

# Analyzing Labor Market Shifts in the Transition to Green Jobs: Mapping Egypt's Green Jobs

Hala Abou-Ali and Mona Amer



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Hala Abou-Ali<sup>1</sup> and Mona Amer<sup>2</sup>

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**Send correspondence to:**

Hala Abou-Ali  
Cairo University  
[habouali@feps.edu.eg](mailto:habouali@feps.edu.eg)

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<sup>1</sup> Professor of Economics, Faculty of Economics and Political Sciences, Cairo University. Research Fellow at the Economic Research Forum.

<sup>2</sup> Lecturer, Faculty of Economics and Political Sciences, Cairo University. Email: mona.amer@feps.edu.eg.

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## Abstract

The global shift toward green economies underscores the need to better understand and measure the labor market changes driven by the low-carbon transition. This paper explores the characteristics of Egypt's labor market in light of the escalating importance of sustainable development, focusing on the composition and differentiation of green jobs compared to non-green jobs. It addresses the scarcity of studies on green jobs in Egypt by leveraging Egyptian Labor Market Panel Survey (ELMPS) data and applying the International Labour Organization's (ILO) definition to identify and categorize these jobs. Using newly incorporated ELMPS 2023 questions on job characteristics tied to environmentally friendly practices, this analysis differentiates jobs based on their degree of greenness, i.e., whether they focus on eco-friendly processes, both processes and output, or output alone. It also assesses the extent of greenness by examining the number of environmental aspects associated with each job. The paper further explores the distribution of green jobs across economic activity, occupation, employment status, gender, education, and age groups while comparing the attractiveness of green and non-green jobs in terms of wages, social benefits, and job stability. Finally, it analyzes the potential for expanding green jobs by examining skill requirements and educational trends.

**Keywords:** Green jobs, Labor Market, Sustainable development, Job quality, Gender, Egypt.  
**JEL Classifications:** J21, J24, J16, J81, Q56, O15.

## ملخص

يؤكد التحول العالمي نحو الاقتصادات الخضراء على الحاجة إلى وجود فهم وقياس أفضل لتغيرات سوق العمل، مدفوعة بالتحول منخفض الكربون. تستكشف هذه الورقة خصائص سوق العمل في مصر في ضوء الأهمية المتزايدة للتنمية المستدامة، مع التركيز على تكوين وتمييز الوظائف الخضراء مقارنة بالوظائف غير الخضراء. وهو يعالج ندرة الدراسات حول الوظائف الخضراء في مصر من خلال الاستفادة من بيانات المسح التتبعي لسوق العمل في مصر (ELMPS) وتطبيق تعريف منظمة العمل الدولية (ILO) لتحديد وتصنيف هذه الوظائف. باستخدام أسئلة المسح المدمجة حديثاً حول الخصائص الوظيفية المرتبطة بالممارسات الصديقة للبيئة، يميز هذا التحليل الوظائف بناءً على درجة خضرتها، أي ما إذا كانت تركز على العمليات الصديقة للبيئة، سواء العمليات أو المخرجات، أو المخرجات وحدها. كما أنه يقيم مدى الخضرة من خلال فحص عدد الجوانب البيئية المرتبطة بكل وظيفة. تستكشف الورقة أيضًا توزيع الوظائف الخضراء عبر النشاط الاقتصادي والمهنة وحالة التوظيف والجنس والتعليم والفئات العمرية مع مقارنة جاذبية الوظائف الخضراء وغير الخضراء من حيث الأجور والمزايا الاجتماعية والاستقرار الوظيفي. أخيرًا، تحلل هذه الورقة إمكانية توسيع الوظائف الخضراء من خلال دراسة متطلبات المهارات والاتجاهات التعليمية.

## **1. Introduction**

The concept of the green economy has attracted significant global attention as economies shift toward sustainable and low-carbon development. Central to this transition is renewable energy, which offers a sustainable alternative to traditional sources like oil and gas. However, the impact of green energy goes beyond the energy sector, influencing job markets across various industries. The rise of green jobs, which prioritize environmental sustainability and decent work, presents both opportunities and challenges, particularly in terms of skill requirements, job quality, and sectoral shifts.

The green transition is expected to generate new employment opportunities, particularly for workers equipped with the appropriate skills and for investments in renewable and climate-friendly technologies. However, workers currently employed in fossil fuel-dependent industries, as well as the communities they live in, may not be equally positioned to benefit from these changes due to geographic, financial, educational, and skill-related disadvantages. Policymakers have recognized the need for a “just transition” that leaves no one behind. To support this transition and mitigate potential labor shortages, policies are required to help workers access green jobs and develop the necessary skills. In addition, policies should focus on supporting workers at a greater risk of job loss, facilitating their transition into new roles to avoid long-term unemployment and its associated economic and social consequences (Causa et al., 2024; Kubursi and Abou-Ali, 2024).

While much of the existing literature focuses on the relationship between sectoral employment shifts and the greening of the economy (Kahn and Mansur, 2013; Hartley et al., 2015; Hanson, 2023), this paper adopts a more nuanced approach by examining the environmental properties of jobs across various sectors (Bluedorn et al., 2023).

This paper addresses the limited research on green jobs in Egypt by utilizing the Egyptian Labor Market Panel Survey (ELMPS) and applying the International Labour Organization’s (ILO) framework for defining and categorizing green jobs across sectors. It leverages newly added ELMPS 2023 questions on job characteristics related to green practices to analyze the share of green jobs and their distribution by economic activity, occupation, gender, education, and age group. The paper also compares green and non-green jobs in terms of wages, benefits, and job stability. Lastly, it explores the potential for expanding green jobs by analyzing skill requirements and educational trends using data from various ELMPS waves since 2006. We aim to answer three key questions: (1) How green is Egypt’s labor market? (2) What are the environmental properties of jobs, and how do they vary across sectors? (3) How are green jobs associated with demographic factors like education and earnings?

### ***1.1. Introduction to the concept of the green economy***

Renewable energy is defined as energy collected from renewable sources that are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal

heat (Ellabban, Abu-Rub, and Blaabjerg 2014). The adoption of renewable energy can displace employment in the traditional energy sector (Bowen, Kuralbayeva, and Tipoe, 2018). However, the effect of renewable energy extends beyond the energy sector's employment. The energy transition is the essence of the green transition for the whole economy, and hence can have a wide impact on the "greenness" of all jobs across different sectors (ILO, 2018a). Green energy adoption has direct, indirect, and induced effects on employment. Direct increased employment effects are the jobs created due to the increased capacity of renewable energy, while indirect increased employment effects are created in industries supporting the expansion of renewable energy. Green expansion can also have a multiplier effect where increased employment in this sector can increase or decrease expenditures for consumption in other sectors, resulting in what is called an induced employment effect. This induced employment can be positive or negative (Meyer and Sommer, 2016).

The term "green jobs" refers to direct and indirect employment that reduces the environmental impact of economic activities in all sectors, ultimately bringing it down to sustainable levels. These jobs are more environmentally sustainable than their conventional alternative (Hosseini, 2020). A job is determined "green" depending on which industry it belongs to. For example, a secretary might be considered a green worker if employed in a firm in the renewable energy sector, but non-green if working in a non-green industry (Bowen, Kuralbayeva, and Tipoe, 2018).

The definition of "green jobs" also captures measures of job quality and decent work that help reduce the consumption of energy and raw materials, thereby de-carbonizing the economy as well as protecting and restoring ecosystems (Besley and Persson, 2023). Decent work under the greenness definition includes concepts such as employment opportunities, adequate earnings and productive work, fair and equal treatment in employment, decent working hours, a fair balance of work and family life, a safe working environment, stability and security of work, social protection, and social dialogue (Pearse and Bryant, 2022). Given this broad definition, green job assessments in the developing world can produce results that do not necessarily correspond to those in the developed world as skills, productivity levels, and the definition of "quality jobs" differs by country.

### ***1.2 Reviewing concepts, methodologies, and measurements for assessing green versus non-green jobs***

Assessing job greenness is largely dependent on the methodology chosen. Several factors, including country-specific contexts, influence the estimation of green jobs. In a free market and in the absence of any political and economic interventions, renewable energy should only take over the conventional energy sector if it is relatively cheaper (von der Ploeg and Rezai, 2019). However, many governments and international institutions are pushing heavily for the adoption of renewable energy through different policies, including taxing the non-renewable energy sector and enhancing investments in the green sector (Sern, Zaime, and Foong, 2018). By increasing the price of fossil fuel energy, governments may reduce populations' purchasing power and demand in the other sectors, driving down job demand and the number of employees

in these sectors (Elum and Momodu, 2017). Consequently, when measuring and forecasting the impact of renewable energy on employment, estimates must take into consideration the potential political agenda and measures aiming at adopting green technology, even at a higher cost. Enhancing investments in the green sector can also negatively affect investments in other conventional sectors (Bowen, 2011).

Although the literature on green jobs is expanding, skill needs are still not heavily explored. There are generally two types of skills demanded by employers: technical and generic skills (Sern, Zaime, and Foong, 2018). Technical skills are likely to be industry-specific, while generic skills can be used in any industry. The idea of “green skills” is still disputed in the literature. Fankhauser et al. (2008) note that there is little information on the productivity and attributes of the jobs created through renewable energy adoption. The European Centre for the Development of Vocational Training (CEDEFOP, 2010) indicates that there is relatively little information on the job skills and training required for employment in green technologies and industries. Lamo et al. (2011) find that job-specific skills make it difficult for workers to respond to sector demand shifts. Accordingly, more specialized workers may require a more costly and lengthy re-training to integrate them into new jobs. Martinez-Fernandez and Hinojosa (2010) argue that green jobs will combine traditional and new skills, suggesting a conversion of knowledge. Consoli et al. (2016) build on data for 905 occupations based on the O\*Net taxonomy to identify two subsets of occupations (green and non-green) with similar occupational characteristics. The main findings are that green occupations are relatively more likely to require a stronger intensity of high-level cognitive skills. For occupations that are changing in terms of the skill content as they become greener, requirements usually include more formal education, work experience, and on-the-job training.

Thus, it is still not clear whether green skills represent a completely new set of skills attributed to the knowledge of sustainable technologies, or whether the already existing skills can be re-directed and topped up with the knowledge of green technology. Shortages of skilled labor could put the brakes on green expansion. Therefore, it is important to prepare the workforce to ensure that green industries do not face expansion blockages due to shortages of adequately skilled workers.

In this paper, we explore the green jobs profile in Egypt, analyzing its scope, attractiveness, and potential for expansion. The findings highlight the country’s progress and challenges in developing a sustainable green economy. Disparities between the public and private sectors are evident, particularly in the benefits and opportunities available to workers. The public sector leads in offering better employment benefits and supporting broader sustainability initiatives, while the private sector focuses more on single-dimensional green activities. Key sectors, such as agriculture and manufacturing, have substantial involvement in green jobs, yet these jobs often address only one green aspect. Expanding multi-dimensional green employment is crucial to fostering sustainable economic growth. The paper also underscores the importance of educational qualifications in accessing green jobs. Addressing educational mismatches and

promoting gender equity in green jobs is vital for enabling Egypt's green economy to reach its full potential.

The remainder of the paper is organized as follows. Section 2 profiles green jobs in Egypt, documenting their incidence and distribution. Section 3 discusses the potential expansion of green jobs, comparing the attractiveness of green jobs versus non-green jobs. Section 4 examines how environmental policies can support green job growth and how these policies interact with labor market structures. Section 5 concludes.

## **2. Profile of green jobs in Egypt**

The green transition will require coherent policies based on strong interrelationships between environmental factors, policies, and labor market dynamics. Across the world, governmental and non-governmental organizations are envisioning large-scale green job creation as an integral part of their development agenda, and Egypt is no exception. The green transition needs collaborative action and cooperation of different actors. While governments are the most important actors in the green transition, non-governmental organizations (NGOs) also assume a very important role in this process. The involvement of NGOs provides societal access to climate information and ensures that vulnerable populations can participate in climate change negotiations. Hence, NGOs play an important role in the formulation, institutional capacity, and interaction with vulnerable populations (Youssef, 2021). On the other hand, the private sector is critical to driving green investment and sustainable development. The private sector is planned to provide 75 percent of the investments, supplementing public sector financing (AfDB, 2018). This necessitates novel techniques for attracting and steering capital flows in accordance with the decarbonization and climate-resilient development trajectory (Bezzeccheri et al., 2024).

In Egypt, many steps and initiatives are being put in place to accelerate the green transition process. The climate change strategy recognizes the agriculture sector as a key contributor to CO<sub>2</sub> emissions. Accordingly, a strategy has been set to raise awareness of the importance of water and irrigation infrastructure. This strategy also advocates for urban and vertical agriculture as a measure to reduce water waste and enhance climate change mitigation (IRENA, 2018). In addition, there are many initiatives focusing on enhancing green labor skills through education. Some tailored training programs have been implemented to address the shortage of green skills. In 2018, a series of training programs were introduced by the Productivity and Vocational Training Authority (PVTDA) focusing on solar energy generation (Barsoum and Mohamed, 2023). Likewise, the Ministry of Education and Technical Education (MoETE) is planning to establish the sectoral center of competencies, with a sectoral focus on providing educational services on renewable energy to the Technical and Vocational Education and Training (TVET) system (Barsoum and Mohamed, 2023). However, the linkage between education and enterprises remains fragmented, this could be due to the absence of coordination between the formal education system and the labor market (ILO, 2018b).



Using the Delphi method of consultation with experts in conjunction with Labor Force Survey Data from 2017-21, Barsoum and Mohamed (2023) explore the number of jobs likely gained by virtue of the green transition in manufacturing, agriculture, accommodation, food services, and transportation and storage activities. The authors argue that all sectors are expected to witness a slight increase in employment in all the mentioned sectors, except for the transportation sector. They also argue that there will be a slight decline in the mining and quarrying sectors.

The ELMPS 2023 incorporates a refined approach to identifying green jobs, focusing on both the production and use of environmental goods and services across various sectors. This paper adopts the ILO's framework to define and categorize green jobs, ensuring consistency in how green employment is measured and understood in the context of Egypt's labor market (Castillo, 2023). According to the ELMPS 2023, individuals are classified as holding green jobs if they either produce or use environmental goods and services. The categories and definitions used in this study—aligning with the ELMPS 2023 questions that follow the ILO's methodology—include activities in sectors such as:

1. Renewable energy production such as solar, wind, and hydropower.
2. Energy-efficient goods and technologies, encompassing a range of LED lighting, energy-saving appliances, and the like.
3. Water-efficient goods and technologies deploying methods such as water recycling systems or efficient irrigation.
4. Recycling and resource reuse, such as waste management and material recovery.
5. Sustainable agriculture, fisheries, or forestry, including activities such as organic farming and reforestation.
6. Pollution prevention, reduction, and removal; reduction of air pollution via emissions control; or clean air technologies.
7. Environmental protection and conservation, encompassing activities such as biodiversity protection and habitat restoration.
8. Environmental compliance, education, and awareness if the job uses environmental law or offers public education.
9. Research, planning, maintenance, and control of environmental technologies (e.g., innovation in green technologies, environmental monitoring...etc.).
10. Any other environmental technologies and practices or goods and services.

These sectors represent a broad scope of green activities, allowing the survey to capture employment linked to environmental sustainability and categorize them as green jobs.

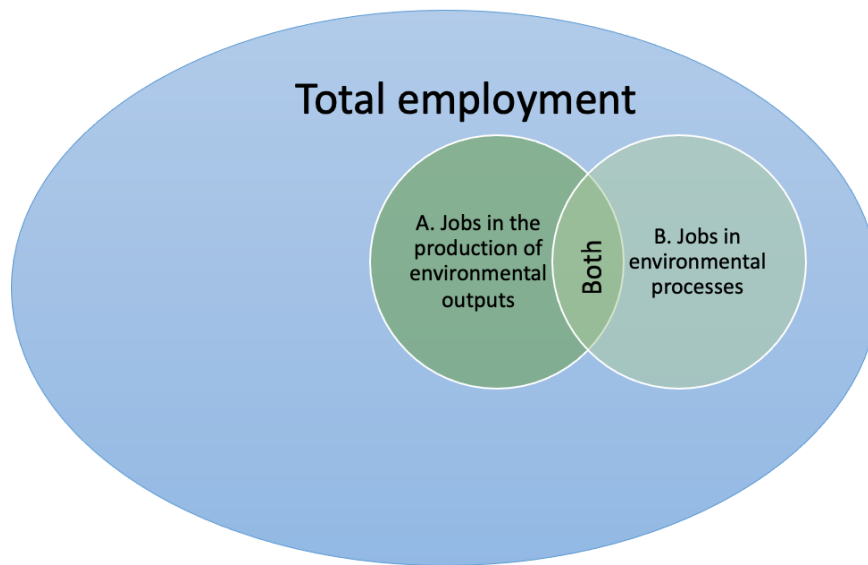
Green jobs, as defined in this study, are split into two primary categories. The first category is employment in the Production of Environmental Outputs (jobs producing environmental goods and services), which refers to jobs involved in the creation of environmental goods and services for consumption outside the producing unit. These roles may exist in specialized industries such as renewable energy firms or clean transportation technologies, or in non-specialized

economic units that produce environmental outputs alongside other goods and services. An example of such activities is a manufacturing firm producing solar panels for external markets. Its workers would be classified under this category as they are directly involved in producing environmental outputs. The second category is employment in environmental processes (jobs contributing to greener processes), which includes jobs where workers use sustainable practices, technologies, or methods to improve the environmental performance of their economic unit, regardless of the unit's primary output. These jobs involve adopting or implementing practices that reduce environmental impacts within the workplace, such as reducing energy or water use, minimizing waste, or developing more sustainable production processes. A factory worker tasked with implementing energy-saving technologies to reduce the factory's carbon footprint, even if the factory itself produces non-environmental goods, would be considered employed in an environmental process. This dual categorization allows us to capture not only jobs that produce green outputs but also those that use green practices internally to promote sustainability.

The relationship between green jobs involved in “output” and “process” is best visualized as intersecting circles (Figure 1). Circle A represents jobs in the production of environmental outputs, while circle B represents jobs involved in environmental processes. The intersection of these circles represents jobs that contribute to both environmental outputs and processes. This approach emphasizes that green jobs can either directly contribute to producing environmental goods or focus on making production more sustainable. For the purposes of this paper, the scope of "green jobs" encompasses both types of employment, i.e., those in environmental outputs and those involved in environmental processes. All figures and analyses provided in this paper adhere to this definition unless explicitly stated otherwise. Additionally, the terms “green jobs” and “green activities” are used interchangeably and refer to the same concept.

The ILO provides a global framework for defining green jobs, but it is important to note that country-specific factors such as skill levels, productivity, and job quality can affect how green jobs are measured and classified. In developing countries like Egypt, green job assessments may yield different outcomes compared to developed countries due to variations in labor market structures, educational attainment, and sectoral distributions. The ELMPS 2023 seeks to capture these distinctions by incorporating local contexts into its green job categorization and analysis. This paper adopts a robust definition of green jobs, as outlined by the ILO and operationalized through the ELMPS 2023. Green jobs are defined as those that either produce environmental goods and services, improve environmental sustainability in production processes, or both. These jobs span a variety of sectors and industries, contributing to a greener economy in both direct and indirect ways. The analysis in this section uses this framework to assess the incidence and distribution, with a particular focus on their social and economic characteristics.

**Figure 1. Visualizing the share of green jobs in total employment**



### *2.1. Overview of the green jobs landscape in Egypt*

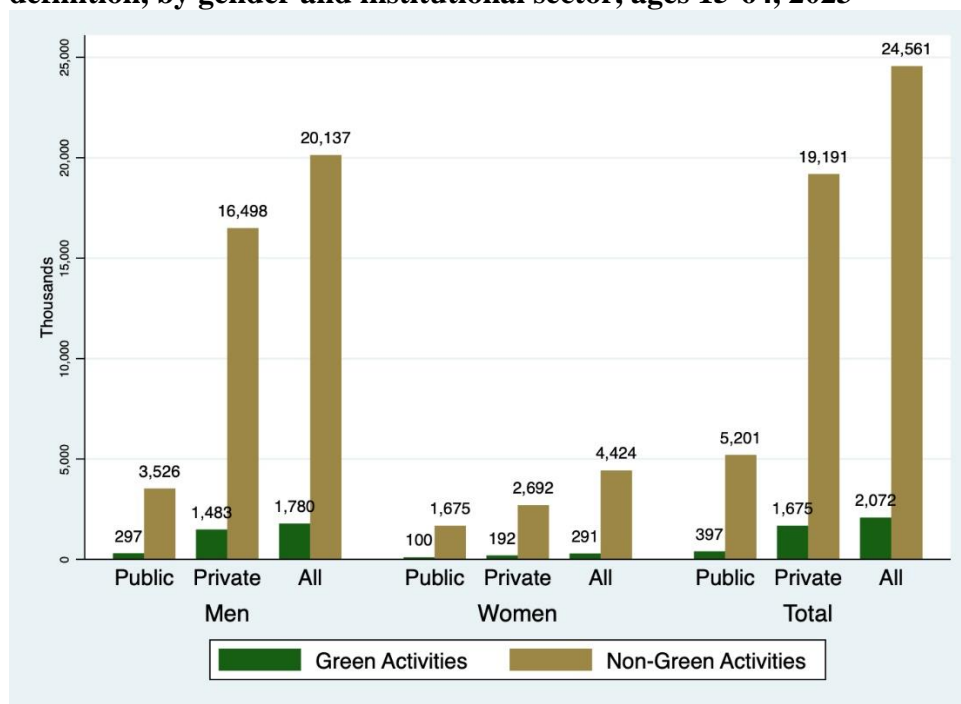
Figure 2 illustrates differences in the prevalence of green jobs by gender and institutional sector according to the ELMPS 2023. Of around 26.63 million employed individuals in Egypt, approximately 2.07 million are engaged in green activities. The majority of these workers (1.675 million) are employed in the private sector, while only 397,000 are in the public sector. Gender disparities are also significant, with men holding 1.780 million of these green jobs compared to just 291,000 for women. This highlights a substantial gender gap in green activities, as well as a strong concentration of green activities within the private sector, where men dominate the workforce. Although the private sector leads in green job creation, the under-representation of women is universal.

The share of green activities within Egypt’s total employment is relatively small, accounting for just 7.8 percent (Figure 3). However, significant disparities exist across both gender and institutional sector of employment. The proportion of green jobs is slightly higher in the private sector (eight percent) compared to the public sector (7.1 percent). The most pronounced disparities are along gender lines. Among employed men, the share of green activities is much higher (amounting to 8.1 percent), while for employed women, it is only 6.2 percent. Interestingly, the gender gap is even more pronounced within the public sector, where the disparity between men and women engaged in green activities is larger than in the private sector. This highlights a greater gender inequality in access to green jobs due to disparities in economic activities, where men hold a significantly higher share of jobs.

As previously mentioned, this paper adopts the market definition of employment, referring to economic activities performed for the purpose of pay or profit. We focus on labor force individuals aged 15-64, in line with standard ILO statistics. The analyses of green activities encompass two categories of employment, namely “output” and “process.” “Output” refers to jobs involved in the production of environmentally friendly goods and services, and “process”

includes jobs focused on reducing environmental harm. Figure 4 illustrates the distribution of these green activities in 2023, classified by “output only,” “process only,” or both “process and output” across gender and institutional sector (public versus private). The distribution pattern of green activities reveals several important gender disparities and sectoral differences. For instance, "process only" roles are slightly more prevalent in the public sector compared to the private sector, accounting for 39.6 percent of green activities in the public sector versus 34.2 percent for the private sector. Conversely, the private sector is more focused on “output” related jobs than the public sector, with 23.8 percent of green activities in the private sector being classified as “output only” compared to just 14.5 percent in the public sector. The difference is likely influenced by the importance of agriculture as a more pronounced activity in the private sector. The public and private sectors, however, show an important emphasis on jobs that combine both “process and output” aspects, reflecting the efforts of firms to integrate sustainability across their operations. In the public sector, green activities are more oriented toward "process and output" (45.9 percent) compared to the private sector (42.1 percent). There are also significant gender-based differences in the distribution of green activities within the public and private sectors. For example, men in both sectors tend to be more involved in "output only" jobs compared to women. In the private sector, 24.3 percent of green activities performed by men fall under "output only,” compared to 19.5 percent of those performed by women.

**Figure 2. Size of employed in green and non-green activities (in thousands), market definition, by gender and institutional sector, ages 15-64, 2023**

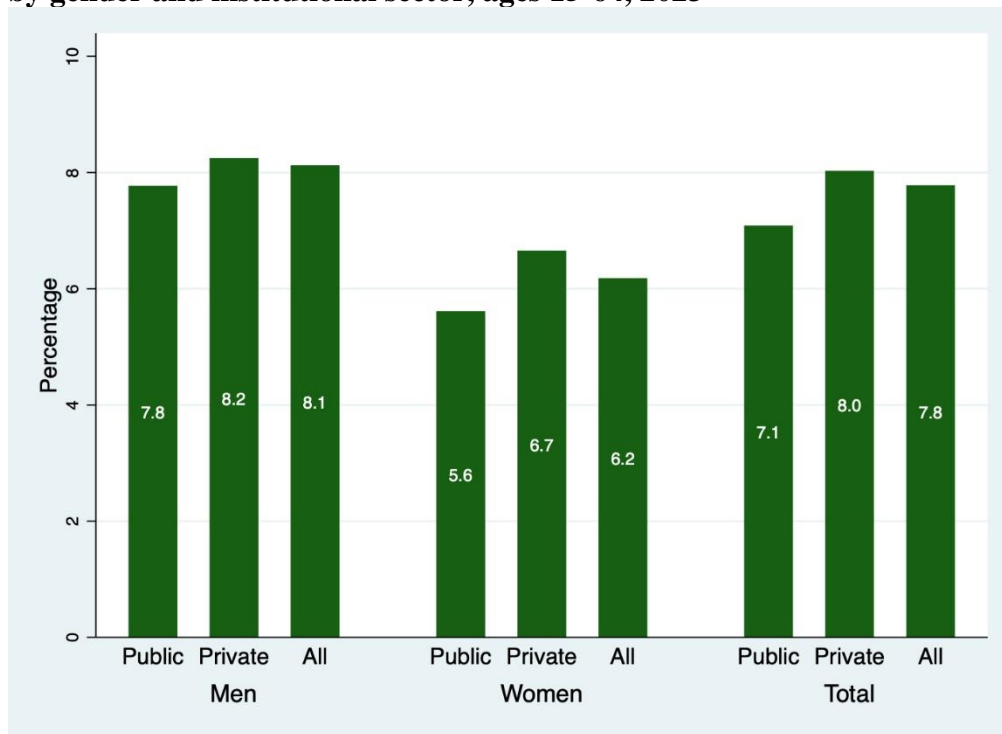


Source: Authors' calculations based on the ELMPS 2023.

In the public sector, men are more likely to be engaged in "process only" activities (36.9 percent) than their counterparts in the private sector (34.3 percent). However, when looking at the combined “process and output” activities, men in the private sector have a lower share (41.4 percent) compared to those in the public sector (46.4 percent). Women tend to have a greater

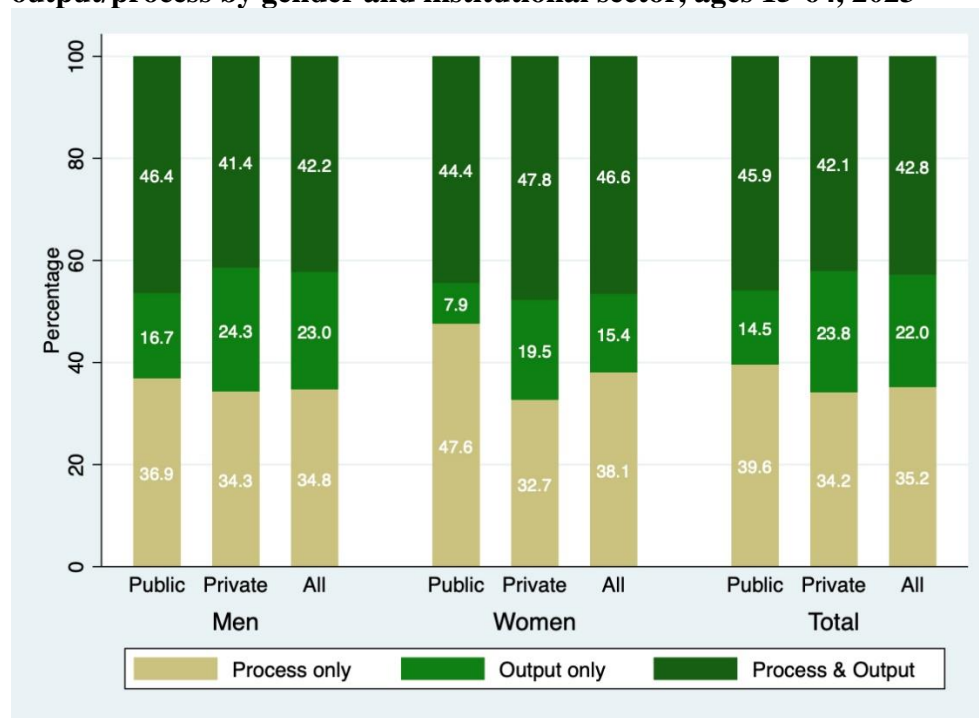
share of "process only" jobs in the public sector (47.6 percent) than in the private sector (32.7 percent), suggesting that public sector jobs for women are more process-oriented, whereas those in the private sector tend to focus more on output-related activities. These patterns highlight important gender disparities in the types of green jobs available across both the public and private sectors.

**Figure 3. Share of green activities in total employment (in percentage), market definition, by gender and institutional sector, ages 15-64, 2023**



Source: Authors' calculations based on the ELMPS 2023.

**Figure 4. Distribution of green activities (in percentage), market definition, by output/process by gender and institutional sector, ages 15-64, 2023**



Source: Authors' calculations based on the ELMPS 2023.

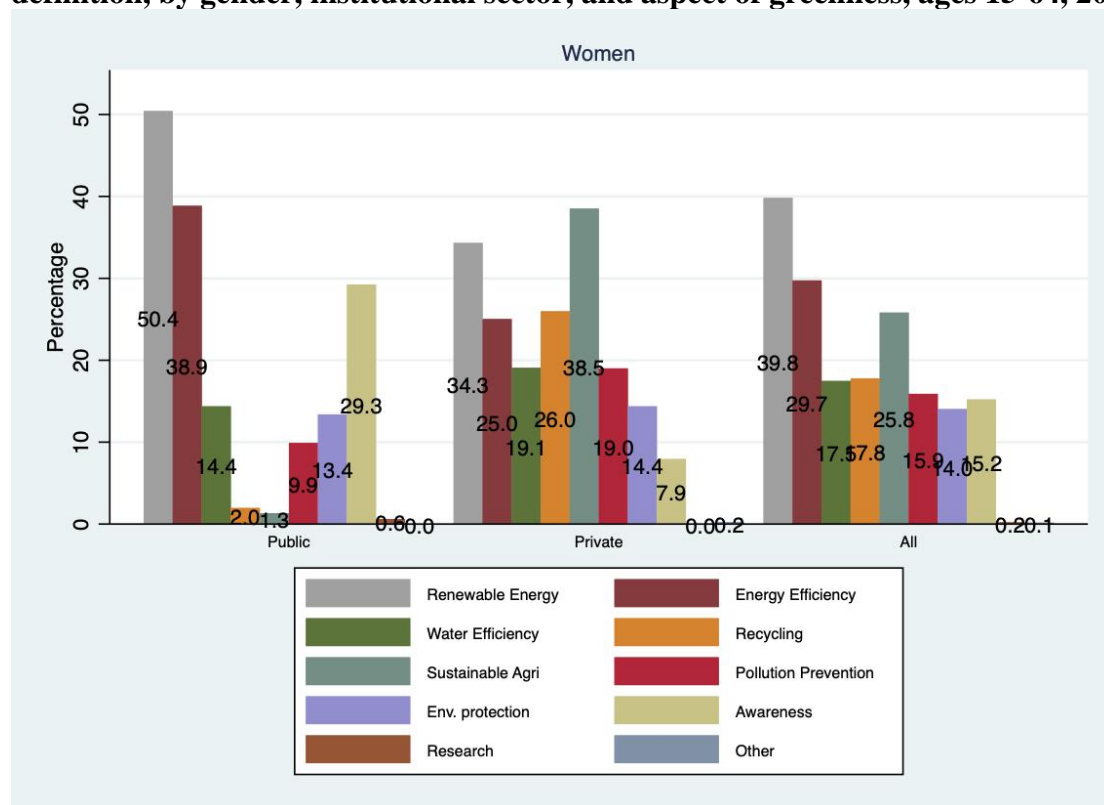
The analysis of green activities in Figure 5 incorporates a broad definition, covering jobs in various sectors that contribute to environmental sustainability. These jobs are classified based on their focus on either process, output, or both, with greenness encompassing a wide range of activities, including renewable energy, energy efficiency, water efficiency, recycling, sustainable agriculture, pollution prevention, environmental protection, awareness, research, and more. Figure 5 presents the share of green activities across gender (men and women), institutional sector (public and private), and the aspect of greenness for individuals aged 15-64 in 2023. This comprehensive classification allows us to explore how green activities are distributed across different types of employment by gender and sector. The public sector appears to have a higher share of “process only” green activities. This sector is typically involved in environmental governance, regulatory frameworks, and process improvements, which include areas such as awareness campaigns, environmental protection, energy efficiency, and research (Ye et al., 2021). The private sector is more likely to engage in “output only” green activities. These are related to industries like renewable energy production, sustainable agriculture, and recycling technologies, where there is a focus on producing environmentally friendly goods and services.

However, the public and private sector mainly emphasize jobs that integrate both the “process” and “output” aspects of greenness, focusing on producing green outputs while also ensuring that sustainable processes are in place. These include roles in firms that not only manufacture renewable energy systems or eco-friendly products but also implement recycling, energy efficiency, and pollution prevention measures throughout their operations. Both sectors have opportunities for such roles, though the private sector may have a stronger emphasis on

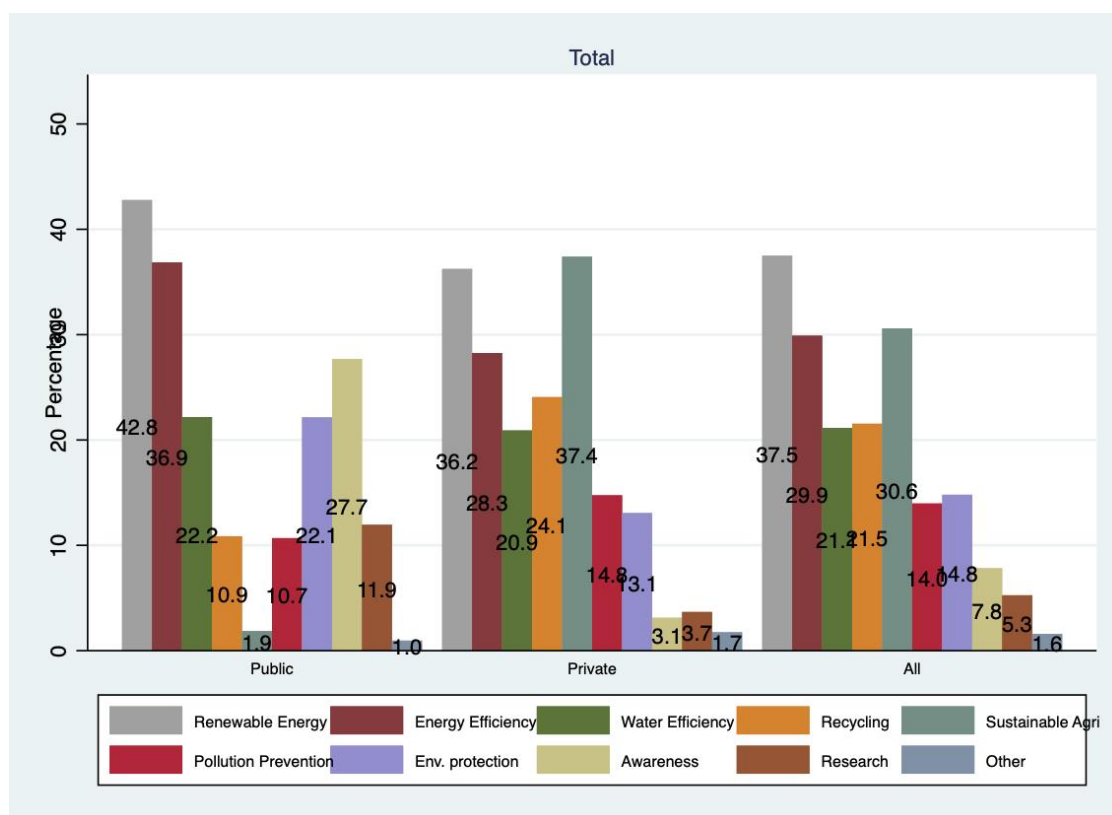
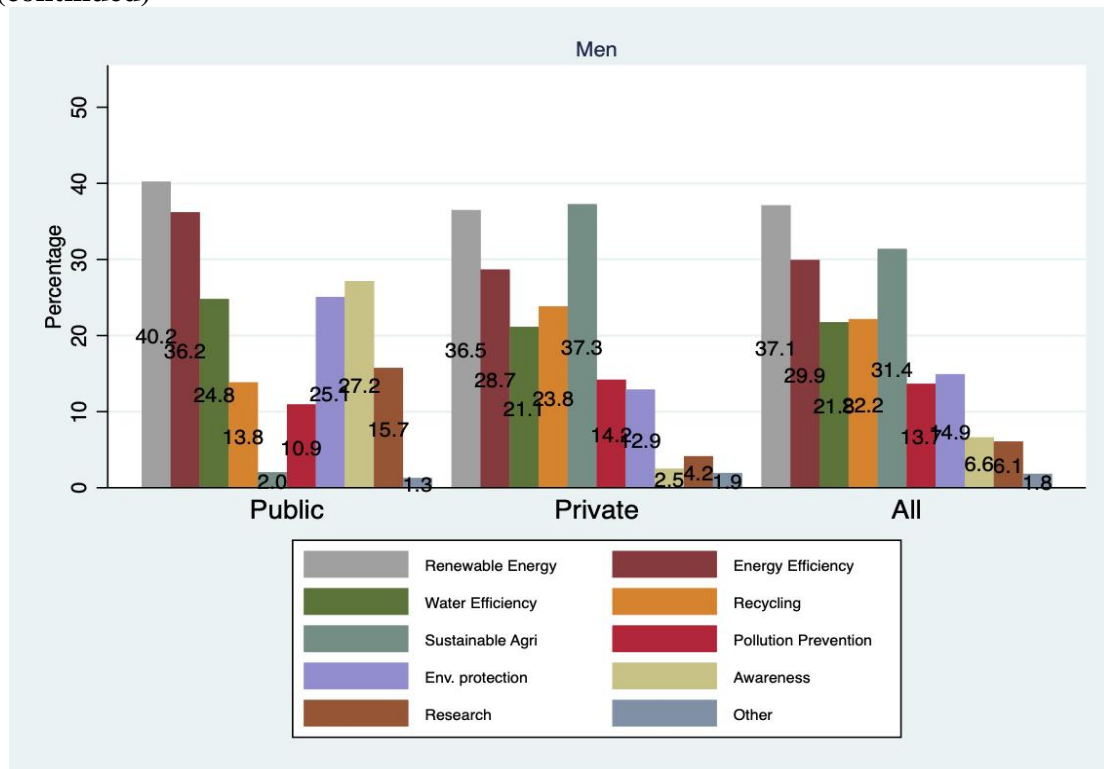
combining these aspects due to the commercial drive for sustainable production, even if this is not yet reflected in the Egyptian labor market.

The figure emphasizes the important differences in how men and women are engaged in green activities. Men tend to dominate recycling jobs in the public sector, water management, environmental protection policies, and research. Women, on the other hand, are more likely to be involved in process-only jobs, especially in the public sector. These activities may include jobs related to energy efficiency, and awareness. These roles are often linked to process improvements, governance, and the development of sustainability initiatives, which are more common in the public sector.

**Figure 5. Share of green activities in total green activities (in percentage), market definition, by gender, institutional sector, and aspect of greenness, ages 15-64, 2023**



**Figure 5. Share of green activities in total green activities (in percentage), market definition, by gender, institutional sector, and aspect of greenness, ages 15-64, 2023 (continued)**



Source: Authors' calculations based on the ELMPS 2023.

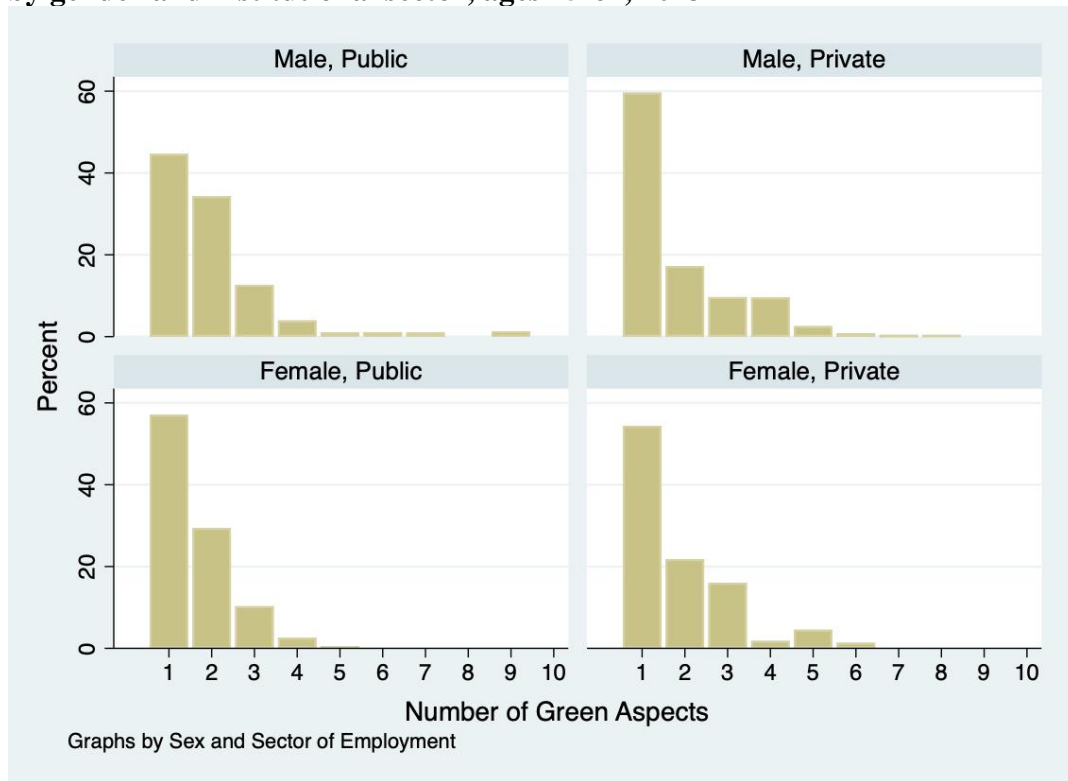
Note: Percentages may not sum to 100 percent because a single individual can contribute to multiple aspects of greenness.



Figure 6 illustrates the distribution of 10 different green aspects across various green activities, differentiated by gender and institutional sector. These green aspects include key activities such as renewable energy, energy efficiency, water efficiency, recycling, sustainable agriculture, pollution prevention, environmental protection, awareness, research, and other aspects contributing to environmental sustainability. The distribution tends to be skewed toward one or two aspects for both men and women, with this tendency being more pronounced among women. This suggests that most of the green jobs in Egypt are not very green. Men in the private sector exhibit the highest frequency of occurrence of green aspects. Women in the public sector show the highest frequency in the case of a single aspect. In contrast, the private sector displays a wider distribution across multiple green aspects compared to the public sector.

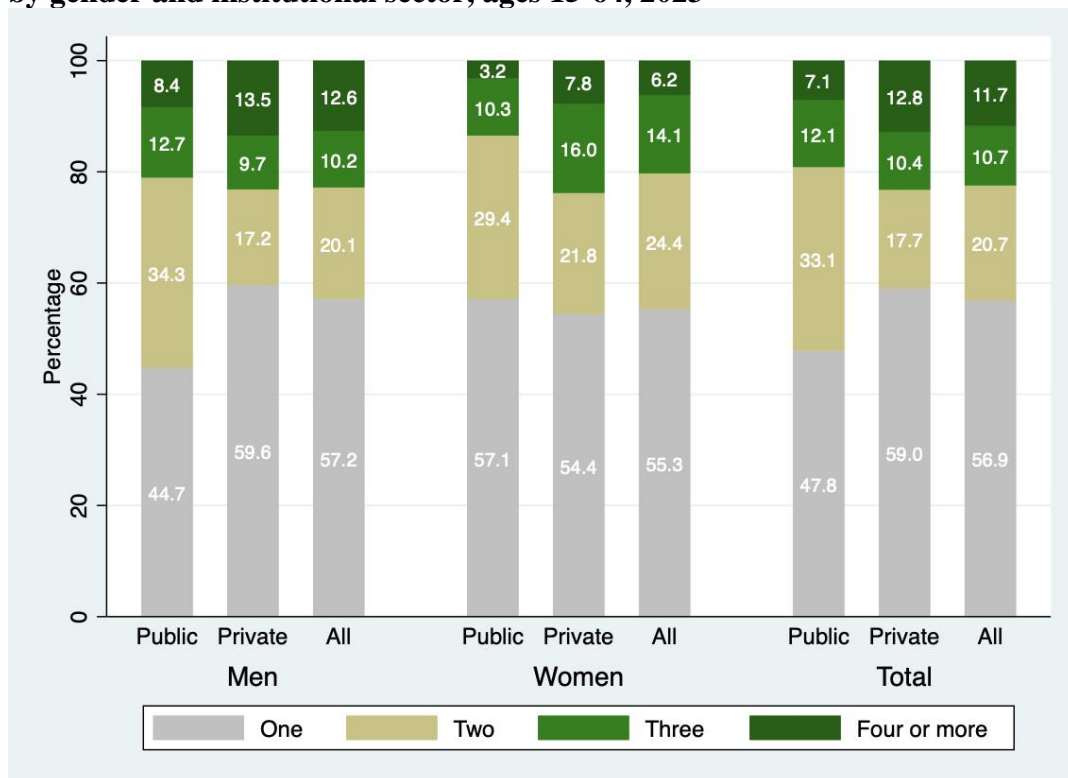
Figure 7 shows the incidence of individuals involved in green activities according to the number of green aspects in which they are engaged (one, two, three, or four or more green aspects). It highlights how broadly or narrowly individuals engage with green activities. The majority of green jobs have only one green aspect, with over three-quarters of green jobs encompassing one or two green aspects. A significant portion of individuals in both the public and private sectors engage in only one green aspect at 47.8 percent and 59 percent, respectively. These roles are specialized and focus solely on one type of green activity, such as renewable energy production, energy efficiency, or sustainable agriculture. This is more common in the private sector, where workers may focus on a single green activity. The figure shows that a third of the public green jobs are involved in two green aspects, while a third of the private green jobs engage in two or three green aspects, particularly in roles that integrate both process improvements and output generation. Workers involved in four or more green aspects barely reached 12 percent. These individuals are more likely to be found in the private sector, where roles require involvement in diverse activities—this is more common for men. Men in the private sector show a higher incidence of roles that focus on a single green aspect (59.6 percent). Women in the public sector are the least likely to engage in multiple green aspects, while men in the private sector are more likely to specialize in a single green aspect. Women, especially in the private sector, show a higher incidence of involvement in multiple green aspects (three or more). There may be a need to encourage the development of roles that incorporate multiple green aspects, especially in the public sector. This could involve creating incentives to train employees in a wider range of environmental processes and outputs, particularly for men, to broaden their engagement with sustainability. To address gender disparities, policies could focus on promoting women's participation in public sector roles with multiple green aspects while also encouraging more men to engage in multi-aspect roles in the private sector. There may be opportunities for collaboration between the public and private sectors to share best practices for managing multiple green aspects.

**Figure 6. Frequency of green aspects in green activities (in percentage), market definition, by gender and institutional sector, ages 15-64, 2023**



Source: Authors' calculations based on the ELMPS 2023.

**Figure 7. Incidence of green aspects in green activities (in percentage), market definition, by gender and institutional sector, ages 15-64, 2023**

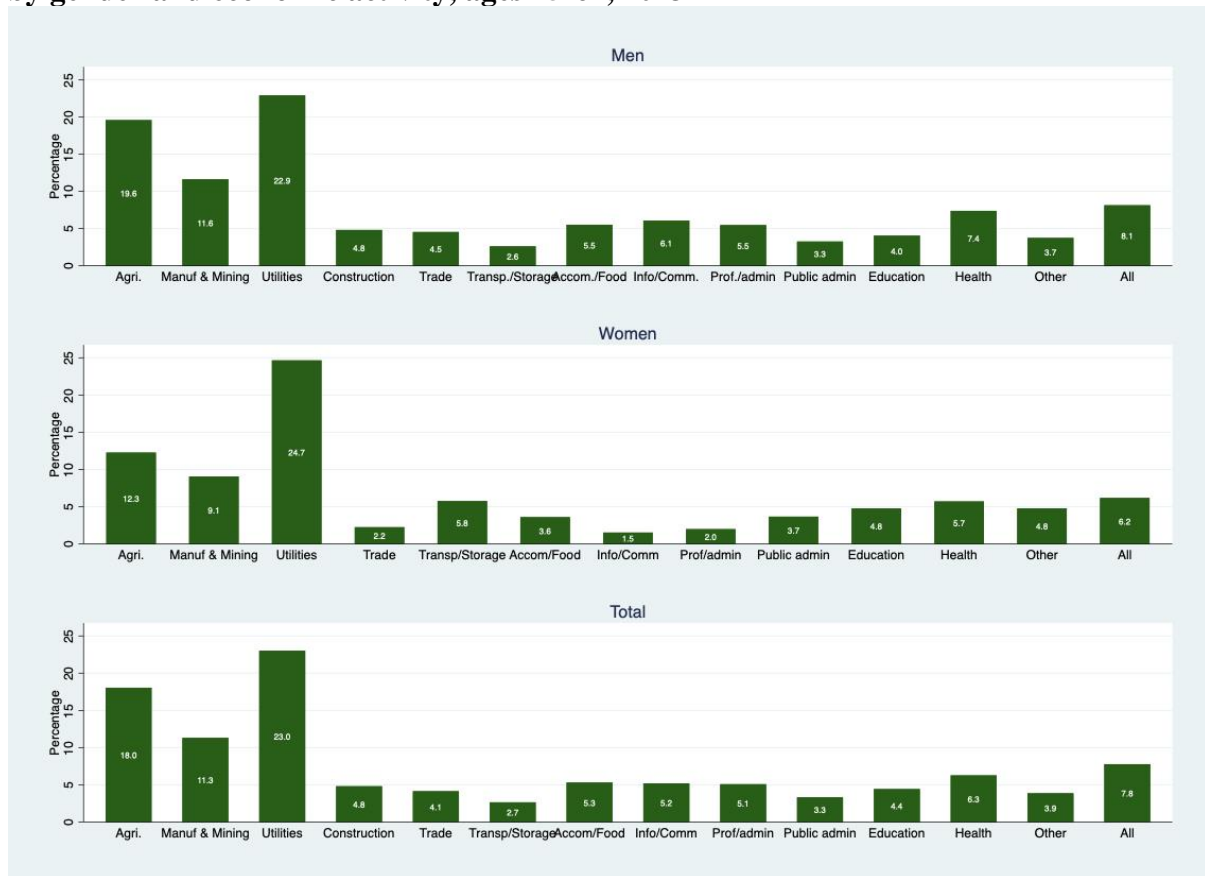


Source: Authors' calculations based on the ELMPS 2023.

Figure 8 illustrates the share of green activities in total employment for both men and women across sectors of economic activity. These sectors are classified using the ISIC Rev. 4 system and aggregated into broader categories for clarity. The aggregation of sectors into broader categories provides a more generalized view of green activities. However, the specifics of what constitutes a green activity might differ significantly within these sectors. For example, in utilities, green jobs could range from renewable energy production to water conservation, while in information and communication services, they might focus on reducing the digital carbon footprint. A few key observations can be drawn from the breakdown by gender and economic activity.

Green jobs are concentrated in a few key sectors of economic activity. Agriculture, forestry, and fishing, traditionally considered among the more green-intensive sectors, often display significant shares of green activities due to the widespread adoption of sustainable practices such as organic farming and environmental conservation. Despite this, the data indicates that the utilities sector exhibits the highest share of green activities. This suggests that Egypt is making substantial progress in its green transition, particularly by decarbonizing electricity generation, enhancing water and waste management systems, and focusing on recycling sewage water before it is discharged into waterways. These efforts reflect a broader national commitment to environmental sustainability and resource efficiency across critical infrastructure sectors. Manufacturing and mining exhibit a relatively high share of green activities. This can be attributed to the rising demand for sustainability-related goods. While human health and social work services are not traditionally considered green sectors, the growing emphasis on eco-friendly practices in healthcare, such as reducing hospital waste and adopting energy-efficient facilities, may explain some of the green activity shares in this sector.

**Figure 8. Share of green activities in total employment (in percentage), market definition, by gender and economic activity, ages 15-64, 2023**



Source: Authors' calculations based on the ELMPS 2023.

Note: Only nine observations for female employment in construction, therefore construction is omitted for women.

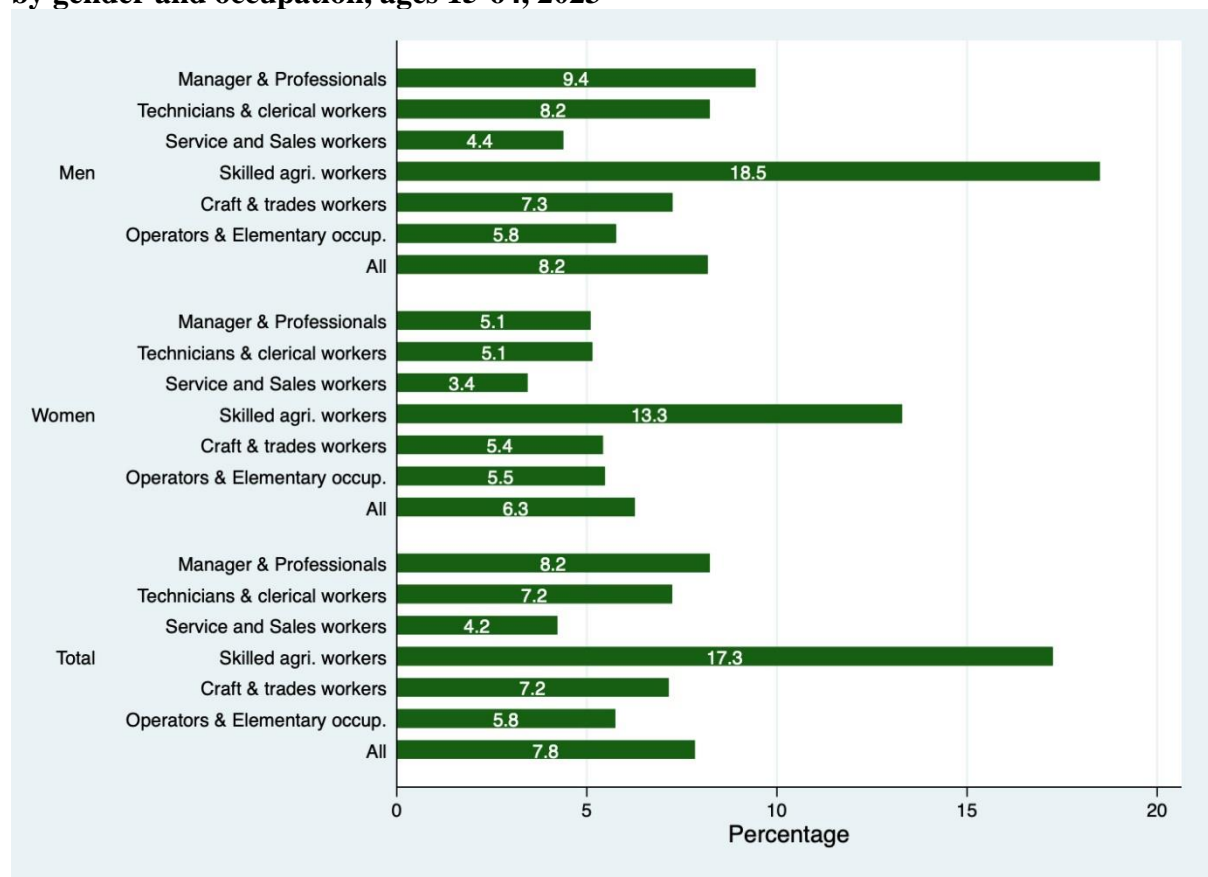
Figure 9 presents the share of green activities in total employment by gender and occupation, for individuals aged 15-64 in 2023. The data reveals several key trends related to how men and women participate in green jobs across different occupational categories. Skilled agricultural workers exhibit the highest share of green activities. This is especially pronounced for men (18.5 percent) and women (13.3 percent), underscoring the critical role of agriculture in green activities. Since agricultural laborers are included under elementary occupations, it is worth noting that green agricultural jobs significantly drive these figures. However, women overall show lower participation in green jobs compared to men (6.3 percent versus 8.2 percent), reflecting a gender gap in access to or participation in green jobs. Among men, green activities are most prominent for skilled agricultural workers (18.5 percent), followed by managers and professionals (9.4 percent), and technicians and clerical workers (8.2 percent). This may reflect the diverse nature of green jobs available, from technical and hands-on roles in agriculture to managerial positions in sustainability-related fields. Women have quite a similar distribution, though with lower shares in all categories.

For men, service and sales workers, craft and trades workers, and operators and elementary occupations show a relatively lower share of green activities (around five to seven percent), which may suggest fewer green related opportunities or a slower transition toward sustainable

practices in these types of occupations. In roles such as managers and professionals as well as technicians and clerical workers, the share of green activities is slightly lower for women (5.1 percent each and 5.1 percent, respectively) compared to craft and trades workers and operators and elementary occupations (5.4 percent and 5.5 percent). In a reverse pattern than that of men, this indicates that women are underrepresented in higher-skilled or technical roles associated with green activities, which could be linked to broader issues related to gender norms in the labor market.

Traditionally, women in Egypt face barriers such as lower participation rates and limited access to certain industries. This is also reflected in their participation in green activities. The lower share of women in green jobs indicates that the expansion of green sectors—such as renewable energy or sustainable agriculture—is still male-dominated, mirroring the overall labor market where male participation outpaces female engagement, particularly in technical and high-growth industries. This underscores the need for gender-sensitive policies to encourage women’s participation in green sectors, which could involve skills training, access to green technologies, and support for entrepreneurship.

**Figure 9. Share of green activities in total employment (in percentage), market definition, by gender and occupation, ages 15-64, 2023**



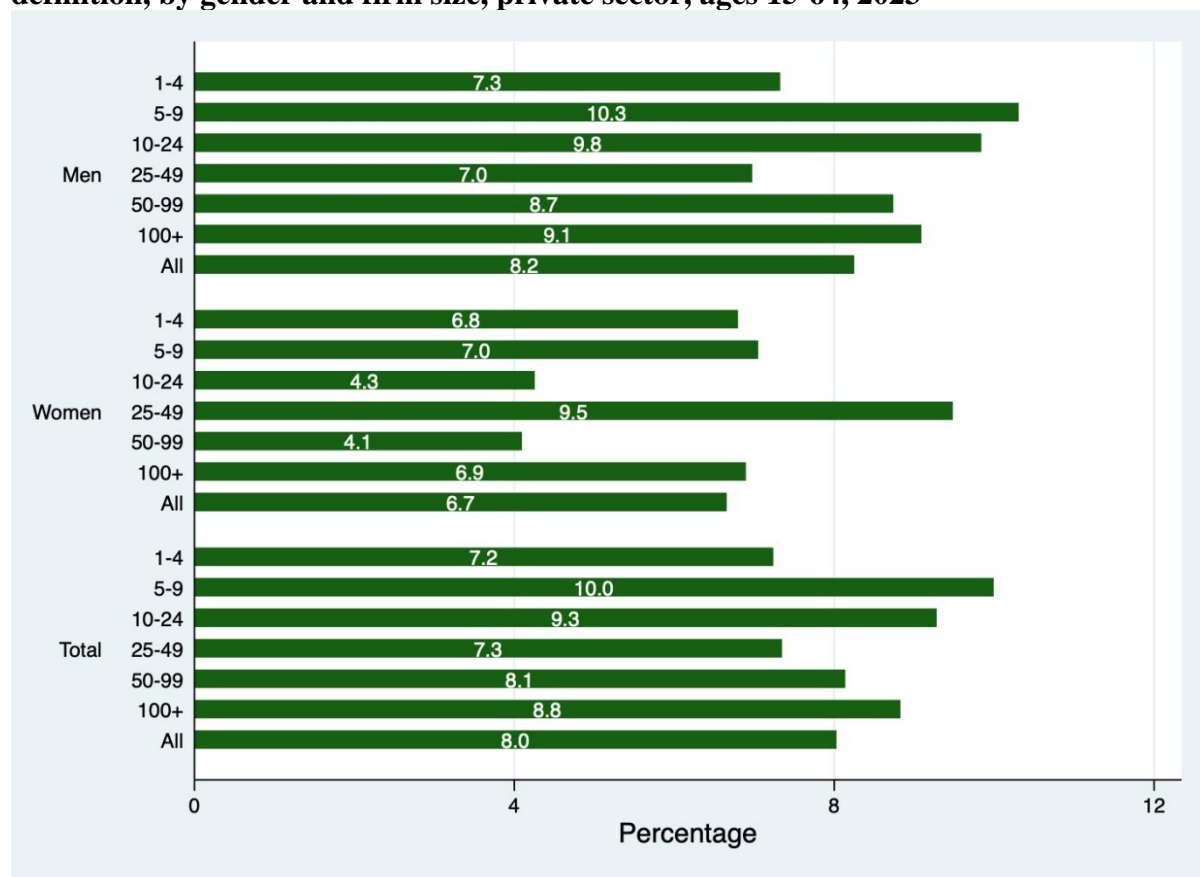
Source: Authors’ calculations based on the ELMPS 2023.

Figure 12 illustrates the variation in green activities between large firms and small and medium-sized enterprises (SMEs), showing that green jobs are more prevalent in SMEs than

in large firms. This may reflect several important dynamics in Egypt's labor market and the structure of its private sector. SMEs may be more flexible and adaptive to new market trends, including the shift toward sustainability and green practices. This adaptability allows them to implement green activities more quickly than larger firms, which may have more rigid structures and require longer processes to change their operations. Furthermore, higher green activities in SMEs could indicate that smaller businesses are capitalizing on niche markets within the green economy, such as eco-tourism, organic farming, renewable energy installations, and waste recycling. These industries often require less capital upfront than large-scale industrial green investments, making them more accessible for SMEs (Mehta et al., 2024). This could also be due to SMEs being more integrated with local communities and grassroots movements, which often focus on sustainability. SMEs may further benefit from government support programs or relaxed regulatory frameworks aimed at encouraging green activities. Many development agencies and government programs in Egypt are focusing on promoting sustainable development through the support of SMEs. These programs provide financial incentives, technical training, or resources to help smaller firms transition to green activities. As a result, SMEs are more likely to take advantage of such support, contributing to a higher prevalence of green jobs.

The fact that green activities are more prevalent in SMEs suggests that these businesses are playing a key role in driving Egypt's green economy forward. Their flexibility, community engagement, and focus on niche markets enable them to adopt green activities at a faster rate than larger firms. However, this also indicates that large corporations may need further incentives or policy support to increase their contribution to green jobs, which is essential for scaling up sustainable practices across the broader economy.

**Figure 10. Share of green activities in total employment (in percentage), market definition, by gender and firm size, private sector, ages 15-64, 2023**



Source: Authors' calculations based on the ELMPS 2023.

Figure 11 illustrates how men and women engage in green activities across various types of employment in Egypt's private sector. The data reveals important gender disparities across employment types, as well as areas where green activities are more concentrated. A striking observation is the high participation in green activities among unpaid family workers, especially men. For men, 20.3 percent of unpaid family work is related to green activities, while for women, it is 12.1 percent. This significant contribution likely stems from rural or agricultural work, where family members assist in environmentally related tasks without formal compensation. These activities could range from small-scale farming to other forms of ecological stewardship common in rural communities. A total of 85 percent of male unpaid family workers are in agriculture, 1.3 percent in manufacturing, nine percent in trade, and 4.5 percent in other service activities. Among formal private wage workers, the share of green activities is modest. Women have a slightly lower rate of green jobs (5.5 percent) compared to men (8.1 percent). This relatively low involvement might reflect the sectors in which formal private wage workers are concentrated, with perhaps fewer green jobs or environmentally related tasks within these formal private enterprises.

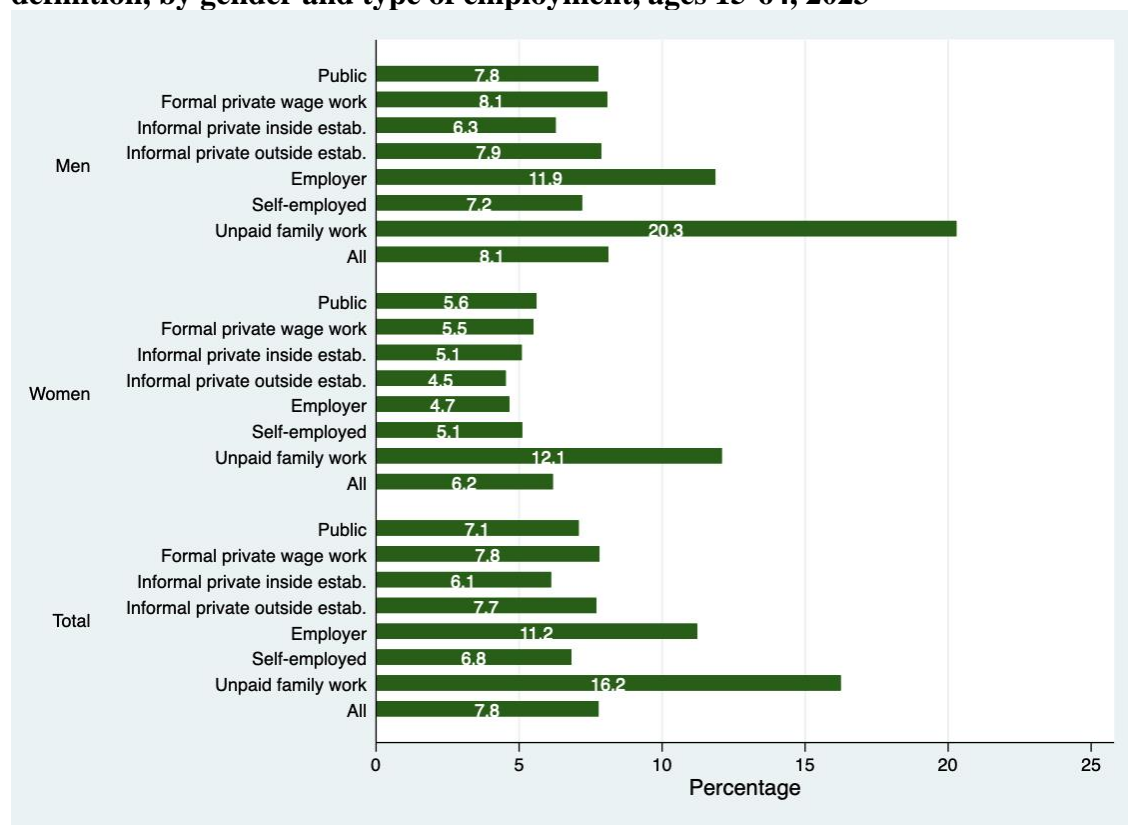
In the category of informal private wage work inside fixed establishments, men are more engaged in green activities than women. The share of men's employment in green activities is 6.3 percent, compared to only 5.1 percent for women. This gap suggests that informal private

wage jobs inside fixed establishments, such as workshops, shops, or small factories, offer more opportunities for men to engage in green activities than for women. Men also dominate green activities in informal wage work outside fixed establishments, with 7.9 percent of men's employment in this category involving green activities, compared to only 4.5 percent for women. This might reflect men's greater involvement in outdoor work, such as on construction sites, on the street, or in a moving vehicle. In the employer category, 11.9 percent of male employers are involved in green activities compared to only 4.7 percent of female employers. This gender gap suggests that men in leadership positions in the private sector are more likely to engage in or lead green activities, possibly reflecting industry-specific dynamics or the nature of male-dominated sectors that focus more on green production or services. Similarly, men have higher rates of green activities than women among the self-employed. The data shows that 7.2 percent of self-employed men are engaged in green activities compared to 5.1 percent of self-employed women.

In the public sector, the share of employment associated with green activities is relatively low for both men and women. Women have a slightly lower rate of green jobs (5.6 percent) compared to men (7.8 percent). Given the public sector's nature, where most jobs are formal and administrative, it is not surprising that this category shows limited involvement in green activities. Overall, men show a higher share of green activities across most employment types, with 8.1 percent of male employment involving green activities compared to 6.2 percent for women. This reflects a gender gap where men generally have more opportunities or are more likely to engage in environmentally related work, particularly as employers or in unpaid family roles. This overall lower share for women points to a need for more inclusive policies that encourage and facilitate female participation in green sectors.



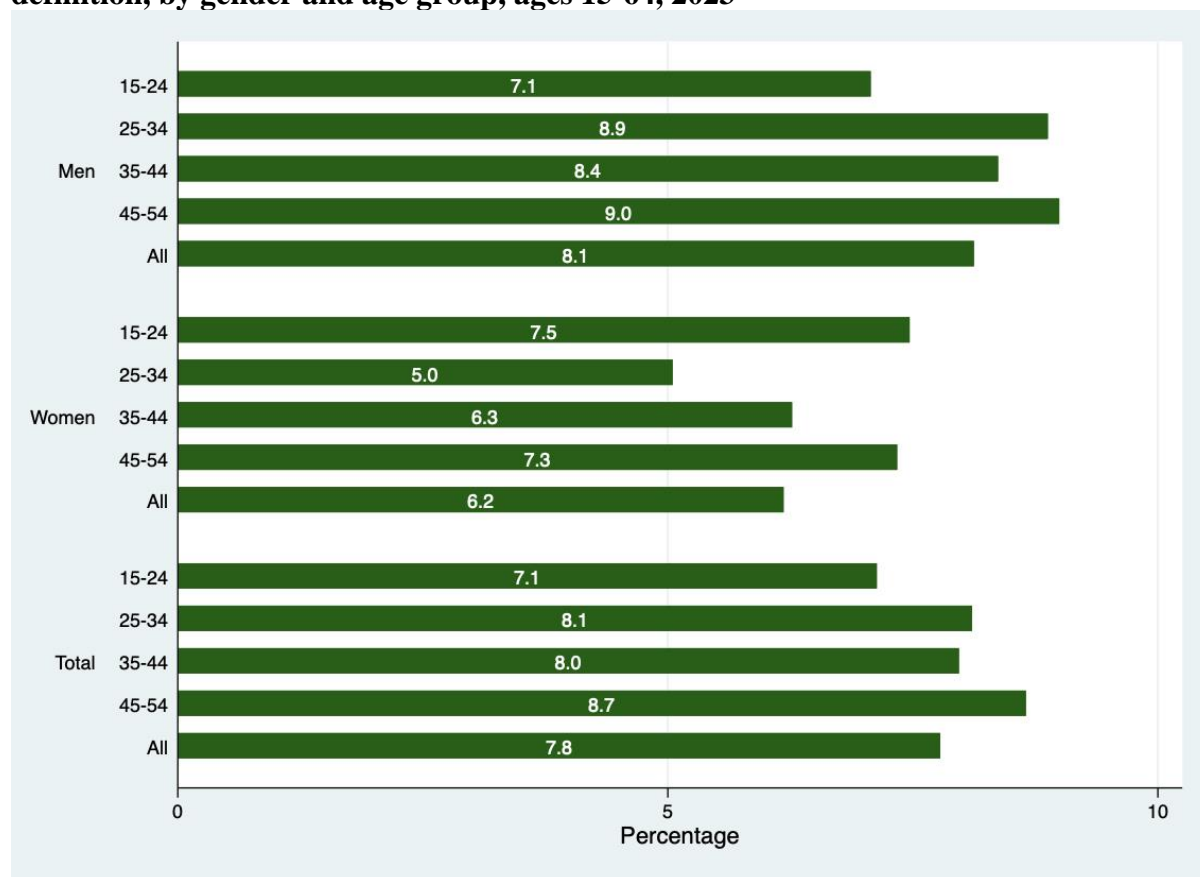
**Figure 11. Share of green activities in total employment (in percentage), market definition, by gender and type of employment, ages 15-64, 2023**



Source: Authors' calculations based on the ELMPS 2023.

A breakdown of the share of green activities in employment across gender and age groups is provided in Figure 12. It highlights important disparities in the distribution of green activities within employment. The total share of green activities in employment for the population (ages 15-64) is 7.8 percent. The percentage increases with age with a slight setback to the 35-44 age group. Younger workers (15-24) have slightly lower rates compared to older groups, with 7.1 percent for men and 7.5 percent for women. The 25-34 age group shows notable disparities between men (8.9 percent) and women (five percent), highlighting a gender gap in green jobs for this cohort. For both men and women, the 45-54 age group exhibits the highest shares of green activity (nine percent for men and 7.3 percent for women). Across all age groups, men consistently have higher percentages of green activities compared to women. The overall share for men is 8.1 percent, while for women, it is 6.2 percent. Engagement in green activities is relatively lower across all age groups, with the lowest percentage observed in the 25-34 women age group (five percent). The consistent gender gap across all age groups suggests structural barriers that limit women's access to green jobs, particularly in their early working years (25-34). The higher rates among older age groups could reflect increased opportunities for green jobs among more experienced workers or greater stability in sectors associated with green activities.

**Figure 12. Share of green activities in total employment (in percentage), market definition, by gender and age group, ages 15-64, 2023**



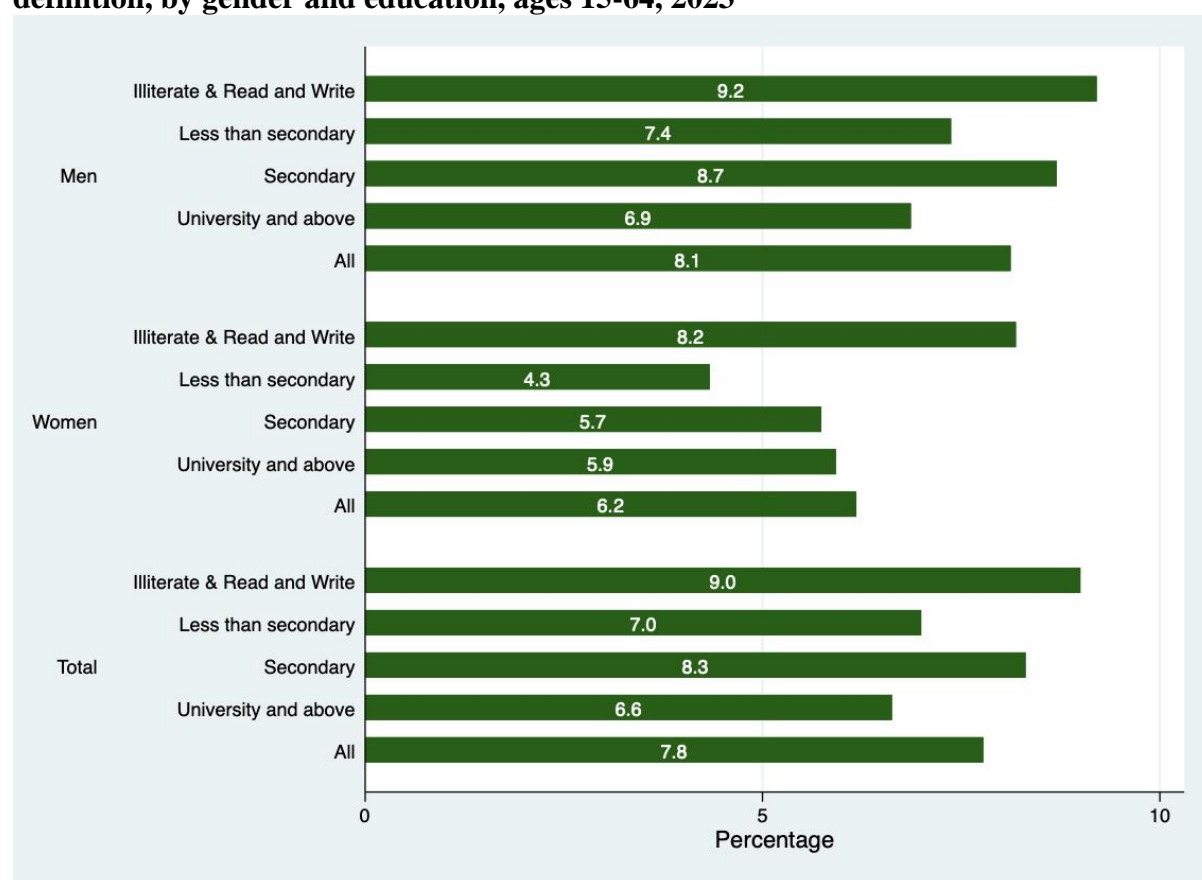
Source: Authors' calculations based on the ELMPS 2023.

Figure 13 and Figure 14 depict the share of green activities in total employment across different levels of education and by gender for individuals aged 15-64 in 2023. The first figure includes all economic activities, while the second excludes agriculture. Men with the lowest education levels are the most engaged in green activities, with a 9.2 percent share in total employment. Men with less than secondary education and with secondary education show 7.4 percent and 8.7 percent participation in green activities, registering a slight decrease compared to the illiterate group. Given the numbers in Figure 11b, the share of green activities (excluding agriculture) drops to 4.2 percent, 5.1 percent, and 6.7 percent, respectively. This suggests that men without formal education are more likely to be involved in environmentally sustainable work, in agricultural settings. Men involved in green activities with higher education are the least affected by the exclusion of agriculture (6.9 percent and 6.7 percent, respectively).

The figures indicate that secondary and above education levels for women provide better access to green jobs outside of the agriculture sector. Women's participation in green activities drops from 6.2 percent to 4.8 percent when agriculture is excluded, indicating that much of their engagement in green work is tied to the agricultural sector. For women with little to no education in particular, the participation in green activities drops from 8.2 percent to 2.6 percent, respectively. Without agriculture, the overall participation in green activities declines slightly for both genders. Both men and women with minimal education tend to engage more

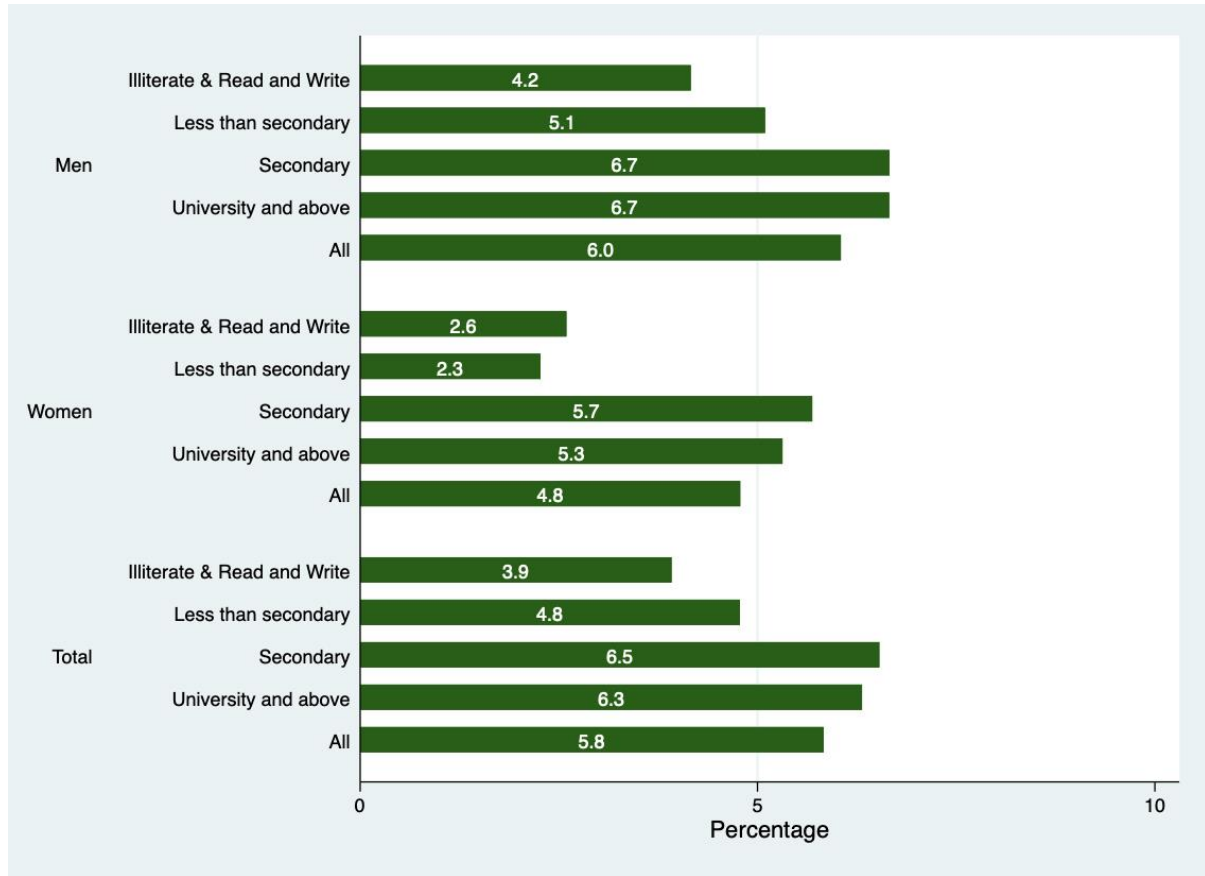
in green activities. Men are more likely to engage in green activities across all education levels, while women's participation in green activities is significantly lower, especially in non-agricultural sectors. The exclusion of agriculture reduces overall engagement in green activities, particularly for women. This highlights the importance of agriculture as a green sector where less educated women can find opportunities for sustainable employment. Interestingly, higher education does not correspond with greater involvement in green activities. Those with university degrees are less likely to be involved in green jobs, possibly reflecting a mismatch between higher education and the types of green activities currently available in Egypt. When agriculture is excluded from the analysis, the gap in the prevalence of green jobs between secondary and university education tightens.

**Figure 13. Share of green activities in total employment (in percentage), market definition, by gender and education, ages 15-64, 2023**



Source: Authors' calculations based on the ELMPS 2023.

**Figure 14. Share of green activities in total employment (in percentage) excluding agriculture, market definition, by gender and education, ages 15-64, 2023**



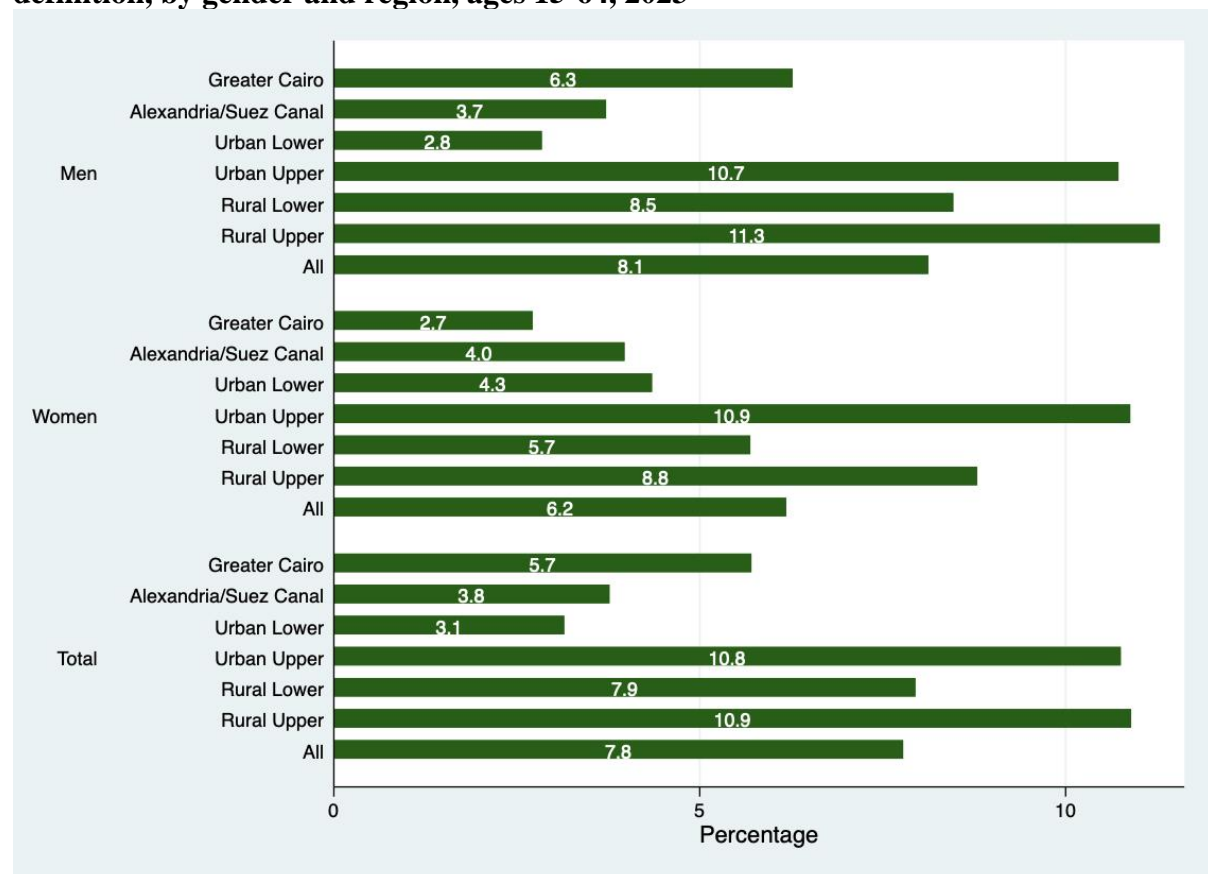
Source: Authors' calculations based on the ELMPS 2023.

Figure 15 provides insight into how the share of green activities in total employment is distributed across different regions of Egypt and how this distribution varies by gender. Rural Upper Egypt has the highest share of green activities, with 11.3 percent for men, and 10.9 percent overall. This indicates that Upper Egypt is more heavily involved in green activities compared to other regions. Urban Upper Egypt also shows significant involvement in green activities, with a 10.7 percent share for men, 10.9 percent share for women, and 10.8 percent overall, indicating a robust presence of green jobs outside the major urban centers and in less developed regions. Greater Cairo and Alexandria/Suez Canal have lower shares of green activities. For example, Greater Cairo's share for men is 6.3 percent, for women it is 2.7 percent, and overall, it is 5.7 percent. This could reflect the urban economic structure being more service-oriented, with fewer opportunities for green jobs. Lower Egypt exhibits moderate participation in green jobs, ranging between two to eight percent.

Across all regions, men consistently have higher participation in green activities than women, except in urban Upper Egypt. Women's involvement in green activities is highest in urban Upper Egypt (10.9 percent) and rural Upper Egypt (8.8 percent). This indicates that women in rural and semi-urban areas have more access to green jobs compared to their counterparts in more urbanized areas. Urban women in Greater Cairo and Alexandria/Suez Canal have the lowest participation in green activities, at 2.7 percent and 4.0 percent, respectively. This reflects

limited opportunities for green activities for women in these major urban regions. When considering both men and women, Upper Egypt leads with 10.9 percent and 10.8 percent of total employment in green activities for rural and urban, respectively. This is followed by rural Lower Egypt with 7.9 percent. Urban Lower Egypt and Alexandria/Suez Canal have the lowest shares of total green jobs, at 3.1 percent and 3.8 percent, respectively. In Cairo, Alexandria, and the Suez Canal, 10.5 percent of green jobs are in agriculture, 30.7 percent are in manufacturing, and 7.3 percent are in trade. In contrast to other regions where green jobs in agriculture amount to 44.4 percent and in manufacturing amount to 13.1 percent, those numbers in Urban Lower Egypt are 22.6, 20, and 8.7 percent, respectively. The prevalence of green activities in Upper Egypt—where both men and women are highly engaged in environmentally sustainable work—is tied to agriculture and renewable energy, as it encloses the largest solar farm in Egypt.

**Figure 15. Share of green activities in total employment (in percentage), market definition, by gender and region, ages 15-64, 2023**



Source: Authors' calculations based on the ELMPS 2023.

### 2.3. Attractiveness of green jobs

This subsection explores the attractiveness of green jobs by comparing the wages, social and health benefits, and job stability of workers engaged in green activities versus non-green activities across institutional sectors and by gender. Understanding the differences between

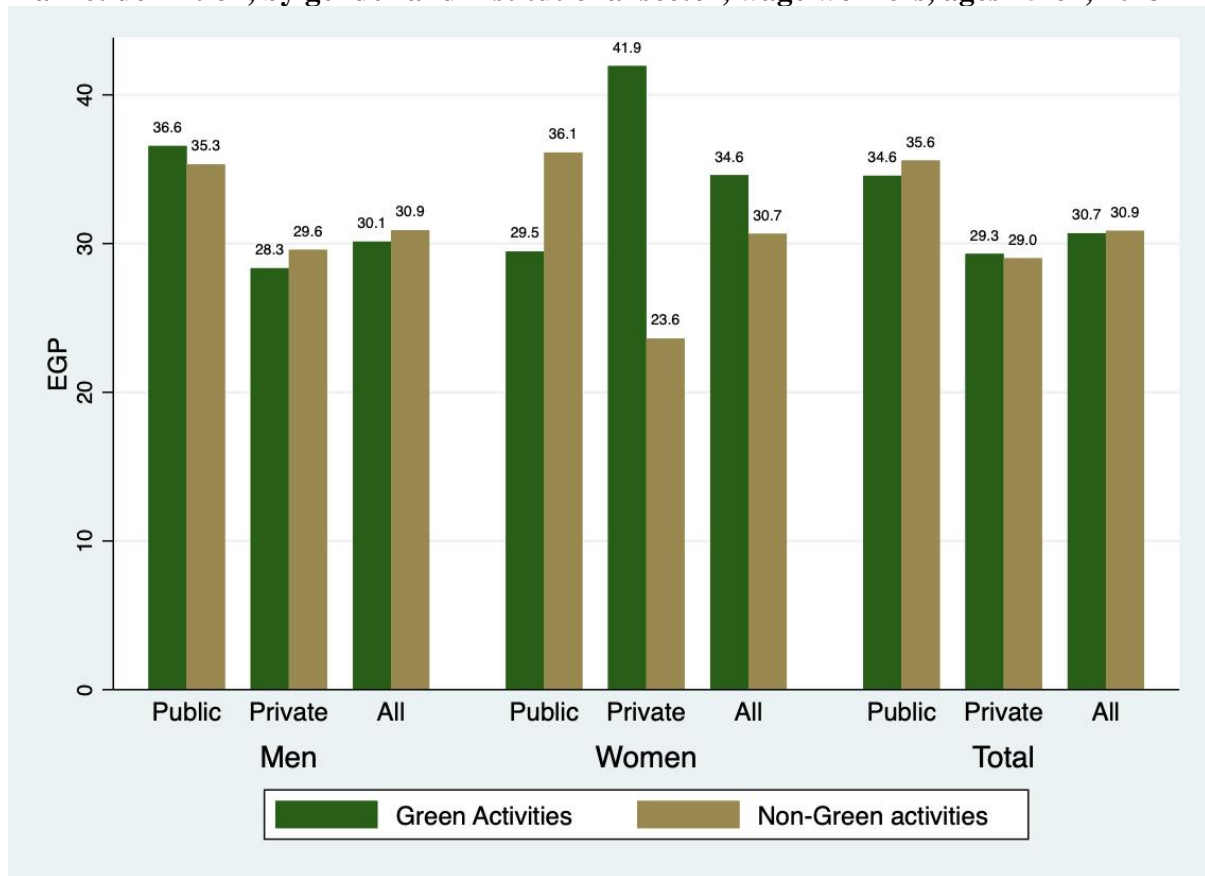
these categories can shed light on the economic incentives for transitioning into green jobs, particularly as global economies increasingly focus on sustainability and environmental protection.

Figure 16 illustrates a comparison of hourly wages between workers engaged in green activities and those involved in non-green activities, segmented by gender and institutional sector (public and private). The data sheds light on wage disparities between men and women across different economic sectors. For men in the public sector, those involved in green activities earn an average of EGP 36.6 per hour, which is higher than the EGP 35.3 earned by men in non-green activities. In the private sector, the wage difference is the same, but men in non-green activities earn EGP 29.6 per hour compared to EGP 28.3 for men in green activities. Across both sectors, however, men's hourly wages in non-green activities slightly surpass those in green activities, with men earning EGP 30.9 in non-green jobs compared to EGP 30.1 in green jobs.

For women, the wage disparity between green and non-green activities is more pronounced. In the public sector, women in non-green activities earn EGP 36.1 per hour, significantly more than the EGP 29.5 earned by women in green activities. This trend is reversed in the private sector, where women in green activities earn EGP 41.9 per hour compared to just EGP 23.6 in non-green activities. Overall, women earn EGP 34.6 per hour in green activities and EGP 30.7 in non-green activities, reflecting a substantial hourly wage gap favoring green jobs.

When considering both genders combined, green activities in the public sector offer an average hourly wage of EGP 34.6, lower than the EGP 35.6 offered for non-green activities. In the private sector, green activities pay EGP 29.3 per hour, compared to EGP 29.0 for non-green activities. Overall, green activities provide an average hourly wage of EGP 30.7, compared to EGP 30.9 for non-green activities. In conclusion, women, particularly in the private sector, benefit from significantly higher wages in green activities compared to non-green activities. Men experience smaller differences in wages between green and non-green activities.

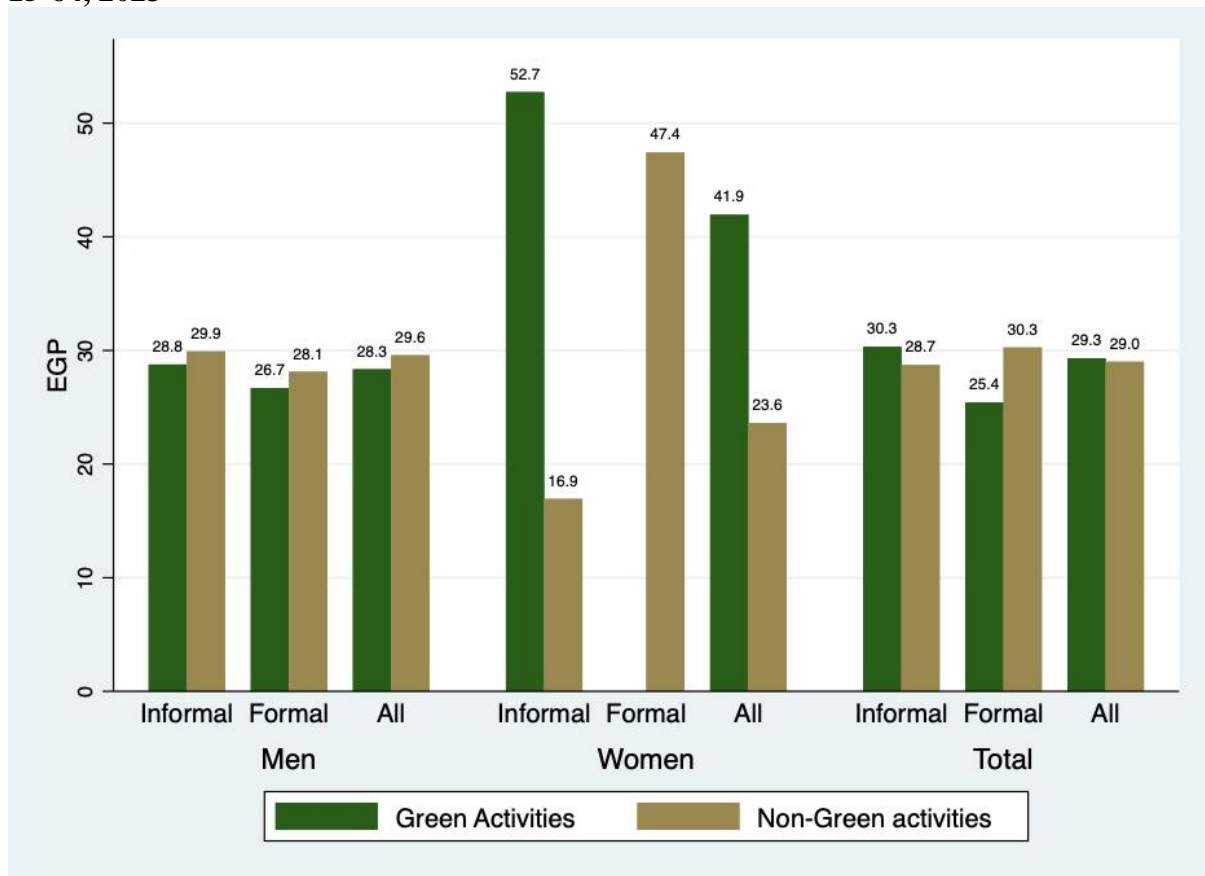
**Figure 16. Hourly mean wage for green activities and non-green activities (in EGP), market definition, by gender and institutional sector, wage workers, ages 15-64, 2023**



Source: Authors' calculations based on the ELMPS 2023.

Figure 17 shows the hourly mean wages for workers engaged in green and non-green activities in the private sector, segmented by gender and the formality of employment and identified by whether the job includes social insurance or not. For workers in formal jobs, namely with social insurance, men involved in green activities earn an average of EGP 26.7 per hour, compared to EGP 28.1 for those in non-green activities. In informal jobs, the wage disparity becomes more pronounced. Men engaged in informal green activities earn an average of EGP 28.8 per hour, while those in non-green activities earn EGP 29.9. For women, although the sample size is limited (only 31 observations), it is noted that women in informal green activities earn nearly double the hourly wages than that of their male counterparts, highlighting a unique trend in this category. The key takeaway from this figure is that informal green jobs offer higher wages compared to formal jobs. Furthermore, green activities tend to pay slightly less than non-green activities across both job types for men. In summary, non-green jobs in the private sector provide a wage premium over green jobs, particularly in formal employment. Moreover, male workers in informal jobs consistently earn more than those in formal employment.

**Figure 17. Hourly mean wage for green activities and non-green activities (in EGP), market definition, by gender and informality status, private sector, wage workers, ages 15-64, 2023**



Source: Authors' calculations based on the ELMPS 2023.

Note: Women in green formal private jobs are excluded from the analysis due to the insufficient number of observations (nine).

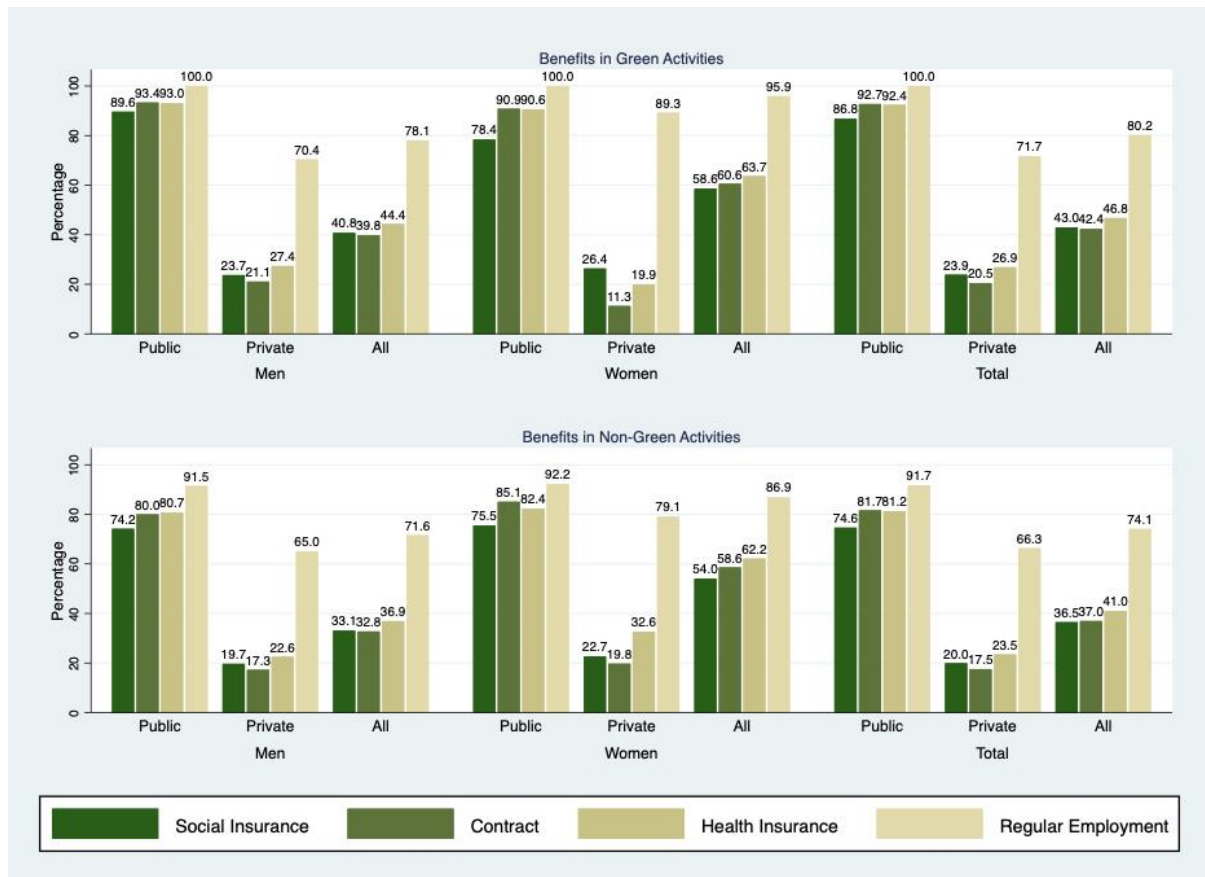
Figure 18 presents the distribution of employment benefits among workers engaged in green and non-green activities across both the public and private sectors, separated by gender. The benefits analyzed are social insurance, written contracts, health insurance, and regular employment. In green activities, for male workers in the public sector, benefit coverage is consistently high for both green and non-green activities. In green activities, 89.6 percent have social insurance, 93.4 percent have written contracts, 93 percent are covered by health insurance, and 100 percent enjoy regular employment. Comparably, in non-green activities, 74.2 percent have social insurance, 80 percent have written contracts, 80.7 percent are covered by health insurance, and 90.6 percent enjoy regular employment. However, male workers in the private sector experience significantly lower coverage rates across all benefits in both categories. In green jobs, only 23.7 percent are covered by social insurance, 21.1 percent have written contracts, 27.4 percent are covered by health insurance, and 70.4 percent are in regular employment. The situation is even worse in non-green activities, where only 19.7 percent have social insurance, 17.3 percent have written contracts, 22.6 percent have health insurance, and 65 percent have regular employment. When looking at the total for male workers across both sectors, the rates average between 41-44 percent for social insurance, written contracts, and health insurance, though regular employment coverage remains comparatively higher. For



female workers, public sector jobs also provide robust benefit coverage in both green and non-green activities, though there are some differences. In green jobs, 78.4 percent of women have social insurance, 90.9 percent have written contracts, 90.6 percent are covered by health insurance, and 100 percent enjoy regular employment. In non-green activities, the rates are comparable; 75.5 percent have social insurance, 85.1 percent have written contracts, 82.4 percent have health insurance, and 92.2 percent have regular employment. In the private sector, women fare worse in both categories compared to men. However, women in green activities have a lower prevalence of written contracts (11.3 percent) and health insurance coverage (19.9 percent) compared to women in non-green activities, with 17.3 percent having written contracts, and 22.6 percent covered by health insurance. However, more women in private green activities have social insurance (about 26.4 percent) and 89.3 percent have regular employment compared to women in private non-green jobs and men in both private green and non-green jobs. Overall, female workers in green activities enjoy significantly higher benefit coverage compared to their male counterparts and compared to both genders in non-green activities.

The differences in employment benefits between green and non-green activities are also illustrated in Figure 18. Across all benefit categories—social insurance, written contracts, health insurance, and regular employment—there are no significant disparities between green and non-green jobs, indicating similar levels of benefit provision in both activity types. For workers in green activities, benefit coverage is nearly universal in the public sector and considerably lower in the private sector. Similarly, in non-green activities, public sector jobs provide robust coverage, while private sector jobs lag behind. However, the gap between green and non-green jobs remains marginal within each institutional sector, suggesting that the activity type (green versus non-green) has less influence on benefit levels compared to other factors such as institutional setting (public versus private) or gender. Remarkably, written contracts emerge as the most deficient benefit across both green and non-green activities, particularly in the private sector. This challenge is more pronounced for women in green jobs, who are disproportionately underrepresented in benefit coverage.

**Figure 18. Percentage with social insurance, written contract, health insurance, and regular employment in green and non-green activities by gender and institutional sector, wage workers, ages 15-64, market definition, 2023**



Source: Authors' calculations based on the ELMPS 2023.

## 4. Potential Expansion of Green Jobs

### 4.1. Analyzing greenness

This section provides a detailed classification and analysis of economic activities and occupations with respect to their share of green activities. The data is categorized by economic activities and occupations at the one- and four-digit levels to facilitate further analysis and interpretation. Throughout this section, economic activities and occupations are distributed according to their share of involvement in green activities, while separating between the public and private sectors.

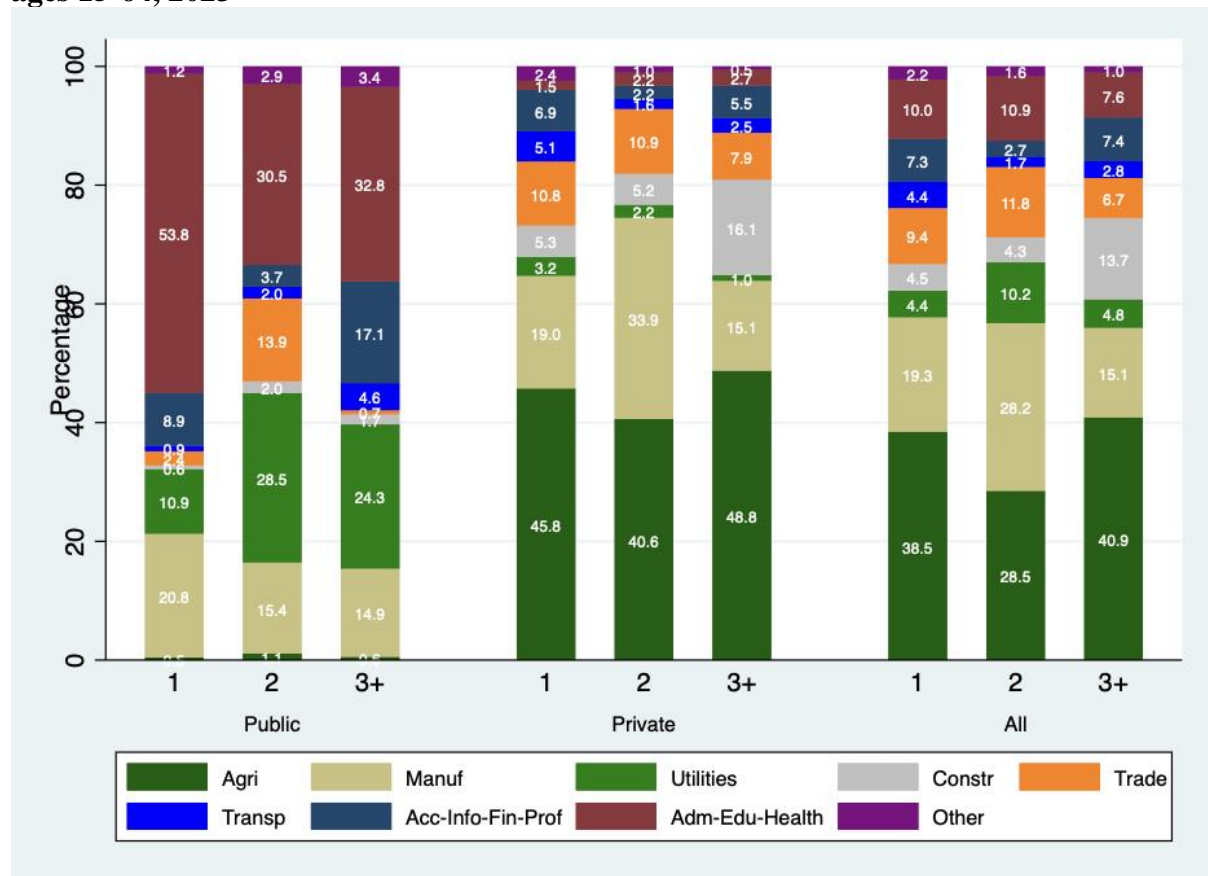
The analysis focuses on employment in activities with three or more green aspects rather than limiting the study to activities with four or more aspects due to the significantly larger dataset available for the former category. While activities with four or more green aspects provide valuable insights into greener practices, the total observations are limited to 156, with only 20 observations in the public sector and 136 in the private sector. This small sample size restricts the ability to draw comprehensive conclusions about green employment trends across sectors.

By focusing the scope to include activities with three or more green aspects, the dataset increases to 307 observations (50 in the public sector and 257 in the private sector), offering a more representative and detailed view of green jobs across diverse sectors such as agriculture, manufacturing, utilities, construction, trade, and others. This perspective enables a better understanding of how green jobs are distributed across both the public and private sectors, highlighting areas of strength and opportunities for growth in integrating sustainable practices into various economic activities.

Focusing on activities with three or more green aspects strikes a balance between depth and breadth. It allows for a detailed analysis of green job characteristics while encompassing a wide range of sectors and workers. This approach also captures a more realistic spectrum of environmental sustainability in employment, reflecting the gradual integration of green aspects across the economy. By studying this, policymakers and stakeholders can identify key sectors where green jobs are growing and prioritize efforts to scale up environmentally sustainable employment, particularly in areas with untapped potential.

Figure 19 provides a breakdown of employment across various economic activities, such as agriculture, manufacturing, utilities, construction, trade, transportation, accommodation, information and communication services, professional administration, public administration, education, health, and other services. It offers a percentage-based view of how employment in these sectors is distributed across both public and private employment. It provides insight into the share of green jobs in economic sectors, indicating the extent to which different segments of the economy are engaging with green initiatives. The figure illustrates a detailed comparison of how different sectors contribute to green activities. This data is essential for understanding the dynamics of green job growth and identifying areas where policies can encourage further environmental sustainability and job creation. The figure helps identify which broad economic sectors employ the largest share of green workers and whether these sectors are predominantly public or private.

**Figure 19. Distribution of employment in green activities (in percentage) by economic activity (isic rev4 - 1 digit), green incidence, and institutional sector, market definition, ages 15-64, 2023**



Source: Authors' calculations based on the ELMPS 2023.

Figure 19 analyzes the distribution of employment in green activities across various sectors of economic activity, segmented by the number of green aspects involved—either one, two, or three or more green aspects. The data covers the labor force for individuals aged 15 to 64 in both the public and private sectors. A caveat to emphasize is the unequal distribution of the share of green activities, with about 60 percent of green activities involving only one green aspect, while the remaining 40 percent is evenly split between jobs that incorporate two or three or more green aspects. Figure 18 shows that the majority of green jobs still focused on addressing a single environmental issue lie in sectors like agriculture, manufacturing, and public administration, education, and health. This indicates that while there is a movement toward greener employment, many roles are still limited in the breadth of their environmental impact. Jobs with two aspects are less common, but they are more likely to be found in sectors such as agriculture, manufacturing, and trade. The first two sectors are beginning to adopt more comprehensive environmental strategies since they are more prevalent in the case of three or more aspects, which could have a broader and more significant impact. While most green jobs focus on only one aspect of environmental sustainability, there is a growing need to promote roles that integrate multiple green dimensions, as complex environmental challenges require more integrated solutions.

In the public sector, green jobs with one green aspect are predominantly concentrated in public administration, education, and health, as well as manufacturing, accounting for 53.8 percent and 20.8 percent of green activities, respectively. As we move toward jobs with two green aspects, the distribution shifts significantly toward utilities and trade sectors, which comprise a substantial portion of green jobs. In the case of three or more green aspects, the accommodation and food services sectors start to gain importance, highlighting the increasing presence of environmental activities in service delivery. In the private sector, green jobs with one green aspect are distributed across sectors, with agriculture leading at 45.8 percent, followed by manufacturing at 19 percent. This demonstrates that private sector green jobs are significantly tied to sustainable agriculture and industrial efficiency, reflecting the role of private companies in addressing environmental concerns like food consumption and emissions. For jobs with two or more green aspects, sectors like manufacturing and construction gain importance. Manufacturing accounts for 33.9 percent of jobs with two green aspects, while construction represents 16.1 percent of those with three or more aspects. This suggests a growing recognition in the private sector of the need to incorporate comprehensive environmental practices into both production and construction processes.

An examination of the distribution of employment in green activities with three or more environmental aspects across various economic activities in Egypt reveals significant trends in the prevalence of green jobs and offers insights into potential areas for growth within the green economy. The cultivation of vegetables, melons, roots, and tubers emerges as the activity with the highest share of green jobs—contributing 13.5 percent to the total—almost entirely dominated by the private sector (16 percent). Similarly, the cultivation of cereals, legumes, and oil seeds follows closely with 10 percent of green jobs, also concentrated exclusively in the private sector (11.5 percent). These findings highlight the importance of agriculture as a cornerstone of Egypt’s green economy and underscore the critical role of private agriculture in advancing multi-dimensional green aspects. Green jobs in comprehensive public affairs activities stand out as a unique example of public sector leadership, with 10.5 percent of public green jobs in this category solely concentrated in government-led administrative functions. Similarly, the healthcare sector, particularly hospital activities, demonstrates strong public sector involvement, with green jobs primarily concentrated in public institutions (7.8 percent). This indicates a concerted effort by the public sector to adopt sustainable practices in critical services, such as healthcare. The trend continues in early education, where six percent of green jobs are found in public institutions.

In contrast, activities such as oil extraction (crude oil) reveal a more balanced contribution between the public (4.2 percent) and private (1.5 percent) sectors. Despite being a non-renewable energy source, this category shows the integration of green aspects, which could include measures such as minimizing environmental damage during extraction or implementing renewable energy solutions within the operations. Despite the presence of green jobs in this activity, there is a need to transition further toward renewable energy sources to align with global climate goals. The construction sector shows varying trends, with building construction (four percent) and other specialized construction activities (six percent)

predominantly led by the private sector. These activities represent a significant opportunity for green job growth, particularly in the adoption of green building practices such as energy-efficient designs, sustainable materials, and waste reduction strategies. The manufacturing of bakery products, while smaller in scale (1.7 percent), similarly offers potential for improvement by integrating environmentally friendly production techniques.

Private sector dominance is also evident in activities such as land transportation of goods (1.9 percent) and food retail trade in specialized stores (2.6 percent). These sectors represent untapped potential for green job creation through the introduction of sustainable practices like transitioning to low-emission transportation methods or promoting environmentally friendly retail packaging and supply chains. While the public sector leads in green jobs for essential services like public administration, healthcare, and education, the private sector's dominance in agriculture, construction, and transportation highlights its pivotal role in advancing green practices across diverse industries. However, the findings reveal an imbalance in the diversification of green activities, with many sectors still lacking significant green job integration. Notably, certain areas such as utilities, transportation, and renewable energy remain underrepresented in green activities, despite their critical importance to sustainable economic growth.

The data highlights numerous opportunities for expanding green jobs in Egypt. In the private sector, expanding green practices in industries like transportation, retail, and construction could drive economic diversification and improve environmental outcomes. For example, transitioning to electric or hybrid vehicles in goods transportation, promoting eco-friendly retail practices, and scaling up green building projects could create substantial green job opportunities while reducing Egypt's carbon footprint. Furthermore, the energy sector offers significant potential for green job growth. The presence of green activities in oil extraction demonstrates the possibility of greening traditional industries. However, Egypt can achieve a larger impact by shifting its focus to renewable energy production, such as solar and wind power, which not only aligns with the global energy transition but also has the potential to create a wide range of high-skill green jobs.

In addition, the education and healthcare sectors can further enhance their green credentials by integrating comprehensive environmental strategies. For instance, investing in eco-friendly infrastructure for schools and hospitals and developing curricula that prioritize environmental literacy could generate green jobs while fostering a culture of sustainability. To fully capitalize on these opportunities, targeted policies are needed to promote green job creation across sectors. Incentives for businesses to adopt sustainable practices, investment in renewable energy, and public-private partnerships in agriculture and construction can drive the expansion of multi-dimensional green jobs.

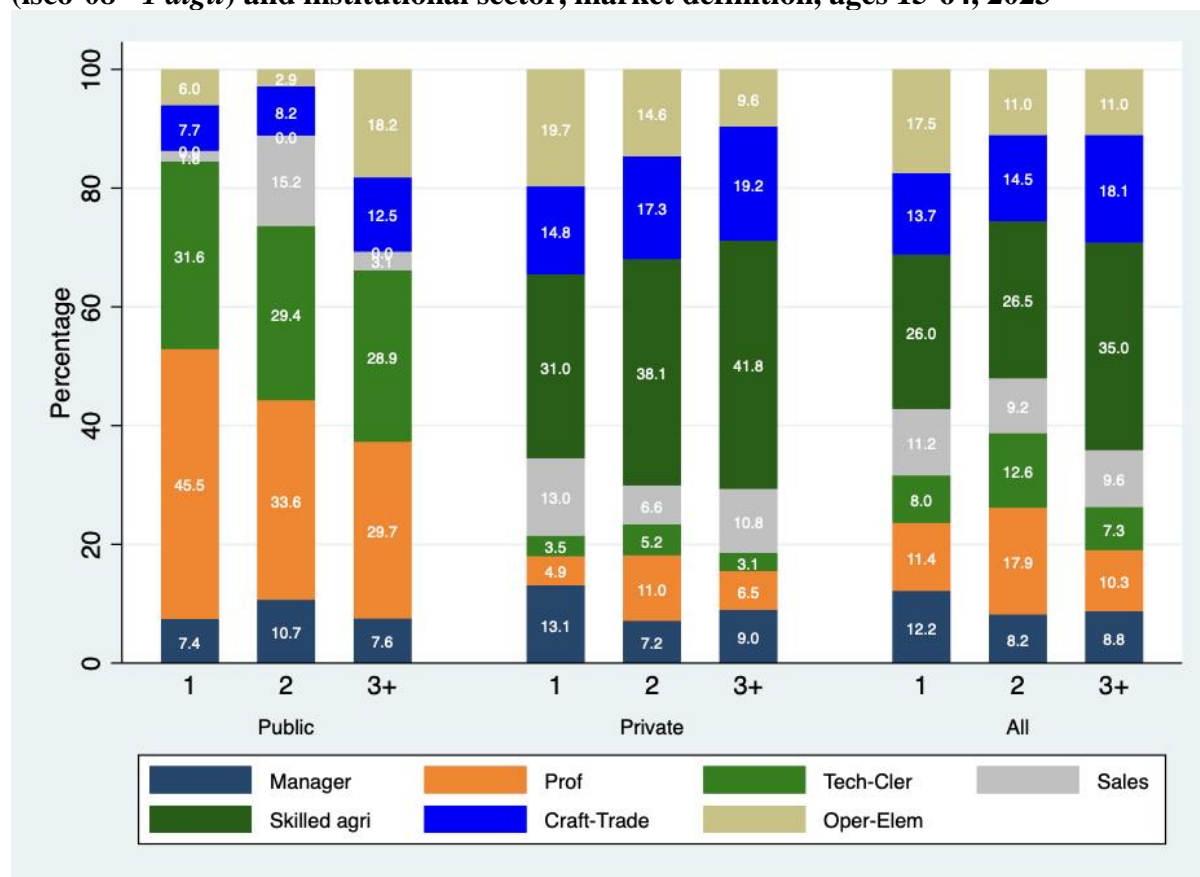
We now turn to the distribution of employment in green activities by occupation and institutional sector, specifically focusing on the number of green aspects integrated into these jobs. Figure 20 classifies occupations into several categories based on the ISCO-08

classification as follows: Managers and professionals (Prof); technicians and associate professionals as well as clerical support workers grouped as technical-clerical (Tech-Cler); service and sales workers (Sales); skilled agricultural, forestry, and fishery workers (Skilled Agri); craft and related trades workers (Craft-Trade); and plant and machine operators, assemblers, and elementary occupations (Oper-Elem). The distribution of green activities by occupation reveals several important trends. First, jobs with one green aspect dominate the managers and plant and machine operators, assemblers, and elementary occupations categories. However, the presence of jobs with two or more green aspects is especially concentrated in skilled agricultural, professional roles, and craft and related trades workers, where workers are likely responsible for implementing or managing more complex sustainability initiatives.

The figure demonstrates that while the integration of green aspects into employment is becoming more common, there is still a need to expand the adoption of multi-dimensional green practices across all occupations. Skilled agricultural, forestry, and fishery workers lead the way in adopting comprehensive green strategies, while other occupational categories, particularly technicians and associate professionals, clerical support workers, managers, sales, and plant and machine operators, assemblers, and elementary occupations are slower to integrate broader sustainability measures. Expanding training and capacity building in green skills across all sectors and occupations will be crucial to enhancing the green economy and ensuring a just and sustainable transition. Skilled agricultural, forestry, and fishery workers have a high proportion of green activities with one green aspect (31 percent). However, this category shows an increasing integration of two and three or more green aspects in the private sector (38.1 percent and 41.8 percent, respectively), reflecting a growing complexity in environmental responsibilities, where basic environmental practices like resource efficiency, land management, and eco-friendly products are common.

An analysis of the distribution of employment in green activities with three or more green aspects by occupation highlights distinct trends. The occupation with the highest share of green jobs is skilled workers in field crops and vegetables, where 30 percent of green jobs are concentrated. Notably, this is almost entirely dominated by the private sector (36 percent), spotlighting the critical role of agriculture in advancing green jobs. These workers contribute to environmentally friendly farming techniques, such as efficient water usage, crop rotation, and organic cultivation, which are essential for Egypt's agricultural sustainability and food security.

**Figure 20. Distribution of employment in green activities (in percentage) by occupation (isco-08 - 1 digit) and institutional sector, market definition, ages 15-64, 2023**



Source: Authors' calculations based on the ELMPS 2023.

Other eminent occupations with significant green jobs include other service managers not elsewhere classified, contributing 7.3 percent of total green jobs, and concrete structure builders and the like, representing 5.4 percent. Both occupations are predominantly driven by the private sector. These findings point to the private sector's leadership in roles that require innovation and technical expertise, particularly in managing services and implementing sustainable construction practices. Pipe and plumbing workers stand out as a key group within the public sector, with 5.8 percent of green jobs in this occupation compared to 2.8 percent in the private sector. The dominance of public sector employment in this role suggests a reliance on government policies and investments to drive green initiatives, particularly in utilities and water management.

Other occupations with important, albeit smaller, contributions to green jobs include concrete structure builders, house builders, and civil engineers, with green job shares of 5.4, 3.3, and two percent, respectively. These occupations play an essential role in the construction sector, where the adoption of green building practices is gaining momentum. Retail and sales-related occupations, such as shop and shop owners (2.2 percent) and shop salesmen and their assistants (2.5 percent), also show some involvement in green activities, entirely driven by the private sector. However, their relatively low share suggests significant room for growth, particularly through public-private collaborations to promote sustainable retail practices.



Interestingly, subsistence workers in animal/poultry farming (2.5 percent) and private car, taxi, and light transport drivers (1.5 percent) demonstrate smaller contributions to green jobs, entirely concentrated in the private sector. These roles represent untapped potential for greening practices, such as eco-friendly farming methods and the adoption of low-emission or electric vehicles in transportation. The data underscores the significant role of the private sector in driving green jobs, particularly in agriculture, construction, and retail. However, it also reveals opportunities for the public sector to expand its involvement in green initiatives, particularly in construction and water infrastructure. For example, public investment infrastructure development could help address gaps in the agricultural and construction sectors. Additionally, occupations like retail workers, subsistence farmers, and transport drivers could benefit from targeted policies to promote greener practices. For instance, supporting small farmers with access to sustainable technologies and providing incentives for businesses to adopt eco-friendly retail operations could significantly increase the prevalence of green jobs in these sectors. Similarly, fostering the adoption of low-emission transportation and enhancing the infrastructure for electric vehicles could create new green job opportunities in the transport sector.

#### ***4.2. Educational requirement and matching***

This section examines the educational requirements for green and non-green jobs across public and private sectors, with a focus on gender differences and the mismatch between workers' educational levels and job demands. Using the ILO's classification system, educational requirements are categorized into three levels: primary or less, secondary, and tertiary education. The analysis highlights the disparities in academic requirements and matching across different employment sectors, particularly emphasizing challenges in the private sector and for women in green jobs. The aim is to explore the relationship between the educational qualifications of workers and the demands of green and non-green roles, delving into the extent of underqualification, overqualification, and appropriate matching.

Figure 21 illustrates the distribution of educational levels required for various jobs in green and non-green activities not only across public and private sectors, but also segmented by gender. The educational levels are classified as primary or less, secondary, and tertiary, and are determined using the ILO conversion table, which aligns occupation types with skill and educational requirements.

The education requirements show that in the public sector, tertiary education is unmistakably dominant across green and non-green activities (62.6 percent and 66.7 percent, respectively). In the private sector, however, there is a different pattern, with secondary education being highly pronounced in green and non-green jobs amounting to 72.2 percent and 73 percent, respectively.

In the public sector, most men employed in both green and non-green activities have tertiary education standing at approximately 60 percent in green activities and 58 percent in non-green

activities. However, a notable percentage (35.1 percent) of men in green public sector jobs have secondary education, which is slightly lower than the 36.6 percent observed in non-green jobs. In the private sector, the educational requirements are more concentrated across the levels. About 71 percent of men in green jobs have secondary education, compared to about 74 percent in non-green activities. This shows a shift away from tertiary education dominance in the private sector compared to the public sector. Women in the public sector predominantly require tertiary education across both green (90.2 percent) and non-green jobs (86.1 percent). The private sector shows a different trend for women, with secondary education being the most common requirement for both green and non-green jobs (83.1 percent and 67.2 percent, respectively).

**Figure 21. Educational requirements by green and non-green activities, gender and sector, ages 15-64, 2023**



Source: Authors' calculations based on the ELMPS 2023.

Figure 22 provides a detailed comparison of educational matching across green and non-green activities by gender and sector for workers aged 15-64 in 2023. Educational matching refers to whether workers' educational levels align with the requirements of their jobs, categorized into three groups: appropriately matched, overqualified (having more education than required), or underqualified (having less education than required). This figure is broken down by public and private sector employment, allowing for a more nuanced understanding of how educational matching varies between men and women and across different types of employment. Examining the workforce, in green activities, 50.5 percent of workers are appropriately

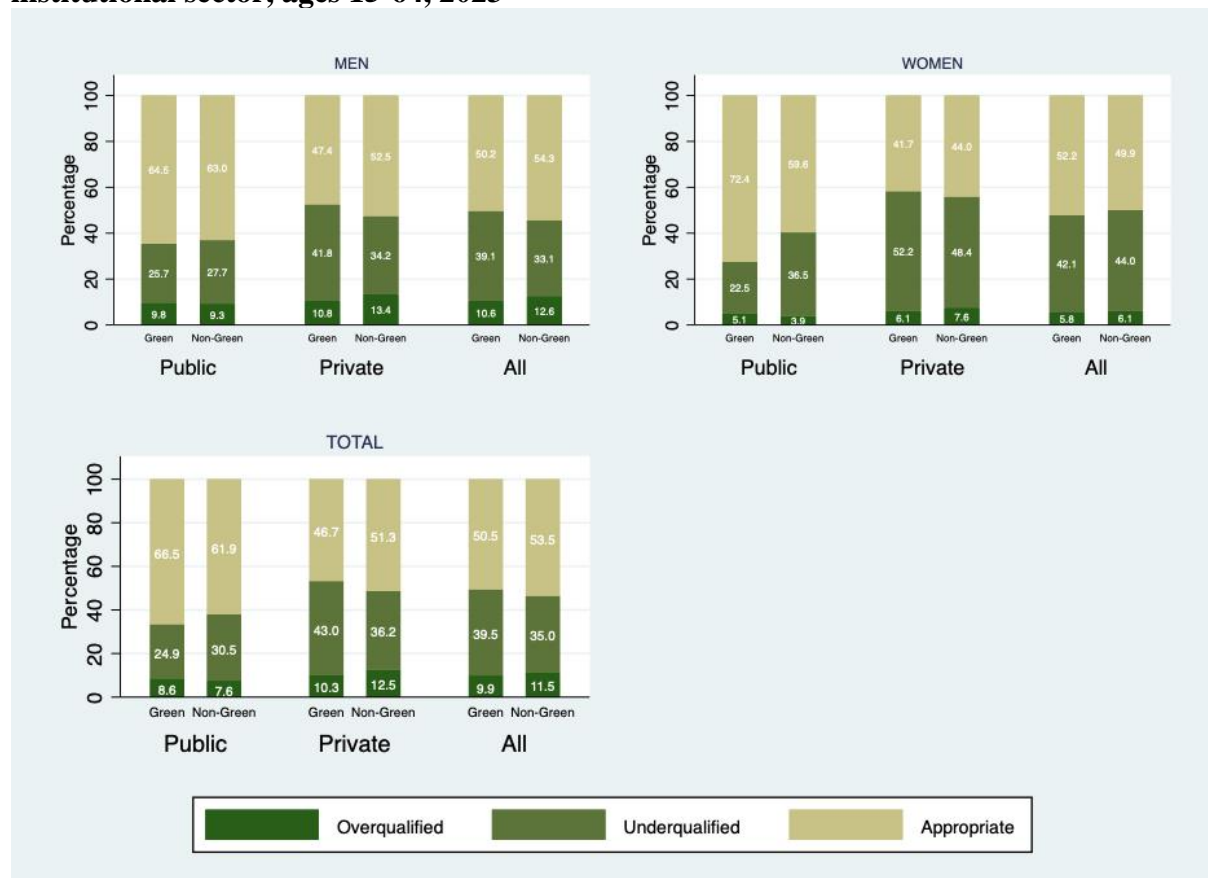
matched, compared to 53.5 percent in non-green activities. Overqualification is slightly more prevalent in non-green jobs (11.5 percent) than in green jobs (9.9 percent). The public sector demonstrates a higher degree of appropriate matching. In green activities, 66.5 percent of workers are appropriately matched, compared to 61.9 percent in non-green activities. Overqualification is more frequent in public sector green jobs (8.6 percent) compared to non-green jobs (7.6 percent). The private sector, however, shows a lower percentage of appropriately matched workers, particularly in green activities where only 46.7 percent of workers are appropriately matched, compared to 51.3 percent in non-green activities. Overqualification is significantly higher in non-green activities in the private sector (12.5 percent) compared to green activities (10.3 percent).

This disparity in educational matching between green and non-green activities raises important questions about the structure of green job opportunities in both sectors. In green jobs, particularly within the private sector, the higher rates of overqualification suggest that these roles may not yet offer a sufficient range of skill-specific opportunities to meet the qualifications of the workforce. The figure also illustrates a substantial degree of underqualification, particularly in green activities, where over a third of workers in green jobs do not meet the formal educational requirements. This suggests that as the green economy expands, there may be a growing need for education and training programs to equip workers with the skills required for these roles.

In the public sector, men involved in both green and non-green activities are largely appropriately matched to their positions, indicating that their educational qualifications align well with job requirements. Approximately 64.5 percent of men in green activities are appropriately matched, compared to 63 percent in non-green activities. Underqualification is relatively low across both sectors and types of activities for men. In the public sector, 25.7 percent of men in green activities and 27.7 percent in non-green activities are underqualified, suggesting that most workers in the public sector meet or exceed the educational requirements of their roles. However, there is a slight tendency toward overqualification in green activities, with 9.8 percent of men in green jobs being overqualified, compared to 9.3 percent in non-green activities. This suggests that while the public sector generally aligns workers' qualifications with job requirements, there may be room for better utilization of the skills of those employed in green activities.

In the private sector, the majority of men (47.4 percent in green and 52.5 percent in non-green) are still appropriately matched. Underqualification remains prominent in green activities, where 41.8 percent of men in green jobs are underqualified, significantly higher than the 34.2 percent in non-green jobs. This suggests that the skills needed for green jobs in the private sector may outpace the educational levels of many workers currently filling these roles, reflecting a potential gap in education and training for these emerging industries. Overqualification is higher in non-green activities (13.4 percent) than in green activities (10.8 percent), indicating that private sector non-green jobs are more likely to employ overqualified men.

**Figure 22. Educational matching by green and non-green activities, gender and institutional sector, ages 15-64, 2023**



Source: Authors' calculations based on the ELMPS 2023.

For women, the pattern is similar but with even more pronounced levels of underqualification in green jobs. In the public sector, women in green activities experience an underqualification rate of 22.5 percent, compared to 36.5 percent in non-green activities. This suggests a major skills gap for women working in public sector jobs. At the same time, a larger proportion of women in green public sector jobs are overqualified (5.1 percent) compared to those in non-green activities (3.9 percent). In the private sector, the underqualification rate for women in green activities rises even further, with 52.2 percent of women in green jobs being underqualified. This figure is more than double the underqualification rate for women in green public sector jobs (22.5 percent). Overqualification is higher in non-green jobs (7.6 percent) than in green jobs (6.1 percent), suggesting that, like men, women in non-green jobs may be taking positions below their educational level, whereas women in green jobs may struggle to meet the educational demands.

Underqualification is a concern in green activities, which generally require more specialized skills and education, leading to a higher incidence of workers with inadequate qualifications. Moreover, it remains a persistent issue in non-green sectors, particularly for women in the private sector, where up to 48.4 percent of workers are underqualified for their roles. This suggests that industries are more willing to employ workers without sufficient education, potentially due to labor shortages or a lower emphasis on formal qualifications. Addressing

underqualification is just as important as tackling overqualification, especially as economies transition toward greener jobs. Ensuring that workers have access to the necessary education and skills training to meet the demands of green activities will be crucial to reducing underqualification and fostering a more productive, skilled labor force. Furthermore, policies should also focus on upskilling workers in non-green sectors, particularly those who may lack the educational background required for their roles, to enhance productivity and labor market resilience.

## **5. Conclusion**

The findings emphasize both the progress and the challenges within Egypt's labor market regarding green jobs. The paper highlights significant disparities in green and non-green activities between the public and private sectors, and between men and women. The public sector, particularly in green activities, offers considerably better employment benefits compared to the private sector, where benefit coverage, especially for women, remains limited. While green jobs are evident in key sectors like agriculture, manufacturing, and administration, education, and health, most of these jobs focus on a single environmental dimension. Expanding multi-dimensional green jobs, especially in sectors such as manufacturing, utilities, and transportation, will be essential to fostering sustainable economic growth and improving Egypt's environmental resilience. A broader approach to green activities can help address long-term national challenges such as climate change, resource scarcity, and sustainable development.

A notable finding is that multi-aspect green jobs are mostly concentrated in traditional industries like agriculture and manufacturing, highlighting the private sector's significant role in promoting environmental improvements across multiple dimensions. Conversely, the public sector—particularly in administration, education, health, and utilities—continues to lead in broader sustainability initiatives, often driven by public policies that emphasize comprehensive environmental action. However, the distribution of green activities reveals an imbalance, with 60 percent of green jobs addressing only one environmental aspect. This indicates that while green jobs are spread across various sectors, their scope remains limited, with considerable potential to expand by encouraging multi-aspect green activities. Sectors like transportation, utilities, and accommodation and food services are well-positioned to adopt more comprehensive environmental measures, contributing to a stronger green economy.

Occupational differences in the integration of green activities were also identified. For instance, agricultural and forestry workers exhibit a relatively higher share of jobs with multiple green aspects, reflecting the industry's shift toward sustainable practices that address diverse environmental challenges such as land and water management and eco-friendly products. On the other hand, managers and elementary occupation workers tend to engage in green activities with fewer environmental dimensions, suggesting that these roles have yet to fully integrate comprehensive green practices.

The paper also underscores the critical role of educational requirements in accessing green jobs. Tertiary education remains a key requirement for green and non-green jobs, especially in the public sector, where more than 60 percent of employees have a university-level education. In the private sector, the prevalence of underqualification of workers highlights a significant educational mismatch, particularly affecting women. The predominance of secondary education among women limits access to high-skill green jobs, where advanced skills and tertiary education are often prerequisites. Women, already underrepresented in green employment, face additional barriers in securing roles that require specialized knowledge or technical ability. Bridging this gap is critical to empowering women in the private sector and fostering their participation in greening the Egyptian economy. Additionally, addressing educational mismatches, particularly underqualification in green activities, is crucial to maximizing the potential of Egypt's labor force in green industries. Policies that align educational qualifications with the demands of green jobs are essential to ensuring that green sectors provide ample opportunities for career advancement and skills development. By integrating education and green activity strategies, Egypt can strengthen its workforce, promote gender equality, and accelerate sustainable economic development.

Although Egypt has made progress in expanding green activities, this paper identifies several areas for improvement. Developing multi-dimensional green jobs, addressing educational mismatches, and promoting equitable access to green activities across genders and sectors are critical for building a more sustainable and inclusive economy.

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