



Identifying and Describing Green Occupations in Egypt: A Task and Skill – Based Approach

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Abstract

What occupations in Egypt are (potentially) green and what are their characteristics? In this report, we rely on two commonly used databases, the O*NET database, developed for the U.S., and the ESCO database, developed for the European Union, to estimate two alternative greenness indices for occupations in Egypt. The greenness indices are based on the prevalence and relative importance of tasks (in O*NET) and skills (in ESCO) designated as green in each occupation according to these two databases. Based on specific cutoff values in these indices, we classify occupations into five green task categories from very high green task intensity to no green tasks and provide information about occupations in each category, such as their share in total employment, their employment growth rates, their education and gender composition, and their broad industrial composition. We refer to occupations with very high and high green task intensity as “green” occupations for short and provide more detailed information about specific occupations in these categories. We end the analysis by examining the most prevalent green tasks/skills as well as the fastest growing ones in the Egyptian context.

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Executive Summary

Measuring Green Occupations

As countries work toward meeting their commitments to address climate change and progress in their green transitions, there is a great deal of interest in the jobs that will likely be needed with the expansion of the green economy. Egypt has ambitious goals for its green transition, as described in its Nationally Determined Contributions (NDCs), which commit to substantially reduce emissions from electricity generation and transmission, oil and gas production, and the transport sector, and to decarbonize industry, promote sustainability in buildings and cities, strive towards low carbon and greener tourism development, and improve integrated waste management to increase materials and energy recovery.

Efforts to determine the implications of the green transition for labor markets have taken many forms, one of which is an attempt to identify green occupations. Since occupations generally involve both green and non-green tasks, the literature has suggested that the greenness of occupations should be measured along a continuum rather than as a binary characteristic, based on the relative prevalence of green tasks in them. Since Egypt does not (yet) have a database that describes the task content of occupations in sufficient detail and a way to designate tasks as green or not, we rely in this report on two commonly used databases that do just that, the O*NET database developed for the U.S. and the ESCO database developed for the European Union.

Both of these databases breakdown occupations into specific tasks, skills, or knowledge concepts, some of which are designated as green.¹ The O*NET database gives an importance weight from 1 to 5 to each task in each occupation and the ESCO system designates each skill as either essential or optional. We use this information to generate greenness indices from each of these databases that vary from 0 (no green tasks) to 1 (all tasks are green) for each occupation in these datasets and then create a crosswalk between these occupations and the equivalent occupation at the 4-digit level of detail in the ISCO-08 classification of occupations used in Egypt.

Our resulting database provides information about a total of 427 4-digit ISCO-08 occupations covered by either the O*NET or ESCO databases out of a total of 437 4-digit occupations in the ISCO-08 classification. We then derive additional information about these 4-digit occupations from Egypt's official Labor Force Survey (LFS), such as employment size relative to total employment, employment growth rates over the period 2018 to 2022, gender composition, educational composition, and distribution across

¹ O*NET uses the term “tasks” to describe the building blocks of occupations (The National Center for O*NET Development, 2010), whereas ESCO uses the terms “skills” and “knowledge concepts” (European Commission, 2022).

broad industry sectors (specifically: agriculture, industry, and services).² An occupation that is present in the O*NET and ESCO databases but not present in the LFS data is assigned an employment share of zero. Based on the estimated greenness index, we classify occupations as having (i) no green tasks (greenness=0), (ii) low green task intensity (greenness>0 & <0.1), (iii) moderate green task intensity (greenness>=0.1 & <0.25), (iv) high green task intensity (greenness>=0.25 & <0.5), and (v) very high green task intensity (greenness>=0.5). In addition, the O*NET system subdivides occupations with no green tasks into ones that are not relevant to the green transition and ones that will grow with the green transition. We refer to occupations with high or very high green task intensity as “green occupations” for short and delve a little deeper into their characteristics.

Top Green Occupations

The results indicate that a handful of occupations that are mostly related to managing and protecting the environment and engagement in the circular economy emerge among the top 30 green occupations in *both* the O*NET and ESCO systems. These include environmental protection professionals, environmental engineers, civil engineers, non-medical life sciences technicians, garbage and recycling collectors, and refuse sorters. Outside this limited set, the two systems designate different sets of occupations among their top 30 green occupations primarily because O*NET and ESCO place a different emphasis on what tasks/skills they designate as green. Because of the O*NET system’s emphasis on tasks related to managing and overseeing environmental processes, renewable energy, and material flows, it highlights occupations related to the construction and mining sectors, as well as various managerial, executive and planning related occupations. ESCO, with its emphasis on biological and conservation processes, tends to produce high greenness scores for occupations related to agriculture and forestry. Many of these agricultural and forestry occupations are designated by O*NET as either having no green tasks but will grow with the green transition, or as having low green task intensity. Despite this, almost a third of green jobs identified by O*NET are in agriculture because of the inclusion of farm managers and employers in agriculture among one of the managerial categories identified as green. Besides the occupations in agriculture and forestry, ESCO assigns high greenness scores to a handful of occupations in architectural design, pest control, insulation, and health and environmental inspection.

The proportion of employment in the very high and high green task intensity categories, that we refer to for short as “green” occupations is 9.7 percent, according to O*NET, and 16.4 percent, according to ESCO. The largest occupations in terms of employment in this group according to O*NET include service managers not elsewhere classified (which include farm managers and agricultural employers), house builders, building and related electricians, plumbers and pipefitters, physical and engineering sciences technicians,

² All characteristics other than employment growth refer to an average for the period from 2020 to 2022.

managing directors and chief executives, refuse sorters, garbage and recycling workers, civil engineers, commercial and sales representative, and business services and administrative managers. The largest “green” occupations according to ESCO include some of the same, such as refuse sorters, garbage and recycling workers, plumbers and pipefitters, commercial and sales representatives, and civil engineers, but also mixed crop and field and vegetable crop growers, painters, and farming and forestry advisers.

Green Occupations are Fast-Growing

Green occupations in Egypt are growing appreciably faster than average. The very high green task intensity occupations were growing at 10.5 percent (O*NET) per annum and 31 percent (ESCO) per annum in the 2018-2022 period, substantially higher than the average employment growth rate of 4.6 percent per annum in this period. The high green task intensity category was also growing much faster than average at 16.9 percent (O*NET) per annum and 7.8 percent (ESCO) per annum. Moreover, even occupations that have no green tasks, but that are designated by O*NET as ones that will grow with the green transition are growing in Egypt at 1.6 times the rate of occupations with no green tasks that are designated as not relevant to the green transition.

The green occupations that have grown in excess of 20 percent per annum from 2018 to 2022 include ones that are classified as green by both systems, such as refuse sorters and garbage and recycling collectors, others that are classified as green by O*NET only, such as research and development managers, policy and planning managers, commercial and sales representatives, technical and medical sales professionals, various kinds of services managers, and ICT sales professionals, and some that are classified as green by ESCO only, such as mixed crop and livestock producers, farm laborers, and garden and horticultural laborers.

Green Occupations Span the Education Spectrum

Of relevance to education planners is the educational attainment of workers in green occupations. We do not observe a straightforward relationship between greenness and the educational attainment of the workforce. In fact, the highest share of educated workers appears to be in the “moderate green task intensity” category, where about 45 percent of workers have technical secondary education and nearly a third have a higher education according to either system, which is higher than their shares of 35 percent (technical secondary) and 25 percent (higher education) in overall employment. According to the O*NET system, about 30 percent of workers in green occupations (very high and high green task intensity) have technical secondary education and another 25 percent have higher education, which is slightly lower or roughly similar to their proportions in overall employment. Because of the over-representation of agricultural workers among occupations designated as green in the ESCO system and because these workers generally have lower educational attainment, the proportion of educated workers

in green occupations according to ESCO is lower, with 28 percent having a technical secondary education and only 7 percent having a higher education.

The green occupations with the highest proportion of technical secondary workers in the O*NET system are the ones related to construction, manufacturing, mining, and utilities. In the ESCO system, they are the ones related to utilities, some of the agricultural occupations, and one related to environmental and occupational health inspection. The green occupations according to O*NET with the highest proportion of workers with higher education are those related to managerial and executive functions, engineering, technical and medical sales, and, according to ESCO, farming and forestry advisers, environmental and occupational health inspectors, and travel guides.

Green Occupations are Male Dominated

Women tend to be under-represented in green occupations in Egypt, but some green occupations have higher than average female shares of employment. In the O*NET system, these include ICT sales professionals, research and development managers, policy administration professionals, town and traffic planners, policy and planning managers, and advertising and public relations

managers. In the ESCO system, feminized green occupations include mixed crop and animal producers and garden and horticultural laborers.

Green Occupations are Concentrated in Agriculture and Industry

Green occupations, according to the O*NET system, are over-represented in the industry and agricultural sectors, despite the fact that no explicitly agricultural occupation is designated as green in this system. This is due to the fact that a high proportion of the occupation “service manager not elsewhere classified,” which is classified by O*NET as green, is in fact mostly made up of farm managers or employers in agriculture. Most of the green occupations related to construction, manufacturing, mining and utilities are predictably in the industry sector, and most of the services managers of various sorts, senior government officials, traditional heads of villages are in the services sector. Because of the ESCO system’s emphasis on green skills related to agriculture, jobs in green occupations according to ESCO are predominantly in the agricultural sector.

Top Green Tasks/Skills

The O*NET system identifies 1,386 tasks out of a total of 19,642 tasks in the database as green, whereas the ESCO system identifies 558 skills and knowledge concepts as green out of a total of 13,123 unique skills and knowledge concepts. The top 20 green tasks in the O*NET system are mostly related to environmental processes, material flows and material recovery, and developing and deploying renewable energy projects. These

tasks are used in occupations that make up about 4.3 percent of total employment in Egypt. The top 20 green skills or knowledge concepts in the ESCO system relate mostly to sustainable agriculture and tourism and are relevant to 15-20 percent of employment in Egypt, because of the importance of agricultural employment in the Egyptian economy. Based on the growth of the occupations that incorporate them, the fastest growing green tasks in Egypt based on the O*NET system are related to the repair or servicing of air conditioning systems, the installation and maintenance of wind turbines, and the installation, control, and maintenance of other environmental systems. The fastest growing ESCO green skills in Egypt are more diverse and relate to business sustainability, managing naturally protected areas and sustainable tourism, skills related to materials recovery and recycling, and skills related to sustainable agriculture.

Policy Implications

The occupational greenness index and the green task intensity categories elaborated in this report and applied to Egyptian labor market data are a necessary step in identifying and eventually anticipating the skills and competences needed to support the green transition in Egypt. This step is a pre-requisite to subsequent policy efforts needed to support the green transition and green jobs. For instance, this work can inform educational policy makers in elaborating a holistic strategy to prepare the future Egyptian workforce for the green transition. Additionally, this research can support policy makers, employers, and stakeholders in the technical and vocational education and training (TVET) system to help the existing workforce with the re-skilling and upskilling needed to adapt to job reallocations that will necessarily accompany the transition and thus ensure a more just transition that does not impose an undue burden on any group of workers.

Introduction

Motivation

Addressing climate change through a transition to a green economy – a socially inclusive economy that relies less on fossil fuels, produces less pollution and greenhouse gases (GHG), strives for agricultural sustainability, and is resource efficient – has now become a top global priority (Barbier & Markandya, 2012; ILO, 2018; Jacob et al., 2015; UNEP, 2011). Egypt demonstrated its commitment to responding to the threat of climate change early on by ratifying the United Nations Framework Convention on Climate Change (UNFCCC) in 1994 (Government of Egypt, 2022). It declared its first Nationally Determined Contribution (NDC) at the time it signed the Paris Agreement in 2016, which it later ratified on 29th June 2017. These NDCs were later updated in 2022 to cover the period from 2015 to 2030. Egypt’s updated NDCs commit the country to reduction in GHG emissions by 2030 compared to the business-as-usual scenario of 33 percent from electricity generation and transmission, of 65 percent from oil and gas production, and of 7 percent from the transport sector. The updated NDCs include additional commitments to decarbonize industry, promote sustainability in buildings and cities, strive towards low carbon and greener tourism development, and improved integrated waste management to increase materials and energy recovery (ibid.).³

The effect of a transition to a green economy on employment and labor markets has been a subject of intense interest around the world, with particular interest in so-called “green jobs” or jobs that are created in the context of an expanding green economy (Bowen et al., 2018; Cappa et al., n.d.; ILO, 2018; Jacob et al., 2015; Kubursi & Abou-Ali, 2024). While some jobs will likely be lost as a result of the transition away from fossil fuels, many more job opportunities will likely be created, and others will undergo a transformation in their task profiles, as a result of expansion of the renewable energy sectors, the growth in the use of electrical vehicles, efforts to increase energy efficiency, the transition to more sustainable agricultural practices, and the expansion of the circular economy (ILO, 2018). The International Labor Organization (ILO) estimates that by 2030 almost 25 million jobs will be created globally as a result of the green transition and seven million jobs will be lost (ILO, 2019b). Of the seven million lost jobs, five million can likely be reallocated across industries in the same occupations, but one to two million workers will be in occupations where jobs will be lost without equivalent jobs in other industries. Additionally, the green transition is conditional on investments in training and skill development to meet the requirements and avoid skill mismatches (ILO, 2019b).

³ For a comprehensive discussion of Egypt’s progress in its green transition see Sarhan (2023).

Most studies conducted on the impact of the green economy on employment take a sectoral approach, with many using input-output methods to estimate the net employment effects of the expansion of the green economy or specific policies to promote the green transition (ILO, 2013, 2014, 2019a, 2022; ILO & UNDP, 2021). While such studies can estimate the size of the employment effects of climate and green economy policies, they cannot identify the kinds of jobs that will be created and transformed and their skill content. We focus here instead on studies that take an occupational approach in identifying green jobs by identifying the task or skill content of occupations and then determining which of these tasks or skills are green. This task-based approach acknowledges that some existing jobs may be in high demand due to the transition to a green economy, but may not involve any green tasks or skills, while others will include varying proportions of green tasks or skills. Greenness of occupations and jobs should, therefore, be considered as a continuum rather than a binary classification (Bowen et al., 2018; Vona et al., 2019).

Previous research has found that green occupations in the U.S. tend to be more high-skilled and the share of green employment within high-skilled, abstract occupations is higher than within low-skilled, manual occupations, with the exception of installation and maintenance jobs (Vona et al., 2019). Green jobs grew faster than total employment in the U.S. from 2006 to 2014, that the bulk of the increase in green employment was among high-skilled jobs rather than low-skilled manual jobs (Vona et al., 2019). Moreover, in the U.S. green jobs pay a wage premium, which is higher for low-skilled workers (Vona et al., 2019).

A series of 32 national studies in 2017-18, covering both low- and middle-income countries as well as high income countries, worked to identify the skill needs of greening economies and the skills policies and strategy responses to respond to these needs (ILO, 2019b). The methodology used in these studies was primarily institutional and qualitative, some including qualitative surveys among experts. Likely because of data limitations, there are few quantitative studies identifying green occupations and skills in detail outside the U.S. and the European Union.

Identifying jobs that are in green occupations, as well as jobs that may not be green but that will grow with the green transition is essential for human resource development and effective environmental and labor market policies. Education planners need to know which occupations and skills to focus on and new labor market entrants would benefit from knowing which occupations are likely to grow as Egypt pushes forward with policies that will promote and accelerate the green transition. In this report, we not only examine the prevalence and growth of green occupations in Egypt, but we also analyze the prevalence and growth of green skills, the specific skills and tasks that make occupations green. Identifying such skills, their prevalence and growth is an essential input into a competence-based education and training curriculum design and planning system, such

as the one that the Egyptian Ministry of Education and Technical Education is engaged in.⁴

Overview

Egypt does not (yet) have nationally representative detailed data on green skills or tasks and how they relate to specific occupations in the Egyptian context. In our analysis, we therefore use two different international databases linking green tasks/skills with occupations to calculate a greenness intensity index at the occupational level. The Occupational Information Network (O*NET), developed for the U.S., links job task requirements with specific occupations using the U.S. Standard Occupational Classification (SOC). It classifies tasks as green or not green and gives each task an importance weight for each occupation, allowing the calculation of a greenness index for the occupation (Vona et al., 2019). The European Classification of Occupations, Skills and Competences (ESCO), developed for the European Union, also classifies skills and knowledge concepts specific to different occupations as green and then identifies each skill or knowledge concept as either essential or optional for each occupation (European Commission, 2022).

Using this information, we calculate a greenness index for each occupation in these two databases. Each of the occupations in these respective classifications is then cross-walked to a corresponding 4-digit occupation in the ISCO-08 classification system used in Egypt. This results in a list of 427 4-digit occupations for which we are able to estimate a greenness index in either of the two systems.⁵ The validity of our analysis depends, therefore, on the assumption that the task content of specific occupations in Egypt is similar to what is prevalent in the U.S. or European contexts. Of course, this assumption is unlikely to be entirely correct since Egypt is at a different stage in its green transition and many of the occupations that may have been greened due to the transition in the U.S. or Europe may not yet have a similar green content in Egypt. However, in the absence of Egypt-specific information on the green task or skill content of occupations, it is at the very least an indication of the direction in which things are likely to go in Egypt.

The mix of occupations and their relative importance in the Egyptian context is, of course, based on Egyptian data. In fact, the characteristics of occupations, such as the share of the occupation in total employment, the share of women in the occupation, and the percentage of employment in the occupation made up of technical school graduates is obtained from pooled 2020-22 data from the Egyptian Labor Force Survey (LFS). The Egypt Occupational Outlook is used to obtain growth rates for different occupations for the period from 2018 to 2022.

⁴ See Ministry of Education and Technical Education (2024). Technical Education Strategy 2.0.

⁵ 43 of these occupations did not occur in the Egyptian Labor Force Survey rounds of 2020 to 2022 and were therefore assigned an employment share of 0.

We classify occupations based on the greenness index as obtained from each of the two systems into several green task intensity categories, from “no green tasks” to “very high green task intensity.” Much of our analysis then focuses on occupations that are classified as very high or high green task intensity (a greenness index of 0.25 or higher on a 0-1 scale), which we refer to as “green occupations” for short. This classification allows us to determine the employment share, the rate of growth, the educational and gender composition, and the broad industry composition of jobs in different categories of occupations based on the green task intensity.

We should note however, that the O*NET system classifies some occupations with no green tasks as ones that will grow with the green transition. Since these additional occupations make up about a quarter of employment in Egypt, it may be worth focusing on these as well.

Our analysis begins by identifying the top 30 greenest occupations according to each system and their employment share in total employment in Egypt. We then examine the relative size in terms of employment of the various green task intensity categories under each system and the relationship between greenness and employment growth. We also identify the fastest growing “green occupations” in Egypt according to each system. We then proceed to examine the educational and gender composition of green occupations, identifying green occupations that have high shares of technical secondary and higher education graduates and high female share. Finally, we examine the broad industrial composition of green occupations, distinguishing between agriculture, industry (mining, manufacturing, utilities, and construction), and services.

Since we know the green skills/tasks that are involved in each occupation, we can also estimate the percent of employment that utilizes specific green skills/tasks and the rate of growth of employment that utilizes these skills. We also classify the jobs that utilize the most common green skills/tasks by gender composition, educational attainment and by broad industry sector.

O*NET Database

The O*NET database version 24.1 (released November 2019) was used (National Center for O*NET Development, n.d.),⁶ as the most recent version of the database with green occupations and tasks. This version of the data includes 972 occupations and 19,642 unique tasks, with 1,386 of these tasks being green.

⁶ This page includes information from the O*NET 24.1 Database by the U.S. Department of Labor, Employment and Training Administration (USDOL/ETA). Used under the CC BY 4.0 license. O*NET® is a trademark of USDOL/ETA. The authors have modified all or some of this information. USDOL/ETA has not approved, endorsed, or tested these modifications.

The O*NET data on green occupations categorizes occupations into one of four groups: (1) Not a green occupation, (2) Green increased demand⁷ (3) Green enhanced skills⁸ (4) Green new & emerging.⁹ The O*NET data also include tasks specifically identified as green tasks. All tasks are given an importance rating for each occupation.¹⁰ The importance scale is from (1) not important to (5) extremely important.

The greenness index was calculated based on the O*NET data across all tasks for each occupation (i) (Elliott et al., 2021; following Vona et al., 2019). The greenness index ($Greenness_i$) is based on multiplying whether each task (j) that is associated with occupation i is green or not ($g_j=0,1$) and the importance weight ($w_{i,j}$, from 1-5) for each task within the occupation. In equation form this is:

$$Greenness_i = \frac{\sum_{j=1}^n w_{i,j} * g_j}{\sum_{j=1}^n w_{i,j}}$$

The resulting greenness index ranges from 0 (no green tasks) to 1 (all tasks are green). We have categorized occupations based on the greenness index and the O*NET green occupation classification into:

- No green tasks and not relevant to green transition (greenness=0)
- No green tasks, but will grow with green transition (greenness=0)
- Low green task intensity (greenness>0 but greenness<0.1)
- Moderate green task intensity (greenness>=0.1 but greenness <0.25)
- High green task intensity (greenness>=0.25 but greenness <0.5)
- Very high green task intensity (greenness>=0.5)

ESCO Database

The ESCO database was used as a secondary data source for estimating the greenness of different occupations. The most recent version of the data (v1.1.1, released September 2022) was used (ESCO, n.d.).¹¹ This version of the data includes 3,007 occupations and 13,123 unique tasks, with 558 of the tasks are classified as green. The greenness index for ESCO was calculated using the same methods as for the O*NET. Because ESCO

⁷ The definition of an occupation with green increased demand is “The impact of green economy activities and technologies is an increase in the employment demand for an existing occupation. However, this impact does not entail significant changes in the work and worker requirements of the occupation. The work context may change, but the tasks themselves do not” (Dierdorff et al., 2009, p. 4).

⁸ Green enhanced skills are occupations that are expected to undergo substantial change in task content due to the green transition (Dierdorff et al., 2009, p. 4).

⁹ Green new and emerging are new occupations in the green economy (Dierdorff et al., 2009, p. 4).

¹⁰ In cases (N=22 occupations, N=144 tasks) where green task importance values were not available, mean importance values for green tasks were used.

¹¹ Acknowledgment: This publication uses the ESCO classification of the European Commission.

does not have a continuous weighting scale for task importance, but only specifies tasks as “optional” or “essential,” an alternative approach was used to get quantitative weights. In the O*NET system, tasks with important weights from 1 to <3 are considered supplemental, whereas tasks with importance weights of 3-5 are considered core tasks. Accordingly, the essential tasks in ESCO were assigned the average importance weight of core tasks in O*NET. The optional tasks in ESCO were assigned the average importance weight of supplemental tasks in O*NET, so as to facilitate comparison between the two indices.

Egypt Labor Force Survey

The Egypt Labor Force Survey (LFS) is a nationally representative, quarterly survey of labor force conditions in Egypt carried out by the Central Agency for Public Mobilization and Statistics (CAPMAS). The LFS rounds of 2020-2022 were used to supplement the O*NET and ESCO data so as to reflect the Egyptian context. Key summary characteristics for 4-digit occupations were extracted from the LFS. These include the employment share of each occupation in total employment in Egypt expressed as a percentage (the number of jobs in a particular occupation in Egypt, divided by the total number of jobs in Egypt, times 100). For instance, 2.2 percent of employment in Egypt is in the occupation “house builders.” This variable was also estimated separately for men and women (number of jobs held by [men/women] in a particular occupation, divided by the total number of jobs held by [men/women] in Egypt, times 100). Additionally, percentage of employment held by women in an occupation was calculated (number of jobs held by women in a particular occupation, divided by the total number of jobs in that occupation in Egypt, times 100).

Other key variables from the LFS are the distribution of employment in each occupation by broad educational attainment and by broad industry sector. Broad educational attainment is classified as less than secondary, technical secondary, or higher education.¹² The broad industry sectors are classified as agriculture (which includes agriculture, forestry, fishing, and hunting), industry (which includes mining, manufacturing, utilities, and construction), and services (which includes everything else).

Egypt Occupational Outlook (EOO)

The Egypt Occupational Outlook (EOO) was updated to use 2018-2022 data. Occupation growth rates were extracted from that database, which is originally based on LFS data. Because the coding system used in the LFS was changed from ISCO-88 to ISCO-08 in 2020, a common code bridging the two coding systems was used in the EOO. This was by necessity a more aggregated code than the 4-digit ISCO-08 code used in the above analysis. Thus, two or more different occupations in the ISCO-08 coding system may have the same growth rates because they share the same “common code” in the EOO.

¹² We include the small category of workers with general secondary degrees with the higher education category. These are rarely terminal degrees and usually track into higher education.

Data on growth rates are only available for occupations with a sufficient sample size in the 2018-2022 LFS data and thus data in the EOO. See EOO documentation for how these growth rates are calculated.

Cross-Walk and Merging

The LFS 2020-2022 data have occupations coded using the International Classification of Occupations (ISCO) 2008 coding. As discussed below, we use existing cross-walks to map occupations in the O*NET and ESCO systems to the equivalent ISCO-08 code that is used in the LFS. All cross-walks are designed to generate classifications at the ISCO-08 4-digit level of occupational detail.

O*NET Cross-Walk

The O*NET data coding was O*NET-19, which maps to the U.S. Standard Occupation Classification (SOC) 2010 coding. Occupations were cross-walked from SOC 2010 coding to ISCO-08 coding (Hardy et al., 2018). The crosswalk generated a many-to-many mapping, with multiple ISCO-08 codes sometimes corresponding to a single O*NET code and multiple O*NET codes sometimes corresponding to a single ISCO-08 code. There were 1,455 combinations overall, based on the 972 O-NET codes¹³ and 422 ISCO-08 codes.

When there were multiple SOC codes within an ISCO code, a simple mean of the greenness index across SOC occupations was taken, and likewise for the importance value of tasks. Similarly, the maximum value of the green occupation classification was taken (1=Green increased demand, 2=Green Enhanced skills, 3=Green New & Emerging) to define green occupations for ISCO. Tasks for any component occupations were carried through in the cross-walk. When there were multiple ISCO codes for a single SOC code, they were all assigned the same greenness index, task importance weights, and green occupation classification.

ESCO Cross-Walk

The ESCO occupations data provided the ISCO-08 (4-digit) group for each occupation in the ESCO data.¹⁴ Multiple ESCO occupations could map onto one ISCO-08 occupation, but there were not multiple ISCO codes that mapped to one ESCO code. There were 3,007 ESCO occupation URI codes which included 417 ISCO-08 4-digit codes. When there were multiple ESCO occupation codes within an ISCO code, a simple mean of the greenness index across ESCO occupations was taken, and likewise for the importance value of tasks.

Combined Database

Occupations that are in the ISCO-08 coding and O*NET or ESCO but not present in the LFS are retained in the database with a share of employment of 0 percent. The resultant databases that rank occupations by their O*NET and ESCO greenness indices and that also include the other occupation-specific characteristics mentioned above are shown in

¹³ 94 occupations, primarily in military roles, did not have corresponding ISCO-08 codes and were dropped.

¹⁴ Ten ISCO-08 occupations, such as traditional chiefs and heads of village, subsistence crop farmers, etc., did not exist in the ESCO data and therefore have missing values for ESCO greenness and are not included in the potential green occupations or tasks from ESCO data. Additionally, there were five ISCO occupations with ESCO data but not LFS or O*NET data; these have missing O*NET variables in the data.

the Appendix (Table 5). The databases are also made available in Excel format for ease of access.¹⁵

Results

Green Occupations

Because O*NET and ESCO identify a different set of tasks or skills/competences as green and use different tasks/skills to describe job responsibilities in the same occupation, there is imperfect agreement between the O*NET and ESCO databases on the greenness of various occupations (Figure 2). The correlation coefficient of the greenness indices produced by two databases is 0.375, and the rank correlation of the two indices is 0.315. As we will see below, the O*NET system tends to designate as green many tasks related to design, monitoring, tracking, building, and maintenance of environmental, renewable energy, and materials recovery processes. It tends to, therefore, designate as green many managerial, executive, planning and policy occupations, as well several construction-related occupations. On the other hand, the ESCO system tends to designate skills and competences related to sustainable agriculture and agroforestry as green, which favors occupations in agriculture and forestry. Both systems designate tasks, skills and competences in environmental management and protection, recycling, and materials recovery as green.

As shown in Figure 1, a handful of occupations at the 4-digit level of the ISCO-08 classification emerge among the top 30 green occupations according to both databases. These include occupations that are directly related to the environment or to the circular economy such as environmental engineers, environmental protection professionals, non-medical life sciences technicians, refuse sorters, garbage and recycling collectors, incinerator and water treatment plant operators. Civil engineers also emerge among the top 30 green occupations in both systems. Together, these occupations make up only 0.9 percent of employment in Egypt.

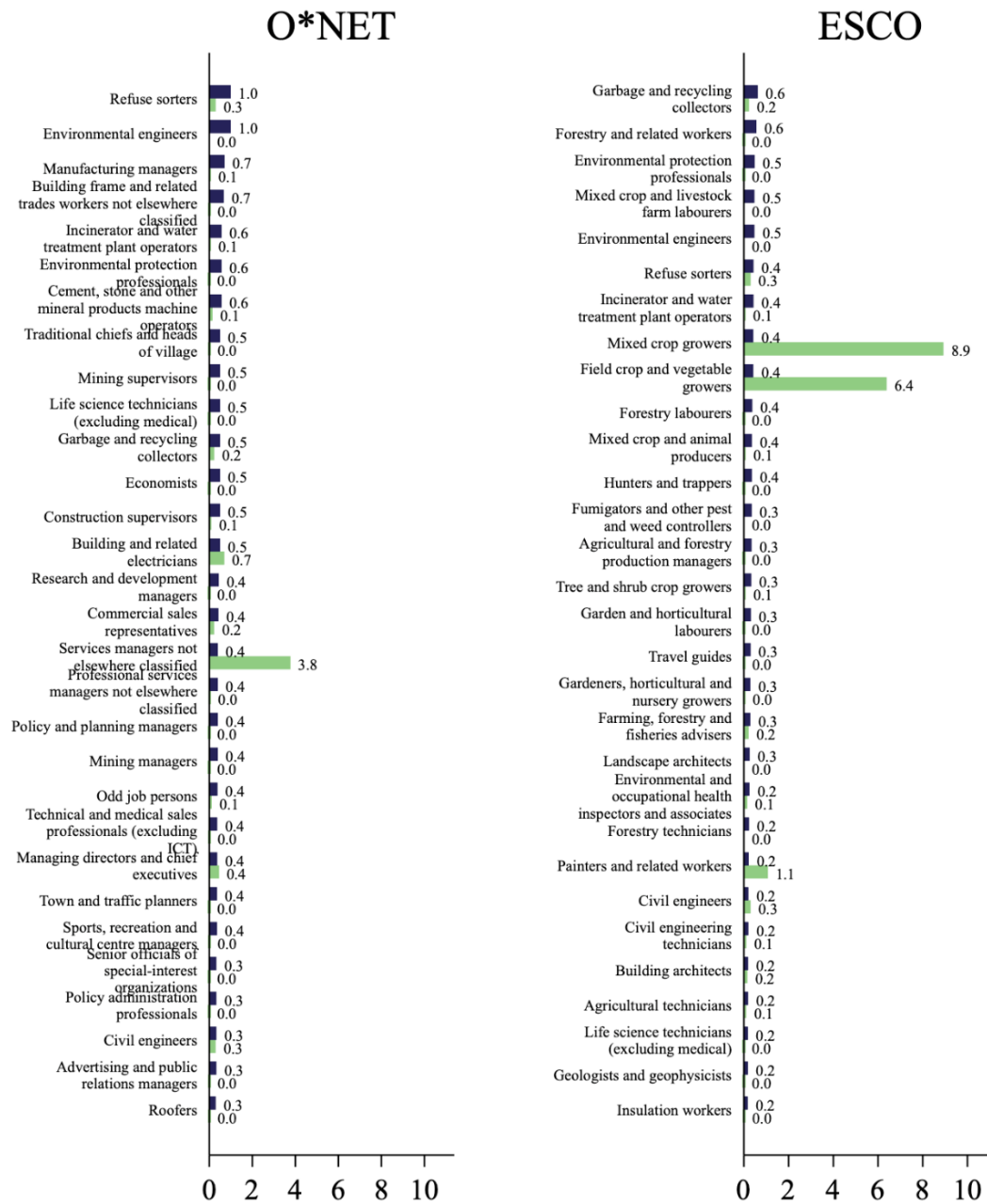
The O*NET database assigns a high greenness index to several additional occupations that are not highly ranked in terms of greenness by ESCO. These include a number of occupations related to the construction and mining industries, including construction supervisors, building and related electricians, roofers, building frame and related trade workers not elsewhere classified (n.e.c.), cement, stone, and other mineral products machine operators, and mining supervisors. Together these constitute about 1 percent of total employment in Egypt. It also generates high greenness indices for several managerial and executive occupations, such as manufacturing managers, mining managers, research and development managers, policy and planning managers, sports, recreation and cultural center managers, advertising and public relations managers, professional services managers n.e.c., service managers n.e.c. (the majority of whom are farm managers and agricultural employers), managing directors and chief executives, senior officials of special interest organizations, and traditional chiefs and heads of

¹⁵ Files will be made available on www.carolinekrafft.com/publications

villages (4.4 percent of employment). The remaining top 30 green occupations according to O*NET include economists, commercial and sales representatives, technical and medical sales professionals, town and traffic planners, policy and administration professionals, and odd job persons (together, 0.4 percent of employment).

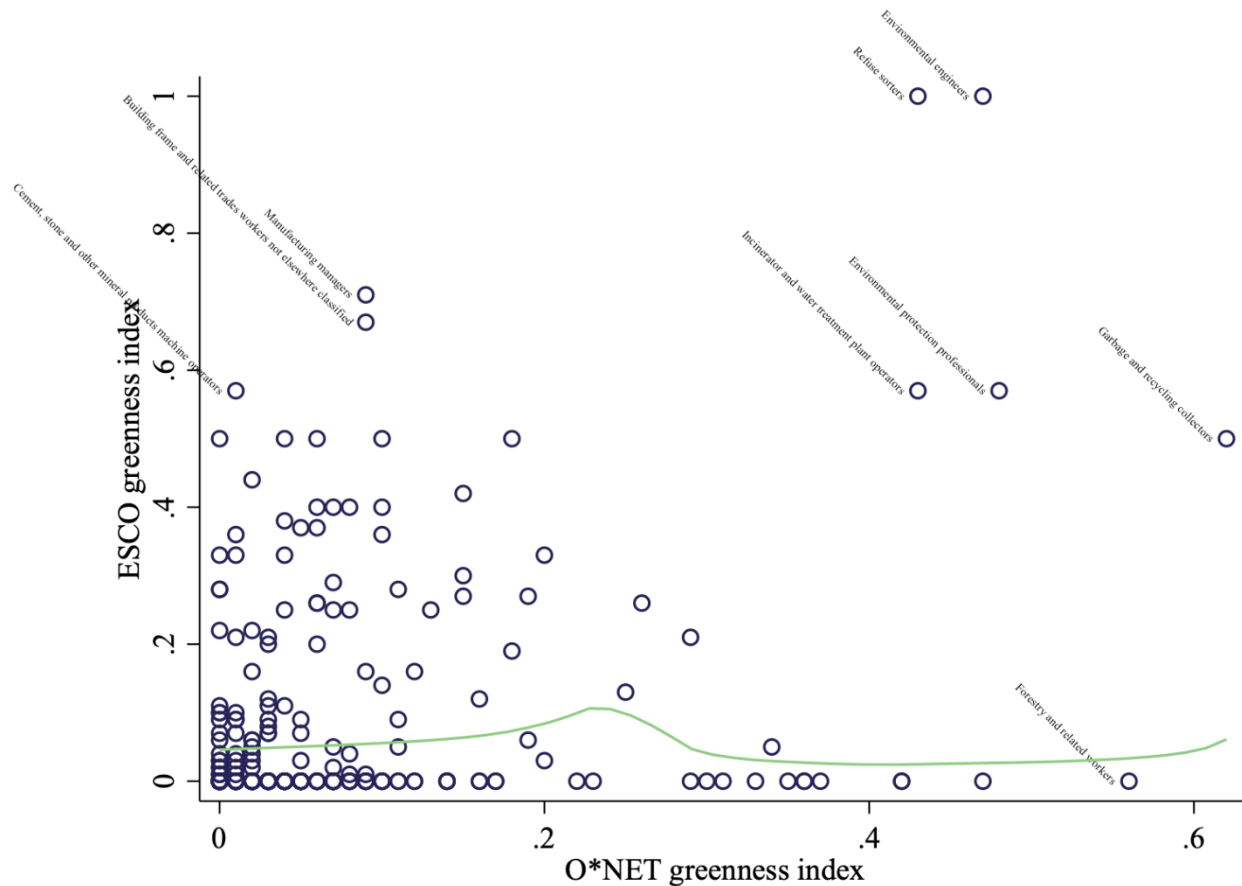
Occupations that are assigned a high greenness index by ESCO but not by O*NET are predominantly in agriculture and forestry. These include forestry and related workers, forestry laborers, forestry technicians, mixed crop and livestock farm laborers, mixed crop growers, field crop and vegetable growers, mixed crop and animal producers, agricultural and forestry production managers, agricultural technicians, tree and shrub crop growers, garden and horticultural laborers and workers, farming, forestry and fishery advisers, and hunters and trappers. Because of the importance of the agricultural sector in Egypt, together these occupations make up 15.8 percent of total employment. The remaining top 30 green occupations according to ESCO include fumigators and other pest and weed controllers, travel guides, landscape architects, building architects, civil engineering technicians, environmental and occupational health inspectors, painters and related workers, insulation workers, and geologists and geophysicists (together, 1.6 percent of employment).

Figure 1. Top 30 Green Occupations per O*NET and ESCO, ranked by Greenness Index, and Percentage of Employment in Occupation



Source: Authors' calculations based on LFS 2020-2022, O*NET, and ESCO.

Figure 2. Greenness Index Correlation Across O*NET and ESCO



Notes: Observation is an occupation. Local polynomial fit line, bandwidth 0.1. Labels for any category with at least one index above 0.5

Source: Authors' calculations based on LFS 2020-2022, O*NET, and ESCO.

We now move to the classification of occupations by green task intensity. In both systems, occupations with no green tasks (or a greenness index of zero) are identified, but the O*NET system distinguishes between occupations with no green tasks that are not relevant to the green transition and those that will grow with green transition. In fact, many of the agricultural and forestry occupations identified by ESCO as green are classified by O*NET as either having no green tasks but will grow with the green transition or as having low green task intensity. The remaining classification into low, moderate, high and very high green task intensity is based on the cut points in the respective greenness indices mentioned in the methodology section above.

According to O*NET, 14 four-digit occupations have very high green task intensity, and as shown in Figure 3, these make up 1.6 percent of employment in Egypt. Only two four-digit occupations have very high green task intensity according to ESCO, and these make

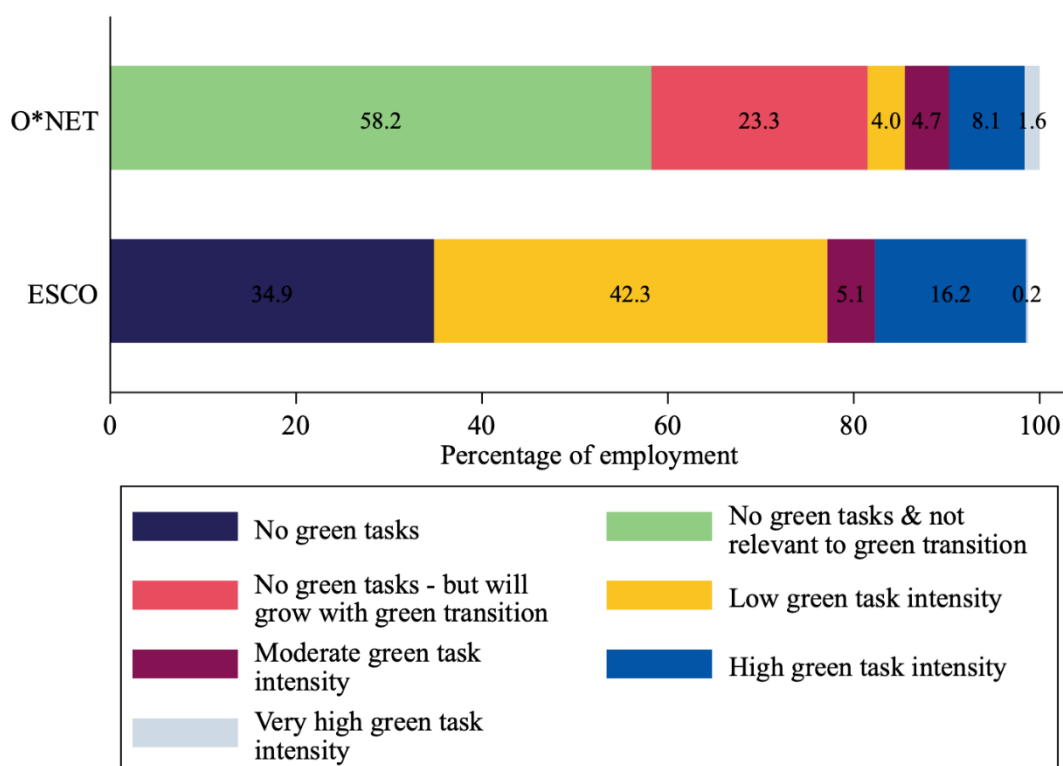
up only 0.2 percent of employment in Egypt. Of the 14 very high green task intensity occupations in O*NET, five are also classified as having very high or high green task intensity by ESCO (garbage and recycling collectors, environmental protection professionals, environmental engineers, refuse sorters, incinerator or water treatment plant operators). An additional 29 occupations according to O*NET (8.1 of employment in Egypt) and 19 occupations according to ESCO (16.2 percent of employment in Egypt) have high green task intensity.¹⁶ Because O*NET's high greenness intensity occupations mostly include construction and managerial occupations and ESCO's includes mostly agricultural and forestry occupations, there is relatively little overlap among the two systems in this category. The only overlap is in fact landscape architects. The share of employment in the moderate green task intensity category, at about 5 percent, is similar in both systems. Thus, the share of employment in occupations with moderate green task intensity or higher is 14.4 percent according to O*NET and 21.5 percent according to ESCO.

ESCO classifies much more employment into the low green task intensity category than O*NET (42 percent versus 4 percent). In fact, O*NET classifies occupations making up 58 percent of employment in Egypt as having no green tasks and not relevant to the green transition and others that make up an additional 23 percent as having no green tasks but will grow with the green transition. In contrast, the employment share of occupations with no green tasks in ESCO is only 35 percent.¹⁷

¹⁶ See excel files for a list of occupations and their greenness intensity classification.

¹⁷ A recent estimate of green jobs in Egypt based on their use of eco-friendly processes or outputs in the nationally representative Egypt Labor Market Panel Survey 2023 puts the share of jobs that are green in Egypt at 7.8 percent (Abou-Ali & Amer, 2024), illustrating that the analyses using O*NET and ESCO, which identify a higher share of jobs as green, are likely identifying potentially (not necessarily currently) green jobs.

Figure 3. Distribution of Total Employment (Percentage) by Category of Green Task Intensity According to O*NET and ESCO



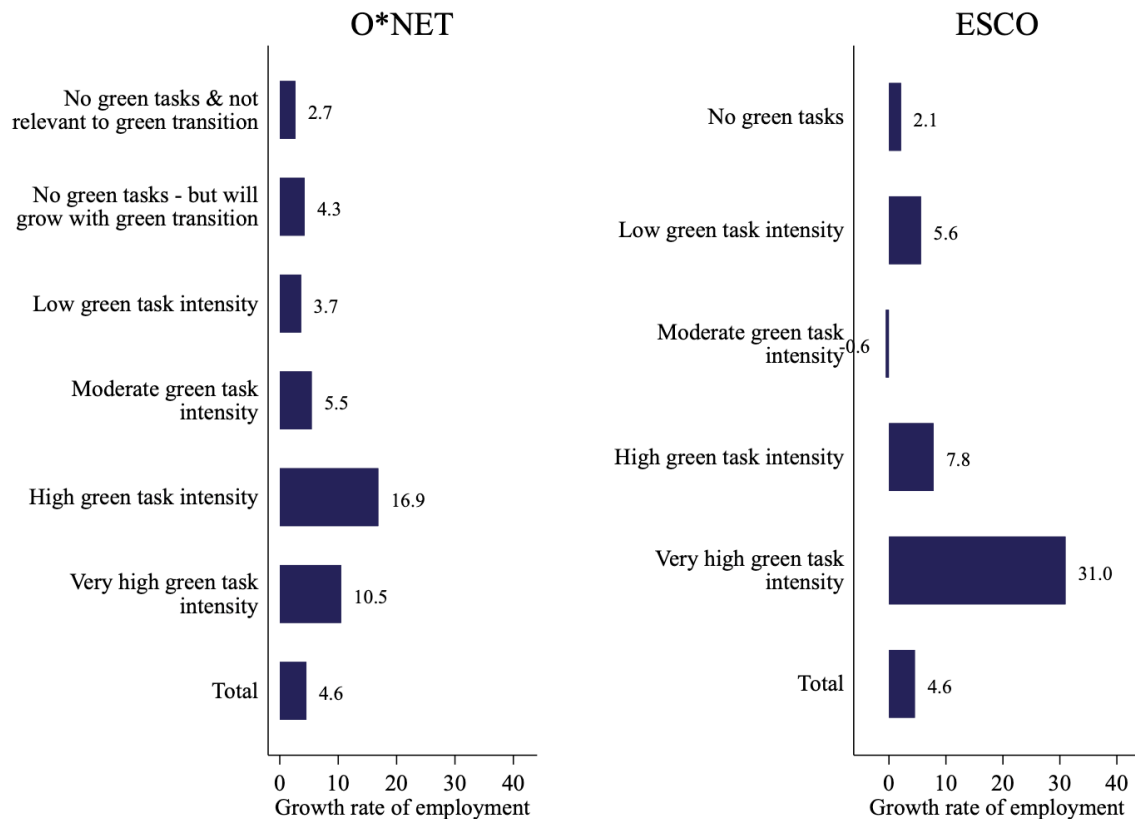
Source: Authors' calculations based on LFS 2020-2022, O*NET, and ESCO.

Notes: Only O*NET distinguishes between whether or not occupations with no green tasks will grow with green transition.

Turning now to the relationship between greenness and employment growth, we first examine how different categories of green task intensity correlate with employment growth. As shown in Figure 4, the very high and high green task intensity categories have much higher rates of employment growth in Egypt than the other categories with lower green task intensity. In fact, the highest rate of growth – 31 percent – is for the admittedly small category of very high green task intensity according to the ESCO system (0.2 percent of employment), but the relatively large category of high green task intensity according to O*NET (8.1 percent of employment) is growing at 16.9 percent per annum, almost four times the average rate of growth. Similarly, the very high green task intensity category according to O*NET (1.6 percent of employment) is growing at 10.6 percent per annum, more than twice the average growth rate. There is, therefore, a clear positive relationship between greenness and the rate of employment growth in the Egyptian context, a relationship that is particularly pronounced when greenness is measured according to the O*NET system. In fact, even occupations with moderate green task intensity in this system (but not ESCO) are growing substantially higher than average. Furthermore, even occupations with no green tasks but that are designated as ones that

will grow with the green transition are estimated to have grown at 1.6 times other occupations with no green tasks that are not relevant to the green transition.

Figure 4. Mean Annual Employment Growth Rate Employment (Percentage) by Category of Green Task Intensity According to O*NET and ESCO



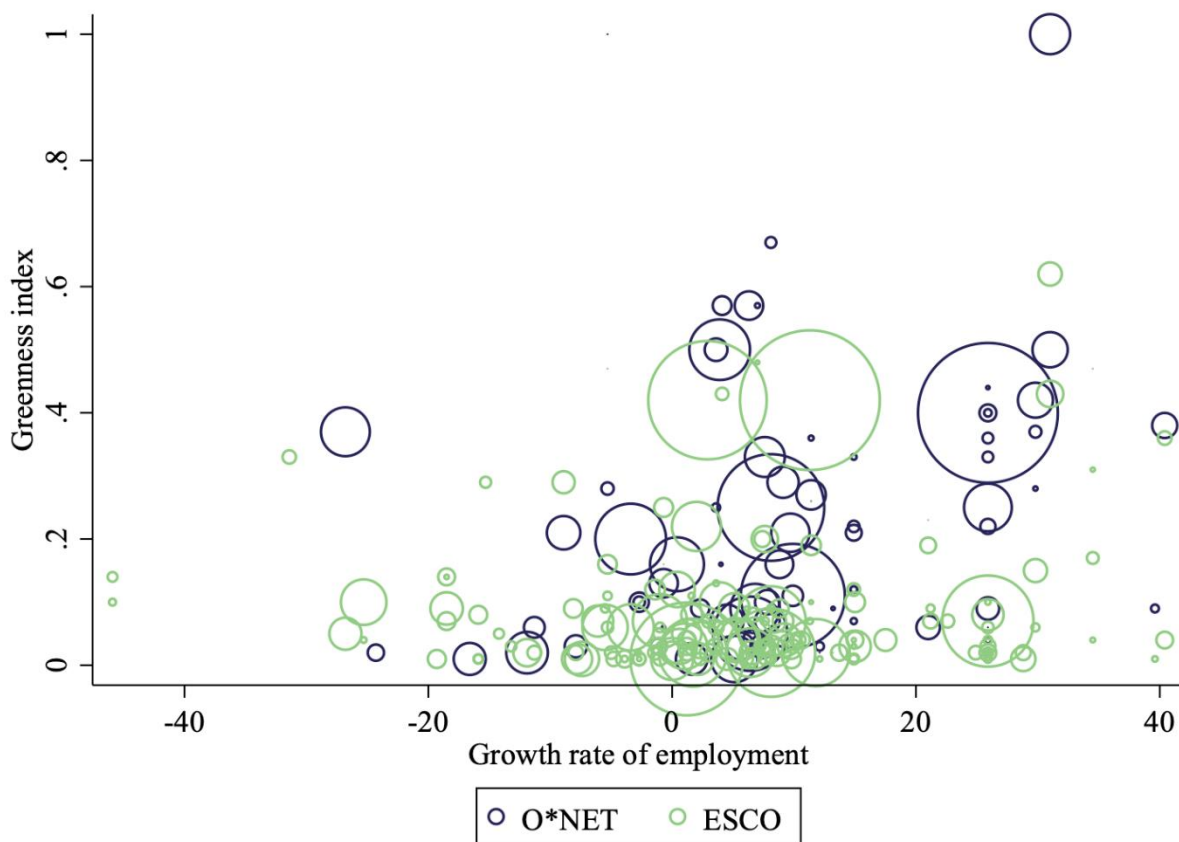
Source: Authors' calculations based on LFS 2020-2022, O*NET, and ESCO.

Notes: Only O*NET distinguishes between whether or not occupations with no green tasks will grow with green transition.

Turning now to how fast specific green occupations have been growing in Egypt, we present in Figure 5 a scatterplot showing the rate of growth of occupational employment versus the greenness index for occupations that have a greenness index above zero according to at least one of the databases (only shown for database with a greenness index above zero). The size of the circle is proportional to the employment share of the occupation. The positive relationship between rate of employment growth and greenness observed above is readily apparent here as well. Of note are occupations with a greenness index of 0.25 or higher (classified as high or very high green task intensity) and growth rates in excess of 20 percent. In the O*NET system, these include refuse sorters (upper right-hand corner), garbage and recycling collectors, research and development managers, policy and planning managers, commercial and sales

representatives, technical and medical sales professionals, various kinds of services managers, ICT sales professionals, and odd job persons. According to the ESCO system, the high growth green occupations, like in O*NET, include garbage and recycling collectors and refuse sorters, but also several of the agricultural occupations, such as mixed crop and livestock producers and farm laborers, and garden and horticultural laborers. There are several occupations in the very high and high green task intensity categories that have moderate rates of growth, such as civil engineers, mechanical engineers, architects, town and traffic planners, policy administration professionals, civil engineering technicians, house builders, construction managers, and environmental protection professionals. A few of these green occupations have negative growth rates. These include environmental engineers, manufacturing and mining managers, managing directors and chief executives, engineering professionals n.e.c., tree and shrub growers, farming, forestry and fisheries advisers, and environmental and occupational health inspectors. In general, however, there appears to be a net positive relationship between employment growth and greenness.

Figure 5. Greenness Index and Employment Growth Rate of Occupation (Percentage), Occupations with Some Green Skills



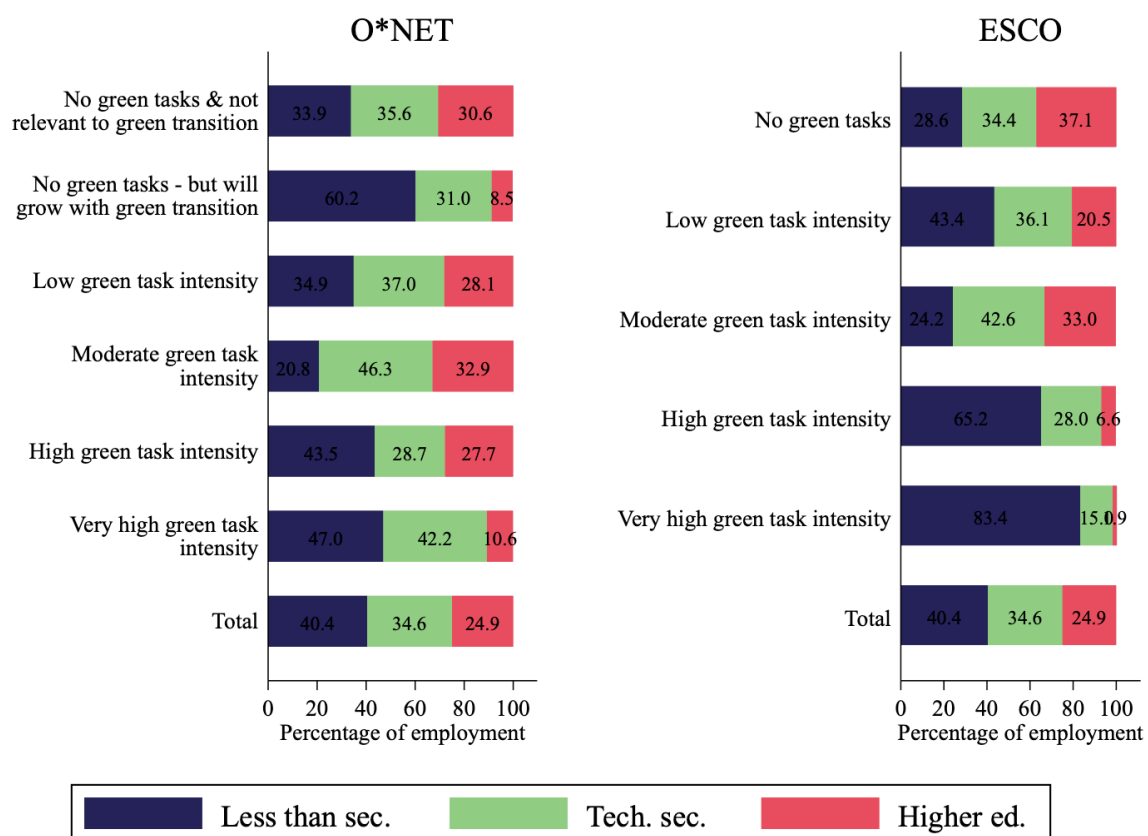
*Notes: Observation is an occupation, weighted by percentage of employment. Restricted to 1st-99th percentiles of growth rates. Restricted to occupations with a greenness above zero on ESCO or O*NET measure.*

*Source: Authors' calculations based on LFS 2020-2022, O*NET, and ESCO.*

As mentioned above, among occupations with no green tasks, the O*NET system identifies some that will grow with the green transition, so it is worth noting the fast-growing occupations among those. They include mixed crop and animal producers, water and firewood collectors, forestry technicians, and earthmoving and related plant operators.

A relevant factor for education planners is the educational level required in green occupation. As shown in Figure 6, there is not a straightforward relationship between greenness and educational attainment. In fact, the highest proportion of higher and technical secondary educated workers is for occupations with moderate green task intensity in both O*NET and ESCO. Just under half the workers in occupations with high and very high green task intensity in the O*NET system have less than secondary education, which is higher than the average for all occupations. This proportion climbs to over two thirds in the very high and high categories in the ESCO system. This is because of the importance of refuse sorters and garbage and recycling collectors according to either system in both in these categories, and the importance of various agricultural and forestry occupations in the ESCO system, all of which have relatively low educational attainment. Nevertheless, 42 percent of workers in very high (O*NET, only 15 percent in ESCO) and 28-29 percent of workers in high green task intensity occupations (O*NET and ESCO) have technical secondary education. Similarly, just under half of workers in the moderate green task intensity category in both systems have technical secondary education. This suggests that the technical education system has an important, but not exclusive, role to play in preparing workers for the green transition.

Figure 6. Distribution of Employment by Broad Educational Attainment (Percentage) by Category of Green Task Intensity According to O*NET and ESCO



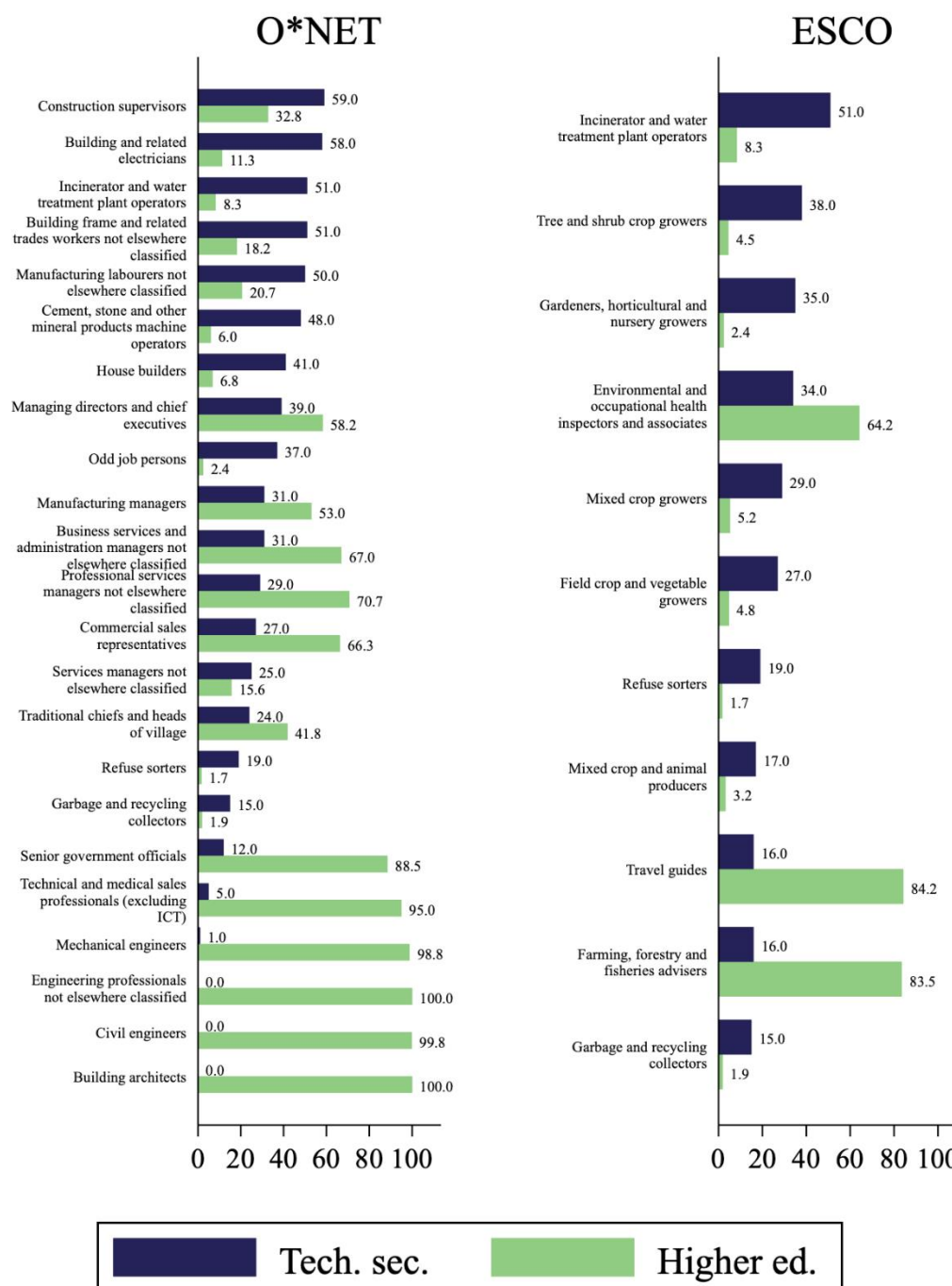
Notes: General secondary included with higher education

Source: Authors' calculations based on LFS 2020-2022, O*NET, and ESCO.

We examine next the education levels of workers in specific occupations with very high and high green task intensity. As shown in Figure 7, ordered by the share of workers with technical secondary, several of the construction-related occupations identified as green in the O*NET system have high proportions of technical secondary workers. In addition to those are incinerator and water treatment plant operators, cement, stone, and other mineral products machine operators, and manufacturing laborers n.e.c., which notably include sorting workers and manual assembly workers. Occupations with very high or high green task intensity in the

O*NET system with high proportions of workers with higher education include architects and engineers of various types, technical and commercial sales representatives, and various kinds of managers. Occupations that have very high or high green task intensity in the ESCO system that have relatively high proportions of technical secondary graduates are again incinerator and water treatment plant operators, environmental and occupational health inspectors, and some of the agricultural occupations, such as tree and shrub growers, and gardeners, horticulturists and nursery growers. Those with high proportion of higher education graduates again include environmental and occupational health inspectors, travel guides, and farming, forestry and fishery advisers.

Figure 7. Percentage of Employment with Technical Secondary, Percentage of Employment with Higher Education in Occupations with very High and High Green-Task Intensity



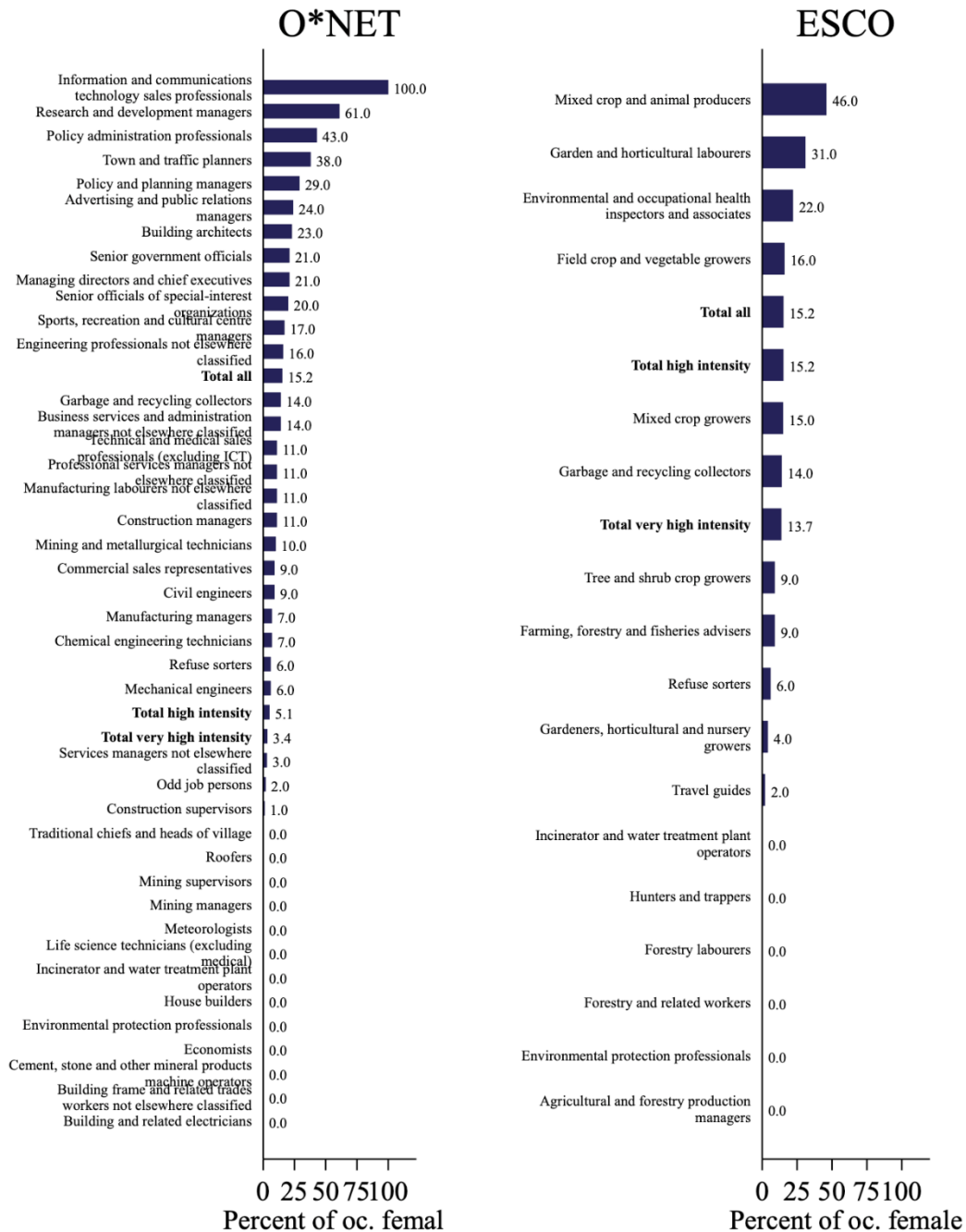
Notes: General secondary included with higher education

Source: Authors' calculations based on LFS 2020-2022, O*NET, and ESCO.

We also investigated the gender composition of green occupations to determine the extent to which they provide employment opportunities for women. Figure 8 sorts occupations in the very high and high green task intensity categories according to the two systems in descending order by share of female workers, but also shows the percent female overall and in the very high and high task intensity categories. In general, green occupations appear to have a lower percent female than average. The overall percent female in all employment is 15.2 percent, whereas occupations with very high green task intensity according to O*NET have a female share of only 3.4 percent and those with high green task intensity have a female share of 5.1 percent. The percent female in green occupations according to ESCO is higher, at 13.7 percent for the very high category, and very close to the overall average at 15.2 percent for the high category. This is probably because of the importance of agriculture-related occupations among the green occupations identified by ESCO and the relatively high female shares in these occupations.

According to the O*NET system, the green occupations that are most open to women are ICT sales professional, which is virtually all female, various professional occupations related to policy and planning, and certain services-oriented managerial occupations, such as those in research and development, policy and planning, advertising and public relations, as well as top management in government and special-interest organizations. They also include professionals such as building architects and engineering professionals n.e.c. The green occupations identified by the ESCO system that have a high female share include several related to agriculture, such as mixed crop and animal producers, garden and horticultural laborers, and field crop and vegetable growers, but also professional occupations such as environmental and occupational health inspectors and associates.

Figure 8. Percentage of Employment Held by Women in Occupations with very High and High Green-Task Intensity According to O*NET and ESCO.



Source: Authors' calculations based on LFS 2020-2022, O*NET, and ESCO.

Note: The “total all” category includes all employment, not just high and very high green task intensity occupations.

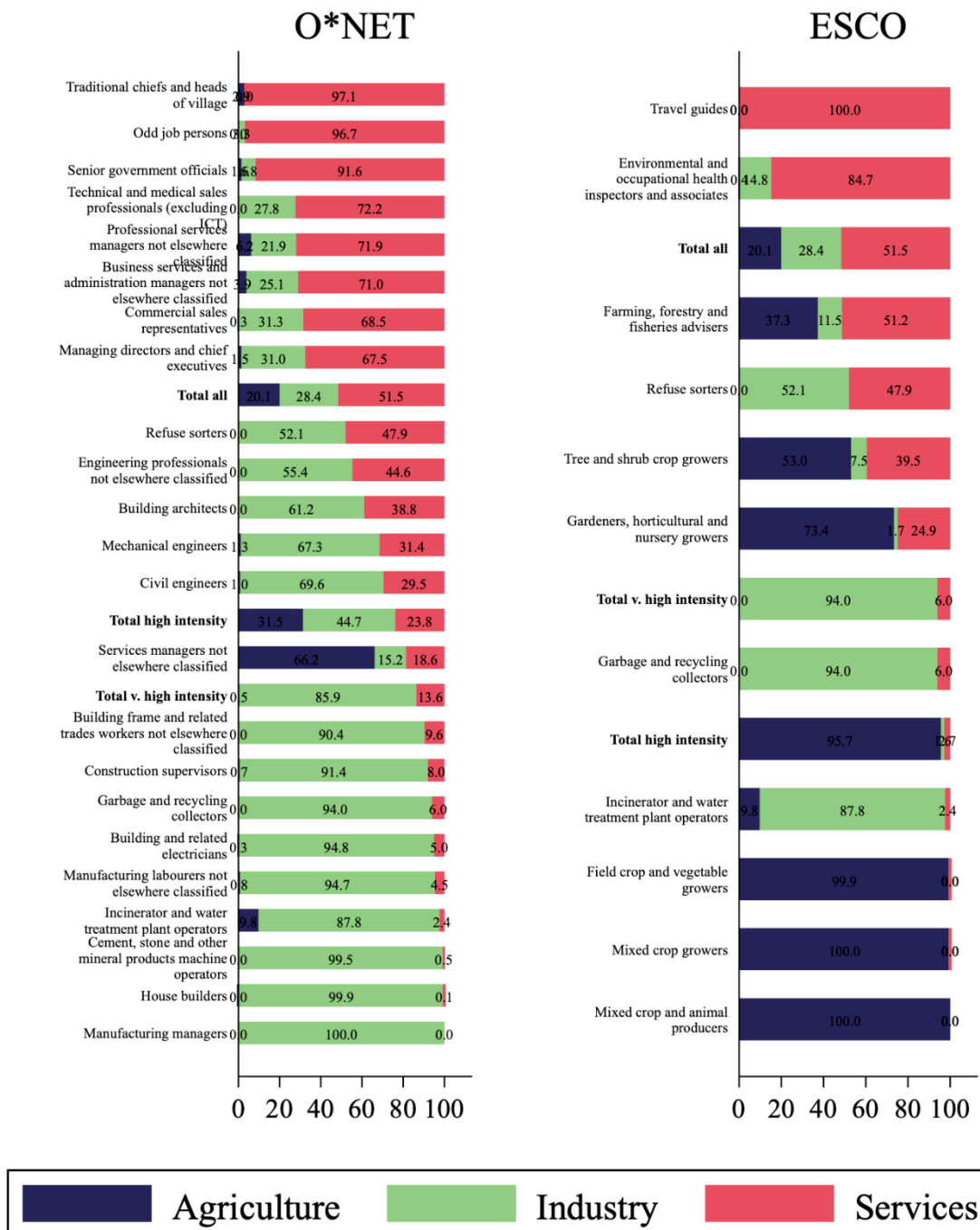
We examine next the industrial composition of green occupations as identified by the two systems. We classify industries into the three broad categories: (i) agriculture, (ii) industry, and (iii) services. Agriculture includes agriculture, forestry, fishing and hunting. Industry includes mining, manufacturing, utilities, and construction. Services includes everything else from wholesale and retail trade to social services. According to the LFS, the distribution of overall employment in 2020-2022 was 20 percent agriculture, 28 percent industry, and about 52 percent services.

As shown in Figure 9, employment in the green occupations identified by the O*NET system is disproportionately in agriculture and industry. In the very high green task intensity category, it is almost all in industry (86 percent), whereas in the high green task intensity category, it is 45 percent in industry and 32 percent in agriculture. The higher than expected proportion in agriculture in the O*NET system despite there being no explicitly agricultural occupations among the O*NET green occupations is due to the category “service managers n.e.c.,” which is dominated by farm managers and agricultural employers. According to the ESCO system, the very high green task intensity category is almost exclusively in industry (94 percent) and the high green task intensity category is almost exclusively in agriculture (96 percent).

The green occupations according to O*NET that are almost entirely in the services sector are traditional chief and heads of villages, senior government officials, and odd job persons. Travel guides and environmental and occupational health inspectors are the ones almost entirely in the services sector in the ESCO system. A high proportion of the green occupations according to the O*NET system are almost entirely in the industry sector. These include the green construction and manufacturing related occupations, the garbage and recycling collectors, and the incinerator and water plant operators, with the last two showing up in the ESCO list as well. As mentioned above the green occupation in O*NET system that is predominantly in agriculture is “service managers n.e.c.,” which includes employers in agriculture in the ISCO-08 classification. The green occupations in the ESCO system that are predominantly in agriculture are the traditional agricultural occupations of field crop and vegetable growers, mixed crop growers, and mixed crop and animal producers.

It is important to also note that some green occupations have a more mixed sectoral distribution. In the O*NET system, these include most of the managerial and engineering occupations identified as green, the sales representatives, and the refuse sorters. In the ESCO system, they include the refuse sorters, but also some of the agricultural occupations such as farming, forestry and fishery advisers, tree and shrub crop growers, and gardeners, horticultural, and nursery growers, who have substantial presence in the services sectors as well as agriculture.

Figure 9. Percentage of Employment by Broad Industry Sector in Occupations with very High and High Green-Task Intensity



Source: Authors' calculations based on LFS 2020-2022, O*NET, and ESCO.

Notes: Industry includes mining and quarrying, manufacturing, electricity, gas and construction.

Green Tasks/Skills

Both the O*NET and ESCO systems classify tasks (O*NET) or skills (ESCO) as green or not green and give these tasks or skills a relative importance within each occupation. Occupations with low, moderate, high, or very high green task intensity necessarily have some green tasks or skills, as green occupations are defined based on the greenness index, which is calculated from the (importance-weighted) fraction of tasks/skills that are green. We therefore shift our focus in this section from occupations to tasks/skills and illustrate some of the top green tasks/skills in each system and their prevalence in the Egyptian economy as ascertained by the prevalence of the occupations that use them. The O*NET system identifies 1,386 tasks out of a total of 19,642 tasks in the database as green, whereas the ESCO system identifies 558 skills or knowledge concepts as green out of a total of 13,123 unique skills and knowledge concepts.¹⁸ The number of different possible green skills, which vary substantially across occupations, underscores that green skills are not monolithic – meaning that education policy and planning for green skills will need to be occupation-specific. It is also important to keep in mind that these are perhaps viewed most accurately as *potential* green tasks and skills – for instance, agricultural tasks could be done sustainably or using conventional farming techniques.

As shown in Table 1, the top 20 green tasks as identified by O*NET are related to designing, monitoring, and managing environmental processes, tracking information about materials flows, developing and deploying renewable energy projects, and tasks related to materials recovery and recycling. As shown in Table 2, ESCO takes a somewhat different track by identifying specific fields of specialization or competence, many of which are related to agriculture, such as agronomy, pest control in plants, soil structure, etc. Given the importance of agriculture-related skills in the ESCO list, it is no surprise that agriculture related occupations show up prominently among the greenest occupations in the ESCO system.

Once green tasks/skills are identified, based on the occupations that require them, we can identify the proportion of employment that potentially incorporates them. Accordingly, only 4.3 percent of total employment in Egypt is in occupations that could incorporate the top 20 green tasks identified by O*NET.¹⁹ While 4.8 percent of male employment incorporates these tasks, only 1.1 percent of female employment does. Since most of the top 20 green skills identified by ESCO are related to agriculture, they are much more prevalent in the Egyptian labor market, potentially incorporated in 15.5 to 20.2 percent of employment. They are more or less equally prevalent among male and female workers.

¹⁸ The list of green tasks/skills associated with each occupation in the database and their relative importance for the occupation as provided by both O*NET and ESCO is available in the database that was created for this report.

¹⁹ These tasks are all required by the following occupations: Senior officials of special-interest organizations; Policy and planning managers; Business services and administration managers not elsewhere classified; Mining managers; Professional services managers not elsewhere classified; Sports, recreation and cultural center managers; Services managers not elsewhere classified. Hence, there is no variation in the percentage of employment requiring these 20 skills.

Table 1. Top 20 Green Tasks per O*NET

Design or implement supply chains that support environmental policies.
Monitor regulatory affairs trends related to environmental issues.
Evaluate and select information or other technology solutions to improve tracking and reporting of materials or products distribution, storage, or inventory.
Prepare or assist in the preparation of applications for environmental, building, or other required permits.
Develop or implement environmental compliance plans for programs, such as air quality, storm water, wastewater treatment, hazardous waste management, pollution prevention, or solid waste management.
Develop scope of work for wind project functions, such as design, site assessment, environmental studies, surveying, or field support services.
Review, negotiate, or approve wind farm contracts.
Maintain records of decisions, actions, and progress related to environmental redevelopment projects.
Maintain operations records, such as work orders, site inspection forms, or other documentation.
Identify opportunities to reuse or recycle materials to minimize consumption of new materials, minimize waste, or to convert wastes to by-products.
Track and maintain records for wind operations, such as site performance, downtime events, parts usage, or substation events.
Coordinate or direct development, energy assessment, engineering, or construction activities to ensure that wind project needs and objectives are met.
Provide expert witness testimony on issues such as soil, air, or water contamination and associated cleanup measures.
Provide training on hazardous material or waste cleanup procedures and technologies.
Evaluate regulatory affairs aspects that are specifically green, such as the use of toxic substances in packaging, carbon footprinting issues, or green policy implementation.
Design or implement measures to improve the water, air, and soil quality of military test sites, abandoned mine land, or other contaminated sites.

Design, implement, or oversee product take back or reverse logistics programs to ensure products are recycled, reused, or responsibly disposed.

Train or coordinate the training of employees in operations, safety, environmental issues, or technical issues.

Conduct or oversee the conduct of life cycle analyses to determine the environmental impacts of products, processes, or systems.

Supervise employees or subcontractors to ensure quality of work or adherence to safety regulations or policies.

Note: All above tasks are incorporated in 4.3% of employment (1.1% of women's employment and 4.8% of men's employment; 5.6% of less than secondary employment; 3.2% of vocational secondary employment; 3.7% of higher education employment; 12.6% of agriculture employment; 2.5% of manufacturing employment; 2.0% of services employment). Ties ranked randomly.

*Source: Authors' calculations based on O*NET*

Table 2. Top 20 Green Skills or Knowledge Concepts per ESCO

health and safety regulations
environmental legislation in agriculture and forestry
ecology
agritourism
crop production principles
agronomy
pest control in plants
plant disease control
soil structure
fertilization principles
agroecology
organic farming
plant propagation
supervise crop production
agroforestry
conservation agriculture
maintain plant health
maintain plant soil nutrition
apply sustainable tillage techniques
execute disease and pest control activities

Notes: Skills incorporated in 15.5-20.2% of employment (15.4-19.9% of male employment and 15.8-21.6% of female employment; 25.5-29.7% of less than secondary employment; 12.8-18.4% of technical secondary employment; 3.2-9.1% of higher education employment; 77.6-82.4% of agricultural employment; <0.1 to 5.8% of industrial employment; <0.1 to 4.2% of services employment). Ties ranked randomly.

Source: Authors' calculations based on ESCO and LFS 2020-2022

Once green tasks/skills have been identified and linked to specific occupations, it is possible to determine the fastest growing green ones in Egypt based on the rate of growth of the occupations that incorporate them. Table 3 shows the twenty fastest growing green tasks according to the O*NET system. They are mostly linked to the repair, servicing, and control of heating, ventilating, and air conditioning (HVAC) system and the installation and maintenance of wind farms. However, these fast-growing tasks are only potentially relevant to a minute proportion of employment in Egypt, somewhere between 0.04 and 0.07 percent of employment.

Table 3. Fastest-Growing 20 Green Tasks per O*NET

Repair or service heating, ventilating, and air conditioning (HVAC) systems to improve efficiency, such as by changing filters, cleaning ducts, or refilling non-toxic refrigerants.
Maintain tool and spare parts inventories required for repair, installation, or replacement services.
Collect turbine data for testing or research and analysis.
Climb wind turbine towers to inspect, maintain, or repair equipment.
Inspect or repair fiberglass turbine blades.
Install radiator controls for room-level zone control heating of residential or commercial buildings.
Assist in assembly of individual wind generators or construction of wind farms.
Install and test automatic, programmable, or wireless thermostats in residential or commercial buildings to minimize energy usage for heating or cooling.
Troubleshoot or repair mechanical, hydraulic, or electrical malfunctions related to variable pitch systems, variable speed control systems, converter systems, or related components.
Test electrical components of wind systems with devices, such as voltage testers, multimeters, oscilloscopes, infrared testers, or fiber optic equipment.
Train end-users, distributors, installers, or other technicians in wind commissioning, testing, or other technical procedures.
Test structures, controls, or mechanical, hydraulic, or electrical systems, according to test plans or in coordination with engineers.
Install or repair air purification systems, such as specialized filters or ultraviolet (UV) light purification systems.
Install magnetic-centrifugal chillers, compressors, or related equipment to cool air temperatures through the use of recirculating water.

Install or repair self-contained ground source heat pumps or hybrid ground or air source heat pumps to minimize carbon-based energy consumption and reduce carbon emissions.

Perform routine maintenance on wind turbine equipment, underground transmission systems, wind fields substations, or fiber optic sensing and control systems.

Diagnose problems involving wind turbine generators or control systems.

Install dehumidifiers or related equipment for spaces that require cool, dry air to operate efficiently, such as computer rooms.

Start or restart wind turbine generator systems to ensure proper operations.

Operate manufacturing equipment to fabricate wind turbines.

Note: All above tasks have a 51.7% growth rate. Ties ranked randomly. Skills required by 0.04 to 0.07% of employment in Egypt

*Source: Authors' calculations based on O*NET*

The fastest growing green skills according to ESCO are more diverse. They relate mostly to four distinct areas: (i) business sustainability, such as sustainable development and finance, corporate social responsibility, measuring sustainability performance, managing procedures for eco-labeling, and green computing (ii) managing naturally protected areas and sustainable tourism, (iii) skills related to materials recovery and recycling, and (iv) skills related to sustainable agriculture such as composting, plant propagation, integrated pest management, and the management of organic by-products. Overall, only less than 0.1 percent to 3.8 percent (varying across skills) of employment potentially incorporates at least one of these skills.

Table 4. Fastest-Growing 20 Green Skills or Knowledge Concepts per ESCO

manage plans for the storage of organic by-products
manage plans for the utilisation of organic by-products
assist in plant propagation
integrated pest management
follow recycling collection schedules
collect broken appliances
monitor composting
install recycling containers
dismantle broken appliances
store sorted waste
provide training in sustainable tourism development and management by-products and waste
measure company's sustainability performance
advise on corporate social responsibility
apply procedures and regulations for eco-labelling
green computing
apply road transport environmental measures
manage visitor flows in natural protected areas
sustainable development goals
sustainable finance

Note: The above skills have a 25.7-40.4% growth rate. Skills are potentially incorporated in between <0.1% and 3.8% of employment. Only “manage visitor flows in natural protected areas” required by more than 0.7% of employment. Ties ranked randomly.

Source: Authors’ calculations based on ESCO and LFS 2020-2022

Conclusions

The O*NET and ESCO systems designate different sets of tasks/skills as green, resulting in different sets of occupations being identified as green in each of the systems. A handful of occupations directly related to environmental protection and to the circular economy emerge as green in both systems. Otherwise, the O*NET system is more likely to result in a green designation for some occupations with technical secondary education requirements, such as some related to construction, mining, and utilities, and others that involve professionals with higher education requirements, such as various managerial and executive occupations, as well as various engineering specializations, and policy and planning roles. The ESCO system, on the other hand, is more likely to designate as green occupations that are related to agriculture and forestry, many of which are described by O*NET as having no green tasks but will grow with the green transition or as having low green task intensity. These occupations tend to have low educational requirements in Egypt, but the green skills that these occupations potentially comprise could be increasingly relevant to the agricultural branch of the technical education system. Other occupations designated as green by the ESCO system involve architectural design, pest control, insulation, and health and environmental inspection, which may require workers with either intermediate or higher education levels.

In terms of green skills, our results highlight the diversity of green skills and tasks that could be incorporated into green occupations. Both comparing O*NET and ESCO and when looking at the top skills within each system, it is apparent that they are highly occupation-specific. Education and economic policy and planning will have to be highly tailored to the needs of different occupations. Furthermore, the results on green skills should be interpreted as skills that could potentially be incorporated into occupations – for instance, ICT jobs could potentially incorporate green computing, but may not yet do so in Egypt.²⁰

One of our most important results is that green occupations in Egypt are growing substantially faster than overall employment. Both the very high and high green task intensity categories have been growing at multiples of the overall employment growth rate and will likely continue to do so as the green transition proceeds. Moreover, even occupations with no green tasks, but designated by O*NET as ones that will grow with the green transition are growing one and half times faster than other occupations with no green tasks that are not relevant to the green transition.

Even though women in Egypt tend to be under-represented in green occupations, especially those designated as such by O*NET, some green occupations have much higher than average shares of female employment, such as information and communications technology sales professionals, policy, administration, and planning professionals, and various kinds of services managers. Occupations related to agriculture, designated as green by ESCO, also have higher than average female shares.

²⁰ For details on green jobs in Egypt based on their use of eco-friendly processes or outputs in the nationally representative Egypt Labor Market Panel Survey 2023 see Abou-Ali & Amer (2024).

Relative to the distribution of all jobs in the Egyptian economy, jobs in green occupations according to O*NET are somewhat over-represented in the industry and agricultural sectors, although nearly a quarter of green jobs are in services. The green occupations that are in the industry sector tend to be occupations requiring technical secondary degrees. The green occupations in services identified by O*NET tend to require higher education degrees. As expected, given ESCO's emphasis on green skills related to agriculture and forestry, the jobs in green occupations as identified by ESCO tend to be predominantly in agriculture.

Given the commitment Egypt laid out in its updated nationally determined contributions to substantially reduce greenhouse gas emissions from its energy and transportation sectors, major efforts will have to be expended in greening the economy. Knowing the employment implications of these greening efforts as well as the jobs and skills that will be needed to achieve the green transition is an essential component in the success of these efforts. This report contributes to this goal by attempting to identify the green occupations in Egypt, their contribution to overall employment, their rate of growth, and their educational, gender, and industrial composition. While this does not directly determine how many jobs will be gained or lost as a result of the green transition, it assists policymakers, education planners, and others concerned with workforce development with the information they need to prepare the next generation of workers. Although this effort depends on U.S. and European databases to assess the greenness of occupations in Egypt, and is therefore subject to assumptions about the similarity of given occupations across these contexts, it provides an important step in this effort until databases similar to O*NET and ESCO can be developed for Egypt.

The rapid growth in green occupations in Egypt that we documented in this report suggests that in the absence of dedicated efforts to train and equip new entrants to the workforce with occupation-specific green skills, skill shortages that can hamper the progress of the green transition can occur. Education and training policy must therefore incorporate these occupation-specific skills into curricula and pedagogy. There will also be need for re-training of existing workers who will lose their jobs in sectors that could be negatively affected by the green transition. Such re-training is critical to achieving a "just transition" where no group of workers bears the brunt of the transition costs. This re-training will require a complex set of policy measures and interventions including re-skilling, upskilling, career guidance, targeted training, and measures that facilitate worker mobility across sectors (ILO, 2019b). Overall, the millions of jobs that can result from the green transition are somewhat conditional on the availability of relevant skills and training and the appropriate policy frameworks to allow worker mobility across sectors.

As an example of what such policy efforts might entail, the European Union has established policies and practices to prepare its future workforce for the green transition. Some of these policies and practices are reviewed in a recent report with examples of inspiring practices in vocational education and training (VET) to support the green transition (European Commission, 2023). One of the first pre-requisites to workforce preparation is to understand, identify and anticipate the skills needed for the green transition, a step to which that this report attempts to contribute. Further steps include

putting in place strategies and funding mechanisms for greening VET. Practices and programs include implementing holistic strategies for greening VET that not only cover upper secondary VET, but also higher-level VET, creating greener VET programs and qualifications, developing green competence standards, and adopting new ways of teaching and learning, including project-based learning. Additional supportive measures include developing the skills of teaching and training staff, developing sectoral and region-specific strategies, offering programs for reskilling and upskilling adults, and fostering links between VET programs with green enterprise development (European Commission, 2023).

The occupational greenness index developed in this report and the greenness task intensity categories associated with it are one step in developing a comprehensive labor market information system in Egypt to support the green transition. Such a system is a pre-requisite to a holistic strategy to prepare the future Egyptian workforce for the green transition as well as assist the existing workforce to adapt to the changes and reallocations that will necessarily accompany the transition.

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Appendix

Table 5. Occupations, Greenness Index per O*NET and ESCO, Percentage of Employment in Occupation, Occupation Employment Growth Rate (Percentage), Percentage of Employment that is Female in Occupation, Percentage of Employment that is less than Secondary, Technical Secondary, or Higher Education in Occupation

<i>ISCO 08 occupation</i>	<i>ISCO 08 code</i>	<i>O-NET greenness index oc.</i>	<i>ESCO greenness index oc.</i>	<i>% of emp. in oc. in Egypt</i>	<i>Occupational emp. growth rate (%) from EOO</i>	<i>% female in oc. in Egypt</i>	<i>% of emp. in oc. less than sec.</i>	<i>% of emp. in oc. tech. sec.</i>	<i>% of emp. in oc. higher ed.</i>
<i>Environmental engineers</i>	2143	1	0.47	0	-5.3				
<i>Refuse sorters</i>	9612	1	0.43	0.297	31	6	79	19	2
<i>Manufacturing managers</i>	1321	0.71	0.09	0.053	-73.7	7	16	31	53
<i>Building frame and related trades workers not elsewhere classified</i>	7119	0.67	0.09	0.019	8.1	0	31	51	18
<i>Environmental protection professionals</i>	2133	0.57	0.48	0.003	7	0			
<i>Cement, stone and other mineral products machine operators</i>	8114	0.57	0.01	0.147	6.3	0	46	48	6
<i>Incinerator and water treatment plant operators</i>	3132	0.57	0.43	0.061	4.1	0	41	51	8
<i>Economists</i>	2631	0.5	0	0.001		0			

<i>Mining supervisors</i>	3121	0.5	0.04	0.002		0			
<i>Building and related electricians</i>	7411	0.5	0.1	0.695	3.9	0	30	58	11
<i>Life science technicians (excluding medical)</i>	3141	0.5	0.18	0.001		0			
<i>Garbage and recycling collectors</i>	9611	0.5	0.62	0.228	31	14	83	15	2
<i>Construction supervisors</i>	3123	0.5	0.06	0.091	3.6	1	8	59	33
<i>Traditional chiefs and heads of village</i>	1113	0.5		0.017		0	34	24	42
<i>Research and development managers</i>	1223	0.44	0.02	0.001	25.9	61			
<i>Commercial sales representatives</i>	3322	0.42	0.15	0.225	29.8	9	6	27	66
<i>Mining managers</i>	1322	0.4	0.08	0.002	-73.7	0			
<i>Professional services managers not elsewhere classified</i>	1349	0.4	0.06	0.049	25.9	11	0	29	71
<i>Services managers not elsewhere classified</i>	1439	0.4	0.07	3.765	25.9	3	59	25	16
<i>Policy and planning managers</i>	1213	0.4	0.1	0.008	25.9	29			
<i>Odd job persons</i>	9622	0.38	0.04	0.113	40.4	2	60	37	2
<i>Technical and medical sales professionals (excluding ICT)</i>	2433	0.37	0.06	0.023	29.8	11	0	5	95
<i>Managing directors and chief executives</i>	1120	0.37	0.05	0.447	-26.8	21	2	39	58
<i>Town and traffic planners</i>	2164	0.36	0.1	0.003	11.4	38			

<i>Sports, recreation and cultural centre managers</i>	1431	0.36	0.01	0.018	25.9	17			
<i>Advertising and public relations managers</i>	1222	0.33	0.01	0.018	25.9	24			
<i>Civil engineers</i>	2142	0.33	0.2	0.295	7.6	9	0	0	100
<i>Senior officials of special-interest organizations</i>	1114	0.33	0	0.002		20			
<i>Policy administration professionals</i>	2422	0.33	0.04	0.004	14.9	43			
<i>Roofers</i>	7121	0.3	0.15	0.019		0			
<i>Mechanical engineers</i>	2144	0.29	0.07	0.178	9.1	6	0	1	99
<i>Information and communications technology sales professionals</i>	2434	0.28	0	0.002	29.8	100			
<i>Senior government officials</i>	1112	0.28	0	0.078		21	0	12	88
<i>Engineering professionals not elsewhere classified</i>	2149	0.28	0.11	0.025	-5.3	16	0	0	100
<i>Building architects</i>	2161	0.27	0.19	0.157	11.4	23	0	0	100
<i>Chemical engineering technicians</i>	3116	0.27	0.15	0.018		7			
<i>Mining and metallurgical technicians</i>	3117	0.26	0.06	0.01		10			
<i>Meteorologists</i>	2112	0.26	0.06	0.002		0			
<i>Landscape architects</i>	2162	0.26	0.26	0	11.4				
<i>Construction managers</i>	1323	0.25	0.13	0.01	3.6	11			
<i>House builders</i>	7111	0.25	0.07	2.181	8.1	0	52	41	7

<i>Business services and administration managers not elsewhere classified</i>	1219	0.25	0.08	0.425	25.9	14	2	31	67
<i>Manufacturing labourers not elsewhere classified</i>	9329	0.25	0.04	0.07		11	29	50	21
<i>Business services agents not elsewhere classified</i>	3339	0.22	0	0.021	14.9	15	17	15	68
<i>Supply, distribution and related managers</i>	1324	0.22	0.02	0.039	25.9	4	2	26	72
<i>Mechanical engineering technicians</i>	3115	0.21	0.03	0.272	9.7	1	8	74	18
<i>Farming, forestry and fisheries advisers</i>	2132	0.21	0.29	0.206	-8.9	9	0	16	84
<i>Public relations professionals</i>	2432	0.21	0.01	0.043	14.9	35	0	9	91
<i>Physical and engineering science technicians not elsewhere classified</i>	3119	0.2	0.06	0.95	-3.4	3	6	76	18
<i>Freight handlers</i>	9333	0.2	0.03	0.018		0			
<i>Geologists and geophysicists</i>	2114	0.19	0.18	0.007		0			
<i>Plumbers and pipe fitters</i>	7126	0.16	0.12	0.547	0.4	0	43	47	10
<i>Electrical engineers</i>	2151	0.16	0.09	0.139	8.8	8	0	2	98
<i>Financial and investment advisers</i>	2412	0.16	0.02	0.001	4	100			
<i>Chemical and physical science technicians</i>	3111	0.14	0.1	0.02		18	7	36	58
<i>Environmental and occupational health inspectors and associates</i>	3257	0.13	0.25	0.146	-0.7	22	2	34	64

<i>Power production plant operators</i>	3131	0.12	0.16	0.012		0			
<i>Management and organization analysts</i>	2421	0.12	0.03	0.006	14.9	34			
<i>Shop keepers</i>	5221	0.11	0	2.075	9.9	10	30	38	32
<i>Retail and wholesale trade managers</i>	1420	0.11	0.03	0.073	9.9	6	5	25	70
<i>Agricultural and industrial machinery mechanics and repairers</i>	7233	0.11	0.04	0.069	51.7	0	45	43	12
<i>Telecommunications engineering technicians</i>	3522	0.1	0	0.021	-2.7	4	4	57	39
<i>Telecommunications engineers</i>	2153	0.1	0	0.106	7.8	21	0	0	100
<i>Electronics engineering technicians</i>	3114	0.1	0.01	0.065	-2.7	9	4	49	48
<i>Sales and marketing managers</i>	1221	0.09	0.03	0.09	25.9	6	1	9	91
<i>Clearing and forwarding agents</i>	3331	0.09	0.01	0.057	2.3	2	2	30	68
<i>Information technology trainers</i>	2356	0.09	0	0.001	13.2	100			
<i>Air conditioning and refrigeration mechanics</i>	7127	0.09	0.11	0.036	51.7	2	54	35	11
<i>Training and staff development professionals</i>	2424	0.09	0.01	0.009	39.6	22			
<i>Electrical engineering technicians</i>	3113	0.09	0.05	0.456	6.8	1	2	81	17
<i>Buyers</i>	3323	0.08	0.03	0.026		5	0	38	62
<i>Translators, interpreters and other linguists</i>	2643	0.07	0	0.036		40	0	0	100

<i>Sheet-metal workers</i>	7213	0.07	0.01	0.199	4.5	0	79	18	3
<i>Financial analysts</i>	2413	0.07	0.03	0.005	14.9	30			
<i>Air traffic safety electronics technicians</i>	3155	0.07	0.05	0.001		0			
<i>Electronics engineers</i>	2152	0.07	0.03	0.109	7.8	15	0	0	100
<i>Aged care services managers</i>	1343	0.06	0	0	25.9	100			
<i>Mechanical machinery assemblers</i>	8211	0.06	0.02	0.076	-11.3	4	28	56	16
<i>Agricultural technicians</i>	3142	0.06	0.19	0.098	21	5	3	76	21
<i>Product graders and testers (excluding foods and beverages)</i>	7543	0.06	0.02	0.001	-0.7	0			
<i>Biologists, botanists, zoologists and related professionals</i>	2131	0.05	0.11	0.002	7	33			
<i>Agricultural and forestry production managers</i>	1311	0.05	0.34	0.002		0			
<i>Aquaculture and fisheries production managers</i>	1312	0.05	0.07	0					
<i>Motor vehicle mechanics and repairers</i>	7231	0.05	0.02	1.05	6.4	0	67	27	5
<i>Trade brokers</i>	3324	0.04	0.01	0.009		0			
<i>Heavy truck and lorry drivers</i>	8332	0.04	0.08	0.08	6.7	0	42	52	6
<i>Philosophers, historians and political scientists</i>	2633	0.04	0	0					

<i>Financial and insurance services branch managers</i>	1346	0.04	0.02	0.006	25.9	29			
<i>Dairy-products makers</i>	7513	0.03	0.05	0.045	-1.1	15	33	49	18
<i>Physicists and astronomers</i>	2111	0.03	0.01	0.001		0			
<i>Legal professionals not elsewhere classified</i>	2619	0.03	0	0.135	5.6	21	1	8	91
<i>Civil engineering technicians</i>	3112	0.03	0.2	0.103	7.4	3	6	37	57
<i>Software and applications developers and analysts not elsewhere classified</i>	2519	0.03	0	0.011	12.1	29			
<i>Chemists</i>	2113	0.03	0.02	0.087	-7.9	34	0	0	100
<i>Building construction labourers</i>	9313	0.02	0.02	0.321	-11.9	2	61	28	11
<i>Database and network professionals not elsewhere classified</i>	2529	0.02	0	0	12.1				
<i>Securities and finance dealers and brokers</i>	3311	0.02	0	0.008		24			
<i>Miners and quarriers</i>	8111	0.02	0.07	0.002		0			
<i>Government social benefits officials</i>	3353	0.02	0.01	0.004		0			
<i>Journalists</i>	2642	0.02	0	0.045	-24.3	35	0	1	99
<i>Customs and border inspectors</i>	3351	0.01	0	0.003		8			
<i>Government licensing officials</i>	3354	0.01	0	0.006		4			

<i>Metal working machine tool setters and operators</i>	7223	0.01	0	0.187	-16.6	0	57	39	4
<i>Stock clerks</i>	4321	0.01	0.09	0.402	5.1	5	10	56	34
<i>Well drillers and borers and related workers</i>	8113	0.01	0.01	0.01		0			
<i>Chemical products plant and machine operators</i>	8131	0.01	0.08	0.182	1.6	16	28	54	18
<i>Electrical and electronic equipment assemblers</i>	8212	0	0.04	0.128	1.2	5	18	74	8
<i>Shop sales assistants</i>	5223	0	0.01	5.792	1.2	20	33	43	25
<i>Sewing machine operators</i>	8153	0	0.01	0.513	-7.4	50	46	44	9
<i>Deep-sea fishery workers</i>	6223	0	0.06	0					
<i>Pet groomers and animal care workers</i>	5164	0	0.07	0	7.2	0			
<i>Office supervisors</i>	3341	0	0	0.006	-25.3	0			
<i>Archivists and curators</i>	2621	0	0	0.003		48			
<i>Fruit, vegetable and related preservers</i>	7514	0	0.07	0.068	22.6	9	36	53	12
<i>Mathematicians, actuaries and statisticians</i>	2120	0	0.01	0.004		47			
<i>Health associate professionals not elsewhere classified</i>	3259	0	0.01	0.001		100			
<i>Air traffic controllers</i>	3154	0	0.01	0.004		17			

<i>Regulatory government associate professionals not elsewhere classified</i>	3359	0	0.1	0.917	-25.3	33	5	48	46
<i>Information and communications technology installers and servicers</i>	7422	0	0.01	0.05	7.6	0	20	42	38
<i>Special needs teachers</i>	2352	0	0	0.019		60	3	10	87
<i>Mobile farm and forestry plant operators</i>	8341	0	0.16	0.141	-5.3	0	62	34	4
<i>Photographic products machine operators</i>	8132	0	0	0.001		0			
<i>Medical secretaries</i>	3344	0	0	0.003	-25.3	100			
<i>Community health workers</i>	3253	0	0	0	-4.2	0			
<i>Industrial and production engineers</i>	2141	0	0.06	0.049	-5.3	8	0	0	100
<i>Earthmoving and related plant operators</i>	8342	0	0.04	0.199	17.5	0	45	45	10
<i>Lifting truck operators</i>	8344	0	0.05	0.017		0			
<i>Electronics mechanics and servicers</i>	7421	0	0.03	0.068	7.6	1	29	40	30
<i>Stall and market salespersons</i>	5211	0	0	0.573	1.2	29	64	29	8
<i>Print finishing and binding workers</i>	7323	0	0	0.002		0			
<i>Legal secretaries</i>	3342	0	0	0.005	7.7	0			
<i>Plastic products machine operators</i>	8142	0	0.02	0.23	6.5	4	41	47	12
<i>Shoemakers and related workers</i>	7536	0	0.09	0.142	-8.1	6	71	24	5
<i>Mining engineers, metallurgists and related professionals</i>	2146	0	0.07	0.04		4	0	0	100

<i>Metal production process controllers</i>	3135	0	0	0	28.8	0			
<i>Software developers</i>	2512	0	0	0.024	12.1	17	0	0	100
<i>Data entry clerks</i>	4132	0	0	0.087	-0.5	28	1	22	77
<i>Teaching professionals not elsewhere classified</i>	2359	0	0	0.127	13.2	57	3	14	82
<i>Optometrists and ophthalmic opticians</i>	2267	0	0	0.001		43			
<i>Social work associate professionals</i>	3412	0	0	0.237		12	34	30	35
<i>Tailors, dressmakers, furriers and hatters</i>	7531	0	0.01	0.446	2.1	25	53	38	9
<i>Structural-metal preparers and erectors</i>	7214	0	0.06	0.009		0			
<i>Sales workers not elsewhere classified</i>	5249	0	0	0.026	1.2	10	48	34	18
<i>Nursing professionals</i>	2221	0	0	0.067	2.7	81	1	13	86
<i>Bakers, pastry-cooks and confectionery makers</i>	7512	0	0.03	0.922	1	5	57	37	6
<i>Health care assistants</i>	5321	0	0	0.011	7.2	68			
<i>Subsistence livestock farmers</i>	6320	0		0					
<i>Travel guides</i>	5113	0	0.3	0.022		2	0	16	84
<i>Scribes and related workers</i>	4414	0		0.001		0			
<i>Manufacturing supervisors</i>	3122	0	0.05	0.169		6	11	45	44
<i>Ships' engineers</i>	3151	0	0.06	0.002		0			
<i>Hand and pedal vehicle drivers</i>	9331	0	0	0.15		0	79	18	2

<i>Musical instrument makers and tuners</i>	7312	0	0.03	0.001		0			
<i>Judges</i>	2612	0	0	0.026		5	0	0	100
<i>Survey and market research interviewers</i>	4227	0	0	0.001	-5.8	100			
<i>Nursing associate professionals</i>	3221	0		1.158	2.7	87	2	55	43
<i>Real estate agents and property managers</i>	3334	0	0.02	0.105	13.7	3	41	24	36
<i>Water and firewood collectors</i>	9624	0		0	40.4				
<i>Beauticians and related workers</i>	5142	0	0.01	0.006	4.8	57			
<i>Glaziers</i>	7125	0	0.03	0.02		0			
<i>Metal finishing, plating and coating machine operators</i>	8122	0	0.02	0.002		0			
<i>Locomotive engine drivers</i>	8311	0	0	0.018		0			
<i>Other arts teachers</i>	2355	0	0	0.002	13.2	60			
<i>Insulation workers</i>	7124	0	0.17	0.023		0	45	47	8
<i>Assemblers not elsewhere classified</i>	8219	0	0.01	0.032	-15.9	3	23	60	17
<i>Forestry and related workers</i>	6210	0	0.56	0.005		0			
<i>Religious professionals</i>	2636	0	0	0.196	1.4	0	2	2	96
<i>Metal moulders and coremakers</i>	7211	0	0	0.011		0			
<i>Coding, proof-reading and related clerks</i>	4413	0	0	0					
<i>Pharmacists</i>	2262	0	0.02	0.307	8.6	60	0	0	100

<i>Midwifery associate professionals</i>	3222	0	0	0	2.7				
<i>Waiters</i>	5131	0	0.01	0.391	-7.8	3	29	47	24
<i>Paper products machine operators</i>	8143	0	0.04	0.116	10.6	8	41	47	11
<i>Hunters and trappers</i>	6224	0	0.36	0.001		0			
<i>Elementary workers not elsewhere classified</i>	9629	0	0.01	0.013	-3.9	0			
<i>Personnel and careers professionals</i>	2423	0	0	0.176	39.6	44	1	43	56
<i>Security guards</i>	5414	0	0	0.93		2	28	54	18
<i>Employment agents and contractors</i>	3333	0	0	0.115	14.6	0	28	43	29
<i>Sociologists, anthropologists and related professionals</i>	2632	0	0.02	0.022		53	0	0	100
<i>Generalist medical practitioners</i>	2211	0	0	0.062	7	44	0	0	100
<i>Mail carriers and sorting clerks</i>	4412	0	0.02	0.075	-1.4	19	7	69	23
<i>Painters and related workers</i>	7131	0	0.22	1.073	2	0	38	52	10
<i>Payroll clerks</i>	4313	0	0	0.003	-5.5	38			
<i>Craft and related workers not elsewhere classified</i>	7549	0		0	3.5				
<i>Shop supervisors</i>	5222	0	0	0.069	1.2	9	4	30	66
<i>Credit and loans officers</i>	3312	0	0.01	0.016		36			
<i>Car, taxi and van drivers</i>	8322	0	0	5.71	3	0	44	47	9

<i>Crop farm labourers</i>	9211	0	0.17	0.053	34.5	13	62	32	6
<i>Weaving and knitting machine operators</i>	8152	0	0	0.531	7	26	41	48	11
<i>Crane, hoist and related plant operators</i>	8343	0	0.01	0.081	-4.8	0	42	51	7
<i>Undertakers and embalmers</i>	5163	0	0.03	0.01		3			
<i>Other language teachers</i>	2353	0	0	0	13.2				
<i>Information and communications technology operations technicians</i>	3511	0	0	0.08	-12.2	7	15	31	54
<i>Primary school teachers</i>	2341	0	0	3.469	0.2	55	0	14	86
<i>Poultry producers</i>	6122	0	0.07	0.129	-18.5	13	43	48	9
<i>Education managers</i>	1345	0	0	0.498	25.9	31	0	10	90
<i>Mixed crop and animal producers</i>	6130	0	0.36	0.073	40.4	46	79	17	3
<i>Handicraft workers in wood, basketry and related materials</i>	7317	0	0.04	0.096	10.3	7	78	22	1
<i>Prison guards</i>	5413	0	0	0.005		29			
<i>Audiologists and speech therapists</i>	2266	0	0	0.006		77			
<i>Telephone switchboard operators</i>	4223	0	0	0.022		5			
<i>Interior designers and decorators</i>	3432	0	0.02	0.012	-2.8	4			
<i>Library clerks</i>	4411	0	0	0.009		35			
<i>Upholsterers and related workers</i>	7534	0	0	0.299	7.6	0	55	36	9
<i>Domestic cleaners and helpers</i>	9111	0	0.03	0.187	8.2	89	84	13	2

<i>Teachers' aides</i>	5312	0	0	0.047	24.9	41	6	51	43
<i>Web and multimedia developers</i>	2513	0	0	0.004	12.1	29			
<i>Riggers and cable splicers</i>	7215	0	0	0.007		0			
<i>Sign writers, decorative painters, engravers and etchers</i>	7316	0	0	0.003		0			
<i>Bus and tram drivers</i>	8331	0	0.01	0.14	9.8	0	47	47	6
<i>Other cleaning workers</i>	9129	0	0.07	0.089	21.2	29	85	14	1
<i>Paramedical practitioners</i>	2240	0		0.056	-4.2	44	3	18	79
<i>Systems administrators</i>	2522	0	0	0	12.1				
<i>Authors and related writers</i>	2641	0	0	0.002	-24.3	0			
<i>Health professionals not elsewhere classified</i>	2269	0	0.01	0					
<i>Cashiers and ticket clerks</i>	5230	0	0	0.006	-19.3	17			
<i>Subsistence fishers, hunters, trappers and gatherers</i>	6340	0		0					
<i>Fast food preparers</i>	9411	0	0.04	0.112	15	10	48	42	10
<i>Web technicians</i>	3514	0	0	0.001	-12.2	40			
<i>Gallery, museum and library technicians</i>	3433	0	0	0	-25.3				
<i>Athletes and sports players</i>	3421	0	0	0.014	11.3	0			
<i>Actors</i>	2655	0	0	0	25.9				

<i>Fibre preparing, spinning and winding machine operators</i>	8151	0	0.01	0.116	-3.9	8	43	48	9
<i>Product and garment designers</i>	2163	0	0.02	0.007	-2.8	74			
<i>Physiotherapists</i>	2264	0	0	0.011		48			
<i>Companions and valets</i>	5162	0	0	0					
<i>Broadcasting and audio-visual technicians</i>	3521	0	0.01	0.005	-2.7	23			
<i>Cabinet-makers and related workers</i>	7522	0	0.04	0.858	5.2	0	58	35	7
<i>Chefs</i>	3434	0	0.1	0.164	15	5	19	51	30
<i>Livestock farm labourers</i>	9212	0	0.04	0.006	34.5	15			
<i>Veterinary technicians and assistants</i>	3240	0	0.05	0.002		0			
<i>Police inspectors and detectives</i>	3355	0	0.01	0.002		0			
<i>Fishery and aquaculture labourers</i>	9216	0	0.02	0.124	3	0	76	22	2
<i>Printers</i>	7322	0	0	0.11	3.7	6	56	39	6
<i>Systems analysts</i>	2511	0	0.01	0.008	12.1	21			
<i>Chemical processing plant controllers</i>	3133	0	0.11	0.012	1.6	0			
<i>Musicians, singers and composers</i>	2652	0	0	0.017		0			
<i>Pelt dressers, tanners and fellmongers</i>	7535	0	0.05	0.019		0			
<i>University and higher education teachers</i>	2310	0	0	0.311	5.3	51	0	0	100
<i>Sewing, embroidery and related workers</i>	7533	0	0.02	0.09	28.8	41	42	44	14

<i>Animal producers not elsewhere classified</i>	6129	0	0.14	0.115	-18.5	68	71	21	8
<i>Concrete placers, concrete finishers and related workers</i>	7114	0	0.02	2.084	1.7	0	55	38	7
<i>Cartographers and surveyors</i>	2165	0	0.03	0.02		29			
<i>Draughtspersons</i>	3118	0	0.03	0.016		13			
<i>Shoemaking and related machine operators</i>	8156	0	0.07	0.07	3	3	48	43	9
<i>Sales demonstrators</i>	5242	0	0	0.515	1.2	5	10	36	54
<i>Dental assistants and therapists</i>	3251	0	0	0.004		85			
<i>Wood processing plant operators</i>	8172	0	0.03	0.101		0	60	32	8
<i>Pharmaceutical technicians and assistants</i>	3213	0	0.02	0.012		5			
<i>Statistical, mathematical and related associate professionals</i>	3314	0	0	0.015		66			
<i>Veterinarians</i>	2250	0	0.12	0.062	14.9	47	0	0	100
<i>Health services managers</i>	1342	0	0	0.012	25.9	44			
<i>Dancers and choreographers</i>	2653	0	0	0					
<i>Mineral and stone processing plant operators</i>	8112	0	0.03	0.017		12			
<i>Dispensing opticians</i>	3254	0	0	0.007		11			

<i>Typists and word processing operators</i>	4131	0	0	0.003		0			
<i>Police officers</i>	5412	0	0	1.319	-1.1	0	24	50	26
<i>General office clerks</i>	4110	0	0	0.297	-5.8	44	4	73	23
<i>Cleaners and helpers in offices, hotels and other establishments</i>	9112	0	0.06	0.908	-5.5	27	67	28	5
<i>Stonemasons, stone cutters, splitters and carvers</i>	7113	0	0.01	0.036	8.1	1	42	55	2
<i>Meter readers and vending-machine collectors</i>	9623	0	0.12	0.159	-1.4	11	2	37	61
<i>Gardeners, horticultural and nursery growers</i>	6113	0	0.29	0.046	-15.3	4	63	35	2
<i>Blacksmiths, hammersmiths and forging press workers</i>	7221	0	0	0.566	3.3	0	54	39	7
<i>Motorcycle drivers</i>	8321	0	0	1.99	-3.9	0	57	38	5
<i>Vehicle cleaners</i>	9122	0	0.09	0.022	21.2	0			
<i>Electrical line installers and repairers</i>	7413	0	0.07	0.023	7.6	0	40	51	9
<i>Valuers and loss assessors</i>	3315	0	0.01	0					
<i>Bricklayers and related workers</i>	7112	0	0.02	3.536	8.1	0	52	42	6
<i>Mining and quarrying labourers</i>	9311	0	0.1	0.03		0	29	54	16
<i>Specialist medical practitioners</i>	2212	0	0	0.342	7	43	0	0	100
<i>Vocational education teachers</i>	2320	0	0.02	0.211	0	35	1	18	81

<i>Film, stage and related directors and producers</i>	2654	0	0	0.018	25.9	17			
<i>Rubber products machine operators</i>	8141	0	0.02	0.019		20			
<i>Social work and counselling professionals</i>	2635	0	0	0.313	-0.3	63	0	1	99
<i>Personnel clerks</i>	4416	0	0	0.023	-5.8	28	2	44	54
<i>Fumigators and other pest and weed controllers</i>	7544	0	0.35	0					
<i>Livestock and dairy producers</i>	6121	0	0.09	0.456	-18.5	66	84	14	2
<i>Hand launderers and pressers</i>	9121	0	0	0.076	-8.5	2	65	33	2
<i>Petroleum and natural gas refining plant operators</i>	3134	0	0.03	0.014	1.6	0			
<i>Cooks</i>	5120	0	0.03	0.427	15	7	34	46	20
<i>Door to door salespersons</i>	5243	0	0	0.189	38.6	2	25	48	27
<i>Metal processing plant operators</i>	8121	0	0.01	0.252	28.8	1	40	49	11
<i>Aircraft engine mechanics and repairers</i>	7232	0	0	0.001		0			
<i>Handicraft workers not elsewhere classified</i>	7319	0	0.03	0.005	10.3	9			
<i>Enquiry clerks</i>	4225	0	0	0.007	6.9	32			
<i>Forestry labourers</i>	9215	0	0.37	0.005		0			
<i>Medical assistants</i>	3256	0	0	0.009	-4.2	57			

<i>Other artistic and cultural associate professionals</i>	3435	0	0	0.01	13.2	6			
<i>Client information workers not elsewhere classified</i>	4229	0	0	0	6.9				
<i>Wood treaters</i>	7521	0	0.05	0					
<i>Personal care workers in health services not elsewhere classified</i>	5329	0	0.03	0.047	7.2	17	9	37	54
<i>Field crop and vegetable growers</i>	6111	0	0.42	6.38	2.9	16	68	27	5
<i>Filing and copying clerks</i>	4415	0	0	1.868		41	3	62	35
<i>Information and communications technology user support technicians</i>	3512	0	0	0.005	-12.2	0			
<i>Production clerks</i>	4322	0	0.04	0		0			
<i>Electrical mechanics and fitters</i>	7412	0	0.07	0.417	-6.1	0	49	43	8
<i>Stationary plant and machine operators not elsewhere classified</i>	8189	0	0.01	0.027	-15.9	7	32	36	32
<i>Computer network and systems technicians</i>	3513	0	0	0.02	-12.2	2			
<i>Laundry machine operators</i>	8157	0	0.01	0.068	-1	8	65	31	4
<i>Process control technicians not elsewhere classified</i>	3139	0	0.04	0.078		9	1	39	60
<i>Applications programmers</i>	2514	0	0	0.047	12.1	17	0	3	97
<i>Underwater divers</i>	7541	0	0.02	0.007		0			

<i>Mixed crop growers</i>	6114	0	0.42	8.921	11.3	15	66	29	5
<i>Traditional and complementary medicine associate professionals</i>	3230	0	0.04	0					
<i>Secondary education teachers</i>	2330	0	0.01	0.777	0	42	0	9	91
<i>Kitchen helpers</i>	9412	0	0.09	0.023	-5.5	6	49	39	12
<i>Inland and coastal waters fishery workers</i>	6222	0	0.04	0.474	9.2	1	80	16	4
<i>Forestry technicians</i>	3143	0	0.23	0	21				
<i>Steam engine and boiler operators</i>	8182	0	0.09	0.002		0			
<i>Subsistence mixed crop and livestock farmers</i>	6330	0		0					
<i>Database designers and administrators</i>	2521	0	0	0.021	12.1	20			
<i>Woodworking-machine tool setters and operators</i>	7523	0	0.03	0.011		0			
<i>Dieticians and nutritionists</i>	2265	0	0.01	0.017		38			
<i>Food and related products machine operators</i>	8160	0	0.05	0.371	1.2	11	43	47	10
<i>Environmental and occupational health and hygiene professionals</i>	2263	0	0.16	0	-0.7				
<i>Accounting and bookkeeping clerks</i>	4311	0	0	0.183	-5.5	29	2	57	41
<i>Midwifery professionals</i>	2222	0	0	0	2.7	100			

<i>Butchers, fishmongers and related food preparers</i>	7511	0	0.07	0.22	8.4	6	54	31	16
<i>Home-based personal care workers</i>	5322	0	0	0.008		90			
<i>Welders and flamecutters</i>	7212	0	0	0.241	4.8	0	42	51	7
<i>Personal services workers not elsewhere classified</i>	5169	0	0	0.002		0			
<i>Railway brake, signal and switch operators</i>	8312	0	0	0.025		0	59	34	7
<i>Psychologists</i>	2634	0	0	0.032	5.7	72	0	0	100
<i>Clerical support workers not elsewhere classified</i>	4419	0	0	0.772	-5.8	20	6	38	56
<i>Precision-instrument makers and repairers</i>	7311	0	0.02	0.016		0			
<i>Receptionists (general)</i>	4226	0	0.01	0.158	6.9	54	7	47	46
<i>Spray painters and varnishers</i>	7132	0	0.04	0.571	2.3	0	64	30	6
<i>Cleaning and housekeeping supervisors in offices, hotels and other establishments</i>	5151	0	0	0.053	6.1	19	3	60	37
<i>Medical records and health information technicians</i>	3252	0	0	0.02		42			
<i>Shelf fillers</i>	9334	0	0	0					
<i>Ambulance workers</i>	3258	0	0	0.004	7.2	0			

<i>Information and communications technology service managers</i>	1330	0	0.02	0.01	25.9	20			
<i>Packing, bottling and labelling machine operators</i>	8183	0	0.08	0.13	-15.9	32	43	49	8
<i>Hairdressers</i>	5141	0	0	0.559	4.8	11	55	38	7
<i>Food service counter attendants</i>	5246	0	0.03	0.117	1.2	10	46	41	13
<i>Contact centre salespersons</i>	5244	0	0	0.046	38.6	59	9	11	80
<i>Food and beverage tasters and graders</i>	7515	0	0.03	0.111	-1.1	11	33	48	19
<i>Accountants</i>	2411	0	0	2.048	4	16	0	7	93
<i>Glass makers, cutters, grinders and finishers</i>	7315	0	0.03	0.089	3.5	2	41	48	11
<i>Insurance representatives</i>	3321	0	0	0.012		55			
<i>Hand packers</i>	9321	0	0.02	0.011		44			
<i>Statistical, finance and insurance clerks</i>	4312	0	0	0.029		20	0	60	40
<i>Pre-press technicians</i>	7321	0	0	0.007	3.7	15			
<i>Apjarists and sericulturists</i>	6123	0	0.14	0.005	-18.5	0			
<i>Transport clerks</i>	4323	0	0.04	0.014		3			
<i>Accounting associate professionals</i>	3313	0	0	0.002		0			
<i>Window cleaners</i>	9123	0	0.08	0	21.2				
<i>Transport conductors</i>	5112	0	0	0.055	0.8	1	15	68	17

<i>Potters and related workers</i>	7314	0	0	0.232	-16.8	1	51	40	8
<i>Fitness and recreation instructors and program leaders</i>	3423	0	0.07	0.011	11.3	0			
<i>Domestic housekeepers</i>	5152	0	0.09	0.004	6.1	100			
<i>Bookmakers, croupiers and related gaming workers</i>	4212	0	0	0					
<i>Chemical engineers</i>	2145	0	0.08	0.02		15	0	0	100
<i>Restaurant managers</i>	1412	0	0.14	0.034	-45.9	3	7	21	71
<i>Garment and related pattern-makers and cutters</i>	7532	0	0.03	0.008		21			
<i>Mixed crop and livestock farm labourers</i>	9213	0	0.47	0	34.5				
<i>Hotel receptionists</i>	4224	0	0	0.03	6.9	20	2	27	70
<i>Glass and ceramics plant operators</i>	8181	0	0.05	0.021		5	24	47	28
<i>Visual artists</i>	2651	0	0	0.01		19			
<i>Photographers</i>	3431	0	0.01	0.061	-2.7	5	13	49	38
<i>Lawyers</i>	2611	0	0.04	0.771	5.5	16	0	0	100
<i>Social welfare managers</i>	1344	0	0.01	0.004	25.9	23			
<i>Fire-fighters</i>	5411	0	0.11	0.016		0			
<i>Aircraft pilots and related associate professionals</i>	3153	0	0.03	0.004		0			
<i>Aquaculture workers</i>	6221	0	0.06	0.012		0			

<i>Dentists</i>	2261	0	0	0.141	6.9	45	1	0	99
<i>Announcers on radio, television and other media</i>	2656	0	0	0.022		52	6	0	94
<i>Carpenters and joiners</i>	7115	0	0.07	1.305	-1	0	61	34	4
<i>Conference and event planners</i>	3332	0	0.04	0.01	-25.3	0			
<i>Child care workers</i>	5311	0	0.02	0.073	24.9	93	43	38	19
<i>Bank tellers and related clerks</i>	4211	0	0.01	0.132	-19.3	24	1	35	64
<i>Protective services workers not elsewhere classified</i>	5419	0	0.08	0.003		0			
<i>Street food salespersons</i>	5212	0	0	1.44	11.8	23	72	23	5
<i>Sports coaches, instructors and officials</i>	3422	0	0	0.089	11.3	7	11	26	63
<i>Government tax and excise officials</i>	3352	0	0	0.096	-1.6	27	0	7	93
<i>Handicraft workers in textile, leather and related materials</i>	7318	0	0.05	0.036	-14.2	13	38	52	9
<i>Street vendors (excluding food)</i>	9520	0	0	0.905	-0.8	10	59	32	9
<i>Human resource managers</i>	1212	0	0.04	0.024	25.9	17	0	9	91
<i>Metal polishers, wheel grinders and tool sharpeners</i>	7224	0	0	0.005		22			
<i>Physiotherapy technicians and assistants</i>	3255	0	0	0.007		28			
<i>Tobacco preparers and tobacco products makers</i>	7516	0	0.01	0.011		0			


<i>Early childhood educators</i>	2342	0	0	0.328	-3	99	2	20	78
<i>Finance managers</i>	1211	0	0.02	0.113	25.9	21	1	11	87
<i>Shotfirers and blasters</i>	7542	0	0.05	0.001		0			
<i>Traditional and complementary medicine professionals</i>	2230	0	0	0					
<i>Computer network professionals</i>	2523	0	0	0	12.1				
<i>Toolmakers and related workers</i>	7222	0	0.02	0.061	-5	1	41	46	13
<i>Driving instructors</i>	5165	0	0.02	0	13.2				
<i>Tree and shrub crop growers</i>	6112	0	0.33	0.07	-31.4	9	58	38	5
<i>Subsistence crop farmers</i>	6310	0		0.005		16			
<i>Police inspectors and detectives</i>	3411	0	0	0.039	7.7	23	12	56	31
<i>Ships' deck officers and pilots</i>	3152	0	0.05	0.023		0	2	4	94
<i>Contact centre information clerks</i>	4222	0	0	0.147	6.9	35	0	14	86
<i>Bicycle and related repairers</i>	7234	0	0.02	0.026	6.4	0	77	19	4
<i>Messengers, package deliverers and luggage porters</i>	9621	0	0	0.984	-3.9	1	62	33	5
<i>Plasterers</i>	7123	0	0.02	0.041		0	39	48	13
<i>Librarians and related information professionals</i>	2622	0	0	0.083	-2.7	57	0	17	83
<i>Other music teachers</i>	2354	0	0	0.002	13.2	21			

<i>Education methods specialists</i>	2351	0	0	0.055	-51.2	53	0	47	53
<i>Travel attendants and travel stewards</i>	5111	0	0.03	0.017		21			
<i>Jewellery and precious-metal workers</i>	7313	0	0	0.019		4			
<i>Fashion and other models</i>	5241	0	0	0					
<i>Medical imaging and therapeutic equipment technicians</i>	3211	0	0.01	0.066	6.1	39	0	2	98
<i>Travel consultants and clerks</i>	4221	0	0.08	0.01		22			
<i>Medical and pathology laboratory technicians</i>	3212	0	0.02	0.104		53	0	11	89
<i>Hotel managers</i>	1411	0	0.1	0.016	-45.9	8			
<i>Bleaching, dyeing and fabric cleaning machine operators</i>	8154	0	0.06	0.033	-1	2	28	63	9
<i>Building caretakers</i>	5153	0	0.02	2.029	11.8	12	73	23	4
<i>Bartenders</i>	5132	0	0	0.788	-7.8	1	56	35	9
<i>Pulp and papermaking plant operators</i>	8171	0	0.14	0.014		3			
<i>Civil engineering labourers</i>	9312	0	0.05	0.007		0			
<i>Floor layers and tile setters</i>	7122	0	0.03	0.536	0.6	0	42	49	9
<i>Child care services managers</i>	1341	0	0.01	0.01	25.9	88			
<i>Medical and dental prosthetic technicians</i>	3214	0	0	0.005		13			
<i>Debt-collectors and related workers</i>	4214	0	0	0.14		3	7	61	32

<i>Garden and horticultural labourers</i>	9214	0	0.31	0.004	34.5	31			
<i>Ships' deck crews and related workers</i>	8350	0	0.03	0.039	-13.2	0	25	45	30
<i>Secretaries (general)</i>	4120	0	0	0.302	-25.3	63	4	57	40
<i>Service station attendants</i>	5245	0	0.02	0.098	1.2	1	24	59	17
<i>Graphic and multimedia designers</i>	2166	0	0	0.04	-2.8	32	1	10	89
<i>Administrative and executive secretaries</i>	3343	0	0	0.319	-25.3	48	2	71	27
<i>Advertising and marketing professionals</i>	2431	0	0.01	0.026	14.9	35	0	10	90
<i>Non-commissioned armed forces officers</i>	210		0	0					
<i>Armed forces occupations, other ranks</i>	310		0	0					
<i>Astrologers, fortune-tellers and related workers</i>	5161		0	0					
<i>Creative and performing artists not elsewhere classified</i>	2659		0.02	0					
<i>Commissioned armed forces officers</i>	110		0	0					

Source: Source: Authors' calculations based on O*NET, ESCO and LFS 2020-2022

Notes: Missing if insufficient sample to calculate



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Im Auftrag des



Bundesministerium für
wirtschaftliche Zusammenarbeit
und Entwicklung