-64 in employment, excluding workers already employed in that job type. For example, the first column estimates the probability of transitioning to a green shortage job for all people in employment, excluding those already employed in a green shortage job. Job-related characteristics such as sector, type of contract and skills are based on the job held before the transition. Average marginal effects based on a complementary log-log regression, with standard errors in bracket. Sample weights are used, and standard errors are clustered at the individual level *** p<.01, ** p<.05, * p<.1

Figure A.1: Regional distribution of jobs by category (2023) (green job = greenness score > 10%)

Figure A.2: Regional distribution of jobs by category (2023) (green job = greenness score > 25%)

Figure A.3: Regional distribution of jobs by category (2023) (green job = greenness score > 50%)

Source: Authors' own calculations based on the list of shortage occupations, O*NET classifications and LFS (2023).

Table A.3: Probability of transitioning to a green shortage job: using different definition of a green shortage job (job is green if greenness score > 0%, 10%, 25% or 50%))

	Greenness > 0% (=Table 4, col. 1)	Greenness > 10%	Greenness > 25%	Greenness > 50%
Level of education (omitted cat.: high):				
- Low	0.002	0.003	0.002	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)
- Medium	0.002	0.003 **	0.002 *	0.000
	(0.002)	(0.002)	(0.002)	(0.001)
Content skills	0.015 ***	0.014 ***	0.014 ***	0.014 ***
	(0.004)	(0.004)	(0.004)	(0.004)
Process skills	-0.008	-0.007	-0.006	-0.001
	(0.005)	(0.005)	(0.005)	(0.005)
Social skills	-0.002	-0.001	-0.001	-0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Complex problem-solving skills	-0.003	-0.002	-0.002	-0.005
	(0.005)	(0.004)	(0.004)	(0.004)
Technical skills	0.008 ***	0.007 ***	0.008 ***	0.008 ***
	(0.002)	(0.002)	(0.002)	(0.002)
Systems skills	-0.008 *	-0.009 *	-0.010 **	-0.007 *
	(0.005)	(0.004)	(0.004)	(0.004)
Resource management skills	0.011 ***	0.011 ***	0.010 ***	0.011 ***
	(0.003)	(0.003)	(0.003)	(0.002)
Age category (omitted cat.: <30Y)				
- 30-49Y	-0.006 ***	-0.006 ***	-0.005 ***	-0.003 *
	(0.002)	(0.002)	(0.002)	(0.002)
- 50-64Y	-0.011 ***	-0.011 ***	-0.010 ***	-0.008 ***
	(0.002)	(0.002)	(0.002)	(0.002)
Male	0.013 ***	0.013 ***	0.012 ***	0.009 ***
	(0.001)	(0.001)	(0.001)	(0.001)
Household size (omitted cat.: 1)				
2	0.000	0.000	0.000	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
3	0.002	0.001	0.001	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
4+	0.000	0.000	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Nationality (omitted cat.: BE)				
- EU non-BE	0.002	0.002	0.001	0.000
	(0.003)	(0.003)	(0.003)	(0.002)
- Non-EU	0.008 *	0.009 *	0.004	-0.001
	(0.005)	(0.005)	(0.004)	(0.003)
Region (omitted cat.: Wallonia)				
- Brussels	-0.007 ***	-0.007 ***	-0.005 ***	-0.005 ***
	(0.001)	(0.001)	(0.001)	(0.002)
- Flanders	0.003 **	0.003 **	0.004 ***	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)

Permanent contract -0.006 ** -0.005 * -0.005 ** -0.002 (0.003) (0.002) (0.002) (0.002)

Working full-time -0.001 -0.002 0.000 0.000 (0.003) (0.003) (0.003) (0.003)

Professional status (omitted cat.: Employee)

- Civil servant -0.001 -0.001 -0.002 -0.002 (0.003) (0.003) (0.003) (0.002)
- Self-employed -0.009 *** -0.009 *** -0.009 *** -0.007 *** (0.001) (0.001) (0.001) (0.001)

- Other 0.006 0.006 0.007 0.011 (0.009) (0.009) (0.009) (0.010)

Training in the past four weeks 0.004 * 0.004 ** 0.003 0.003 * (0.002) (0.002) (0.002) (0.002)

Initial sector of activity (omitted cat.: non market services)

- Primary & utilities 0.012 *** 0.012 *** 0.010 ** 0.009 ** (0.004) (0.004) (0.004) (0.003)
- Manufacturing 0.021 *** 0.021 *** 0.021 *** 0.019 *** (0.003) (0.003) (0.003) (0.002)
- Construction 0.010 *** 0.010 *** 0.010 *** 0.009 *** (0.003) (0.003) (0.003) (0.002)
- Business services 0.012 *** 0.012 *** 0.011 *** 0.010 *** (0.002) (0.002) (0.002) (0.001)

Year dummies Yes

Yes 119 809	Yes 120 276	Yes 122 614

Obs. 127 916

Source: Authors' own calculations based on the list of shortage occupations, O*NET classifications and LFS (2017-2023). Probability of transitioning to a green shortage job one year later, based on different definitions of green jobs. See Section 1.1.1 for the definition of green jobs based on their greenness score. The population contains all people aged 18-64 in employment, excluding workers already employed in a green shortage job. Job-related characteristics such as sector, type of contract and skills are based on the job held before the transition. Average marginal effects based on a complementary log-log regression, with standard errors in bracket. Sample weights are used, and standard errors are clustered at the individual level *** p<.01. ** p<.05. * p<.1

Table A.4: Probability of transitioning to a green shortage job: varying set of control variables

To green shortage job

To green shortage job

Level of education (omitted cat.: high):

To green shortage job

To green

To green shortage job (= Table 4. col. 1)

- Low 0.003 0.002 0.002 0.002 (0.002) (0.002) (0.002) (0.003)
- Medium 0.004 *** 0.003 * 0.002 0.002 (0.002) (0.002) (0.002) (0.002)

Content skills 0.016 *** 0.021 *** 0.015 *** 0.018 *** (0.004) (0.004) (0.004) (0.005)

Process skills -0.024 *** -0.023 *** -0.008 -0.004 (0.006) (0.005) (0.005) (0.006)

Social skills -0.005 -0.003 -0.002 -0.006 (0.004) (0.003) (0.003) (0.004)

Complex problem-solving skills 0.003 -0.004 -0.003 -0.004 (0.004) (0.004) (0.005) (0.005)

Technical skills 0.016 *** 0.011 *** 0.008 *** 0.009 *** (0.002) (0.002) (0.002) (0.002)

Systems skills -0.005 -0.005 -0.008 * -0.012 ** (0.004) (0.004) (0.005) (0.005)

Resource management skills 0.015 *** 0.013 *** 0.011 *** 0.014 *** (0.002) (0.002) (0.003) (0.003)

Age category (omitted cat.: <30Y)

- 30-49Y -0.008 *** -0.006 *** -0.006 *** (0.002) (0.002) (0.002)
- 50-64Y -0.014 *** -0.011 *** -0.011 *** (0.002) (0.002) (0.002)

Male 0.015 *** 0.013 *** 0.014 *** (0.001) (0.001) (0.002)

Household size (omitted cat.: 1)

2 0.001 0.000 0.001 (0.002) (0.002) (0.002)

3 0.002 0.002 0.002 (0.002) (0.002) (0.002)

4+ 0.000 0.000 0.000 (0.002) (0.002) (0.002)
Nationality (omitted cat.: BE)
- EU non-BE 0.002 0.002 0.002 (0.003) (0.003) (0.003)
- Non-EU 0.010 ** 0.008 * 0.007 (0.005) (0.005) (0.005)
Region (omitted cat.: Wallonia)
- Brussels -0.007 *** -0.007 *** -0.009 *** (0.001) (0.001) (0.002)
- Flanders 0.004 *** 0.003 ** 0.003 * (0.001) (0.001) (0.002)

Permanent contract -0.006 ** -0.009 *** (0.003) (0.003)

Working full-time -0.001 0.000 (0.003) (0.004)
Professional status (omitted cat.: Employee)
- Civil servant -0.001 -0.001 (0.003) (0.003)
- Self-employed -0.009 *** (0.001)

- Other 0.006 (0.009)

Training in the past four weeks 0.004 * 0.004 * (0.002) (0.002)
Initial sector of activity (omitted cat.: non market services)

- Primary & utilities 0.012 *** 0.016 *** (0.004) (0.006)
- Manufacturing 0.021 *** 0.022 *** (0.003) (0.003)
- Construction 0.010 *** 0.009 *** (0.003) (0.003)
- Business services 0.012 *** 0.013 *** (0.002) (0.002)

Wage (omitted cat.: 1st quartile)

- 2nd quartile -0.001 (0.002)

- 3rd quartile -0.001 (0.002)

- 4th quartile -0.001 (0.003)

Year dummies Yes

Yes 119 854	Yes 119 809	Yes 119 809

Obs. 97 969

Source: Authors' own calculations based on the list of shortage occupations. O*NET classifications and LFS (2017-2023). Probability of transitioning to a green shortage job one year later. The population contains all people aged 18-64 in employment. excluding workers already employed in a green shortage job. Job-related characteristics such as sector, type of contract, skills and wage are based on the job held before the transition. Wages contain the gross monthly income from the main occupation. For 18% wage data is missing (which includes the self-employed and certain foreign employees); these observations are dropped when including the wage control. Average marginal effects based on a complementary log log regression. with standard errors in bracket. Sample weights are used, and standard errors are clustered at the individual level *** p<.01. ** p<.05. * p<.1

Table A.5. Probability of transitioning to a (non) green job (not) in shortage: regression with additional explanatory variables on share of jobs for which skill distance is limited

	To a green shortage job	To a green non-shortage job	To a non-green shortage job	To a non-green non-shortage job
% green shortage jobs with skill distance below median	**0.016 ****	-0.013	-0.073 ***	-0.019 *
	(0.008)	(0.009)	(0.012)	(0.011)
% green non-shortage jobs with skill distance below median	-0.004	**-0.013 ***	-0.042 ***	-0.009
	(0.007)	**(0.007)**	(0.010)	(0.011)
% non-green shortage jobs with skill distance below median	0.017 *	-0.001	**0.053 *****	-0.006
	(0.010)	(0.010)	**(0.012)**	(0.013)
% non-green non-shortage jobs with skill distance below median	-0.014	0.016	0.013	**0.040 *****
	(0.011)	(0.012)	(0.016)	**(0.015)**
Baseline probability of transitioning to this job type	3.1 %	1.6 %	2.0 %	2.8 %
Demographic and professional controls (see Table 4)	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Obs.	99 926	119 809	121 001	94 204

Source: Authors' own calculations based on the list of shortage occupations. O*NET classifications and LFS (2017-2023). Probability of transitioning to a green shortage job one year later. The additional controls contain the share of jobs for which the skill distance with respect to the current job is lower than the median skill distance observed in actual transitions. The population contains all people aged 18-64 in employment, excluding workers already employed in a green shortage job. Job-related characteristics such as sector, type of contract and skills are based on the job held before the transition. Average marginal effects based on a complementary log-log regression, with standard errors in bracket. Sample weights are used, and standard errors are clustered at the individual level *** p<.01, ** p<.05, * p<.1

Table A.6: Probability of transitioning to a (non-)green job (not) in shortage: sample restricted to people engaging in occupational mobility

	To a green shortage job	To a green non shortage job	To a non-green shortage job	To a non-green non-shortage job
Level of education (omitted cat.: high):				
- Low	0.007	-0.049 **	0.079 **	-0.045
	(0.019)	(0.022)	(0.032)	(0.029)
- Medium	0.020	-0.070 ***	0.015	0.005
	(0.013)	(0.016)	(0.018)	(0.021)
Content skills	0.118 ***	0.074 *	-0.253 ***	-0.010
	(0.038)	(0.042)	(0.052)	(0.054)
Process skills	0.026	0.003	0.223 ***	-0.057
	(0.043)	(0.067)	(0.064)	(0.070)
Social skills	-0.036	-0.057	-0.053	0.069
	(0.029)	(0.040)	(0.045)	(0.047)
Complex problem-solving skills	-0.040	0.045	0.026	-0.057
	(0.037)	(0.046)	(0.048)	(0.061)
Technical skills	0.067 ***	0.006	-0.084 ***	-0.082 ***
	(0.018)	(0.019)	(0.027)	(0.030)
Systems skills	-0.096 **	-0.019	0.019	0.138 **
	(0.037)	(0.046)	(0.052)	(0.055)
Resource management skills	0.050 **	0.042	-0.052 *	-0.058 *
	(0.022)	(0.027)	(0.031)	(0.035)
Age category:				
- 30-49Y	0.019	0.012	-0.013	-0.019
	(0.012)	(0.016)	(0.019)	(0.019)
- 50-64Y	0.017	0.001	-0.020	-0.012
	(0.016)	(0.019)	(0.022)	(0.023)
Male	0.100 ***	0.069 ***	-0.069 ***	-0.060 ***
	(0.012)	(0.014)	(0.017)	(0.018)
Household size (omitted cat.: 1)				
2	0.001	0.024	0.006	-0.008
	(0.018)	(0.019)	(0.023)	(0.025)
3	0.019	0.003	0.040	0.022
	(0.019)	(0.021)	(0.025)	(0.026)
4+	0.007	0.007	0.021	0.002
	(0.018)	(0.018)	(0.022)	(0.024)
Nationality (omitted cat.: BE)				
- EU non-BE	-0.001	0.011	0.020	-0.001
	(0.021)	(0.026)	(0.030)	(0.032)

- Non-EU 0.014 0.087 ** -0.014 -0.070 * (0.033) (0.043) (0.037) (0.038)
Region (omitted cat.: Wallonia)
- Brussels -0.062 *** 0.007 0.045 * 0.024 (0.014) (0.023) (0.025) (0.032)
- Flanders 0.017 -0.007 0.066 *** -0.060 *** (0.013) (0.015) (0.017) (0.019)

Permanent contract -0.020 0.054 -0.016 0.007 (0.024) (0.034) (0.030) (0.033)

Working full-time 0.023 0.068 * -0.039 -0.043 (0.031) (0.036) (0.030) (0.029)
Professional status:
- Civil servant 0.013 0.006 -0.018 0.100 *** (0.024) (0.022) (0.021) (0.025)
- Self-employed -0.024 0.083 *** 0.023 -0.022 (0.017) (0.026) (0.025) (0.027)

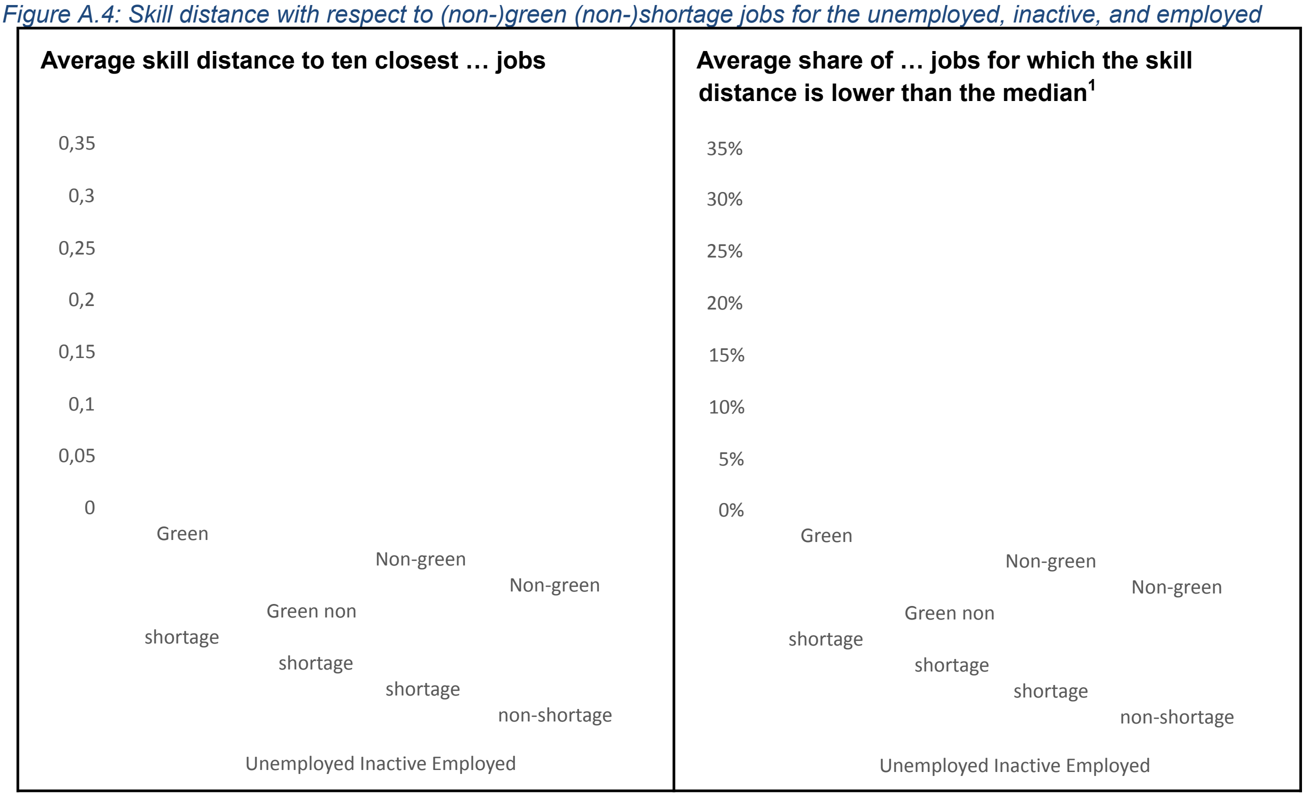
- Other -0.043 0.062 -0.035 -0.075 (0.047) (0.081) (0.063) (0.063)

Training in the past four weeks -0.005 -0.003 0.030 -0.009 (0.013) (0.016) (0.019) (0.020)
Initial sector of activity (omitted cat.: non market services)

- Primary & utilities 0.088 *** 0.126 *** -0.106 ** 0.045 (0.033) (0.042) (0.045) (0.051)
- Manufacturing 0.167 *** 0.129 *** -0.107 *** -0.018 (0.024) (0.025) (0.024) (0.028)
- Construction 0.156 *** 0.113 *** -0.050 -0.076 ** (0.035) (0.032) (0.032) (0.034)
- Business services 0.087 *** 0.099 *** -0.012 0.030 (0.014) (0.017) (0.021) (0.021)
Baseline probability of transitioning to this job type 29.5 %
Year dummies Yes
Obs. 8 653

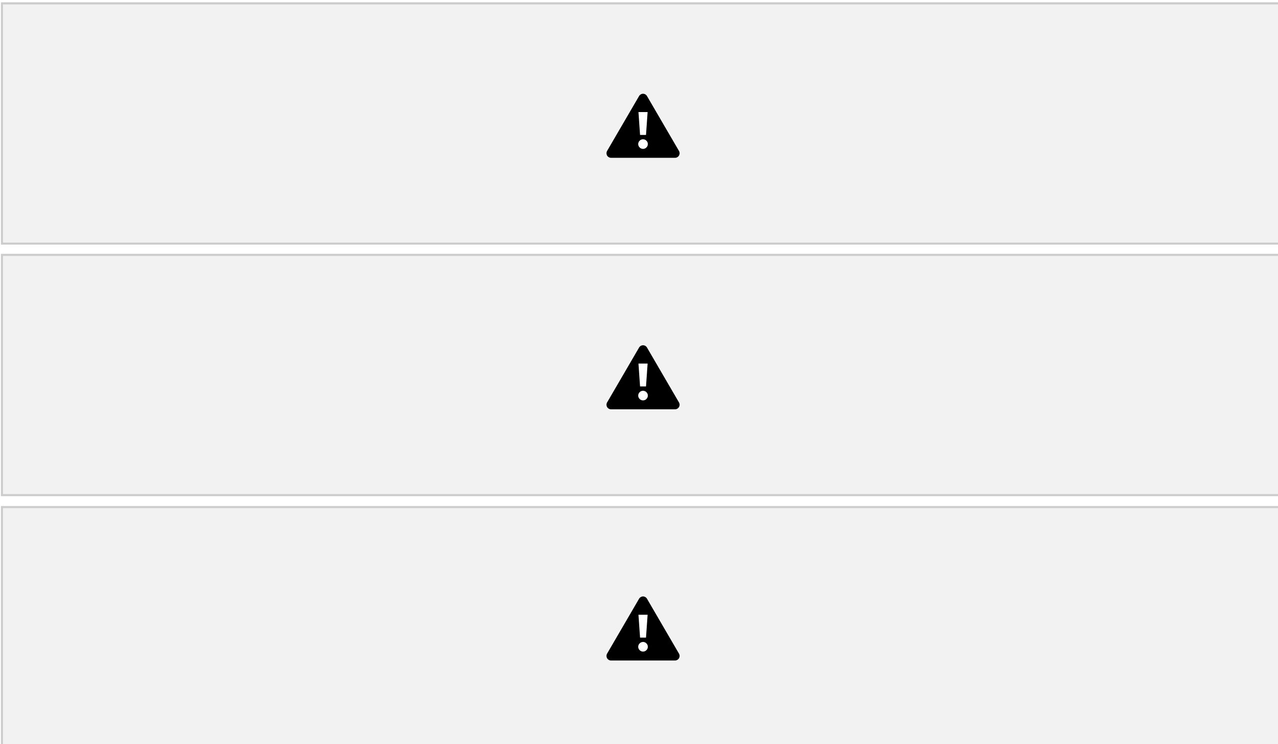
Source: Authors' own calculations based on the list of shortage occupations. O*NET classifications and LFS (2017-2023). Probability of transitioning to a given job type one year later for the population of all people aged 18-64 in employment, excluding workers already employed in that job type. For example, the first column estimates the probability of transitioning to a green shortage job for all people in employment, excluding those already employed in a green shortage job. Job-related characteristics such as sector, type of contract and skills are based on the job held before the transition. Average marginal effects based on a complementary log-log regression, with standard errors in bracket. Sample weights are used, and standard errors are clustered at the individual level *** p<.01, ** p<.05, * p<.1

Figure A.4: Skill distance with respect to (non-)green (non-)shortage jobs for the unemployed, inactive, and employed



Source: Authors' own calculations based on the list of shortage occupations. O*NET classifications and LFS (2017-2023). Both graphs show skill distances between the working population. unemployed and inactive on the one hand, and different job categories on the other. For example, the left-hand graph shows the average skill distance with respect to the ten closest green shortage jobs, averaged over all workers not already in a green shortage job. The right-hand graph shows that, again averaged over all workers not already in a green shortage job, the "skill distance is limited" for 21% of green shortage jobs. We say that the skill distance is limited if it is smaller than the median observed in actual transitions.

Figure A.5: Forecast employment impact of the EGD by 2030 (difference between EGD skills forecast scenario and baseline in 000s and average share of occupation in shortage in 2023)



Source: Authors' own calculations based on Cedefop projections, the list of shortage occupations, O*NET classifications and LFS (2023). Note: the regional shares of occupations in the critical functions' lists are aggregated with an unweighted average. The orange dotted lines correspond to the median values.

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EU European Union

OECD Organisation for Economic Co-operation and Development **Abbreviations**

Cedefop European Centre for the Development of Vocational Training EBRD European Bank for Reconstruction

and Development EGD European Green Deal

EIB European Investment Bank

List of abbreviations

Countries or regions

EU European Union

OECD Organisation for Economic Co-operation and Development **Abbreviations**

Cedefop European Centre for the Development of Vocational Training EBRD European Bank for Reconstruction

and Development EGD European Green Deal

EIB European Investment Bank

FPB Federal planning Bureau

ICT Information and Communication Technology ISCO International Standard Classification of Occupations LFS

Labour Force Survey

O*NET Occupational Information Network

SOC Standard Occupational Classification

SOCPC Standard Occupational Classification Policy Committee Statbel Belgian statistical office

VDAB Flemish Service for Employment and Vocational Training 43

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