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National Forum on the
Future of Work in Egypt
Joining Forces for Tomorrow and Beyond

The Promise of Information and Communication Technology (ICT) Jobs in Egypt

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National Forum on the
Future of Work in Egypt
Joining Forces for Tomorrow and Beyond

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Abstract

This report examines the growth of ICT jobs in Egypt, where ICT jobs are defined as (1) ICT occupations in ICT industries, (2) Non-ICT occupations in ICT industries, and (3) ICT occupations in non-ICT industries. The analysis uses microdata from nationally-representative annual waves of the official Labour Force Survey (LFS) from 2009 to 2021 complemented by insights from interviews with 17 experts and key informants. The findings of this report are the following. First, although ICT employment makes up a small share of total employment, it grew rapidly between 2009 and 2021, three times as fast as the average annual growth rate of non-ICT jobs. Second, women's employment in ICT jobs expanded whereas it contracted in non-ICT jobs, underscoring the promising role of ICT jobs in providing opportunities for women in an otherwise inhospitable private sector labour market. Third, ICT jobs recruit increasingly more tertiary educated workers than non-ICT jobs, and the proportion of workers with technical secondary education fell over time. Fourth, data entry, receptionists, call centres and operators, followed by tec hnical assistants and sales represent the largest two occupations in ICT employment, and the fastest growing over time. Fifth, the characteristics of ICT jobs are at stake, with declining real wages and stalling social insurance coverage rates for men and falling ones for women, indicating potential struggles in the patterns ICT job creation.

JEL Classifications : J21, J24, J38, L86, L96.

Keywords: ICT, job creation, gender, Egypt, MENA.

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GENERAL ABBREVIATIONS AND ACRONYMS

BPO	Business Process Outsourcing
BPS	Business Process Services
CAPMAS	Central Agency for Public Mobilization and Statistics
ELMPS	Egypt Labour Market Panel Survey
ER&D	Engineering Research & Development
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
ICT	Information and Communication Technology
ISCO	International Standard Classification of Occupations
ITS	Information Technology Services
KIIs	Key Informant Interviews
KS	Knowledge Services
LFS	Labour Force Survey
MCIT	Ministry of Communications and Information Technology
MENA	Middle East and North Africa
MoETE	Ministry of Education and Technical Education
MoHE	Ministry of Higher Education and Scientific Research
MPED	Ministry of Planning and Economic Development
NSRP	National Structural Reform Programme
PISA	Programme for International Student Assessment
SMEs	Small and Medium Enterprises
TIMSS	Trends in International Mathematics and Science Study

Executive Summary

This report examines the prospects for growth of ICT jobs in Egypt, where ICT jobs are defined as (1) ICT occupations in ICT industries, (2) Non-ICT occupations in ICT industries, and (3) ICT occupations in non-ICT industries. This study investigates the growth of ICT jobs in the Egyptian labour market, the composition of the ICT workforce in terms of educational credentials, the skills required, the growing occupations within the ICT workforce, and working conditions in ICT jobs. The analysis uses microdata from nationally-representative annual waves of the official Labour Force Survey (LFS) from 2009 to 2021 complemented by insights from interviews with 17 experts and key informants. After showing the overall picture of ICT employment in Egypt, including public and private sector employment, the analysis focuses only on the private sector.

ICT jobs, although a small share of employment, grew rapidly.

Although ICT jobs make up a small fraction of total employment in Egypt, their share grew rapidly from 1.4% of employment in 2009 to 1.9% in 2021; the result of an average annual growth rate of 4.1% in ICT jobs. ICT jobs in the private sector grew even faster at an average annual rate of 5.5%. The growth of overall ICT employment is driven by growth in ICT occupations in non-ICT industries reflecting the ongoing digital transformation of the economy.

ICT jobs represent a tremendous potential source of employment for women.

Between 2009 and 2021, women became substantially more likely to work in ICT jobs. By 2021, 2.3% of employed women worked in ICT jobs, up from 1.0% in 2009, marking an average annual growth rate of 6.4% in female ICT employment. In the private sector, women's employment in ICT expanded even faster at an average annual rate of 10%. This contrasts with contracting women's employment in non-ICT jobs at an annual average rate of 1% overall (public and private sector), and 1.4% in the private sector. Therefore, the growth of ICT jobs represents a tremendous opportunity to increase women's employment in an otherwise inhospitable labour market.

Workers with tertiary education make up a growing majority of the ICT workforce.

ICT jobs are 4 to 4.7 times more likely to recruit workers with tertiary education than non-ICT jobs. Also, the proportion of tertiary educated workers in the ICT workforce in the private sector increased from 43% in 2009 to 63% in 2021. This implies a shrinking proportion of workers with other education levels, particularly workers with technical secondary education, whose proportion fell from 36% in 2009 to 24% in 2021.

The ICT workforce is more likely to have educational credentials specialised in ICT over time, but more so among the tertiary educated than among the technical secondary educated.

Although workers with ICT specialised education are still only a small fraction (1.8%) of the Egyptian workforce, they represent a substantial fraction of ICT employment. Workers in ICT jobs are increasingly likely over time to have ICT specialised education degrees, especially among the tertiary educated, where those with ICT specialised education represent 37% of the total. This is not the case for ICT workers with technical secondary education who are considerably less likely to be ICT specialised. Basic digital skills are key for ICT jobs, including basic literacy (reading and written comprehension), mathematics and statistics, and computer skills.

Lowering the transaction costs of doing business, adapting social security systems, and promoting skills development are key priorities to boost sustainable and inclusive growth of ICT employment.

Major national efforts are underway by the Government of Egypt to promote the ICT sector, such as identifying ICT as one of the most promising three sectors in terms of contributions to growth, employment, and exports in the National Structural Reform Program. The Government has several reform measures to (1) increase the contribution of the ICT sector in GDP and accelerate the digital transformation, (2) boost ICT exports in Business Process Outsourcing/Knowledge Process Outsourcing, electronic products, and IT consultancy services, and (3) raise the private sector capacity in job creation, promote the development of necessary skills for the future of work, and support small and medium enterprises (SMEs). Additional key policy areas to ensure sustainable and inclusive job growth in ICT should include improving the quality of the business environment and lowering the transaction cost of doing business; expanding the supply of ICT specialists and mainstreaming basic digital skills throughout the education system; adapting social insurance schemes to all forms of employment, including non-standard ones; and sustaining women's employment growth in ICT jobs.

CHAPTER 1 Introduction

Promoting information and communication technology (ICT) industries with a focus on the offshoring and outsourcing industry, can play a major role in employment creation in Egypt. Egypt has a dynamic ICT industry that can potentially grow into a major purveyor of tradable services and is consistently ranked among the most favoured global locations in Business Process Outsourcing (BPO). For instance, the Ryan Strategic group ranked Egypt 6th out of 50 countries as the most favoured offshore contact centre after South Africa and India in first place, Poland and Philippines in third place, and Malaysia in fifth place (Ryan Strategic Advisory, 2022). Also, South Africa and Egypt were the two African locations leading the entire continent for BPO services, according to the recent Ryan Strategic Advisory report in 2022.

> *"Out of the roughly 50 offshore and nearshore locations under analysis in this year's research, Egypt was the most consistently ranked across all demand markets."*
>
> **Ryan Strategic Advisory (2022).**

Egypt's position in the BPO industry outperforms not only all other MENA and African countries, but also many other high-income countries like Germany, France, Spain, and Japan. According to the Global Services Location Index 2021, Egypt ranked first in the MENA region and among African countries and ranked 15th globally out of 60 countries in the overall score. This ranking is likely due to its good performance in different aspects of the index, which include financial attractiveness, people skills and availability, business environment, and digital resonance[1]. The main reasons behind Egypt's competitive advantage as an offshoring destination include its distinct location at the middle of the world with a similar time zone to Europe, the substantially lower labour cost in Egypt than that prevailing in other countries, Egypt's sizable workforce, and the ongoing government efforts to support the digital transformation of the economy and to develop the offshoring industry (German Outsourcing Association, 2020).

How can Egypt capitalise on its consistent comparative advantage in ICT to achieve sustainable and inclusive job creation?

To answer this question, this report examines patterns of ICT employment over 13 years, to understand the potential of job creation, but also discusses challenges, risks and potential areas of intervention. The report relies on nationally representative microdata from the official Labour Force Survey (LFS) from 2009 to 2021, to answer the following questions:

1. What is the share of ICT employment (and its components) in total employment? How did this share evolve over the period between 2009 and 2021?
2. What are the education levels of the ICT workforce? And how specialised are ICT workers?
3. What is the occupational structure of the ICT workforce and its evolution over time?
4. What are the working conditions in ICT employment?

[1] Digital resonance is a new metric that scores countries on digital skills of the labour force, digital outputs, the amount of corporate activity, legal protections of intellectual property, and other key elements of business activity in the digital age (see https://www.kearney.com/digital/gsli for more details).

Following this introduction, chapter 2 presents the definition of ICT jobs and the different data sources that are used in the analysis. Chapter 3 discusses the performance of the ICT industry at the macroeconomic level in Egypt. Chapter 4 presents the key findings of the main questions addressed in this report, namely the evolution of the share of ICT employment in the labour market, the education structure of the ICT workforce and the prevalence of ICT specialists, the growing occupations along with the skills required for ICT jobs, and the working conditions in ICT jobs. Chapter 5 provides a summary of findings and discusses the major national efforts undertaken by the government to promote the ICT sector, and key policy recommendations derived from the findings.

CHAPTER 2 Definitions and Data Sources

2.1 Definition of ICT jobs

Data on the size of ICT employment are usually reported for two ICT industries, namely telecommunications and information. However, the number of jobs in these two ICT industries does not represent all ICT work opportunities in the labour market. ICT employment may also exist in other industries because of the widespread adoption of digital technology in many non-ICT industries for which ICT specialists are needed. For example, the growing digitalization of banking services requires hiring ICT experts in the banking industry to run these digitised operations. Because limited data exists on ICT employment outside of ICT industries, this report bridges this knowledge gap by adopting a more comprehensive approach to measuring ICT employment, spanning across ICT industries and non-ICT industries. ICT employment includes three categories of workers, as follows, and as illustrated in table 1:

1. Workers in ICT occupations in ICT industries (e.g., telecommunications engineers, computer programmers, technicians, data entry, call centres and telephone operators etc.)
2. Workers in ICT occupations in non-ICT industries (e.g., software developers in the banking sector, call centres in the real estate sector, computer engineers in the construction or manufacturing sector, software analysts in the health sector, etc.)
3. Workers in non-ICT occupations in ICT industries (e.g., project administrators, accountants, human resources, drivers, etc.).

Our definition of ICT employment includes this third category of workers because the growth of employment in ICT industries is not only confined to purely ICT occupations such as engineering and software development, but also involves the growth of support activities and occupations such as translation, human resources, finance, legal services, and research (German Outsourcing Association, 2022).

Table 1 Scope of ICT employment

Definition of ICT Jobs		
	ICT industries 1. Telecommunications 2. Computer programming activities 3. Computer consultancy and computer facilities management 4. Other information technology and computer service activities 5. Data processing, hosting and related activities	**Non-ICT industries**
ICT occupations*: 1. Computing professionals 2. Electronics and telecommunications engineers 3. Electronics and telecommunications engineering technicians 4. Computer assistants 5. Process control technicians 6. Technical and commercial sales representatives 7. Data entry & calculating machine operators. 8. Receptionists and information clerks (including call centres) 9. Telephone switchboard operators 10. Electronics fitters, mechanics, and servicers 11. Electrical and electronic equipment assemblers	**ICT employment**	**ICT employment**
Non-ICT occupations	**ICT employment**	**Non-ICT employment**

Source: Authors' illustration. *ANNEX 2 TABLES

Annex Table 1 lists the ISCO-88 and the corresponding ISCO-08 codes for these ICT occupations.

2.2 Data sources

This report uses microdata from 13 annual waves of the Labour Force Survey (LFS) from 2009 to 2021 (OAMDI, 2016a, 2016b, 2016c, 2017, 2018a, 2018b, 2018c, 2018d, 2019a, 2021a, 2021b, 2022, 2023). With a nationally representative sample of households, the LFS provides information on all workers, including those who work formally (having social insurance coverage) or informally (having no social insurance coverage). It also provides information on characteristics of their jobs in terms of employment status (wage work, employer, self-employed, unpaid family worker), their occupation, the industry in which they work, the type of workplace, job stability, whether the job is in or outside a fixed establishment, if it is covered by a legal employment contract and social insurance, in addition to a wealth of other information about the worker, such as age, education level, educational specialisation, marital status, city of residence, etc. For the analysis of skills, some of the findings are based on the Egypt Labour Market Panel Survey (ELMPS) of 2018 (OAMDI, 2019b). In addition to the quantitative results based on microdata from LFS and ELMPS, the report makes use of some of the results stemming from 17 Key Informant Interviews (KIIs), conducted by GIZ between November and December 2022, to provide potential insights for some of the quantitative findings. These interviews were conducted between November and December 2022 with representatives from different ICT fields, including fintech, e-commerce, e-banking, telecommunications, information and computer technology, etc. [2]

Data Sources

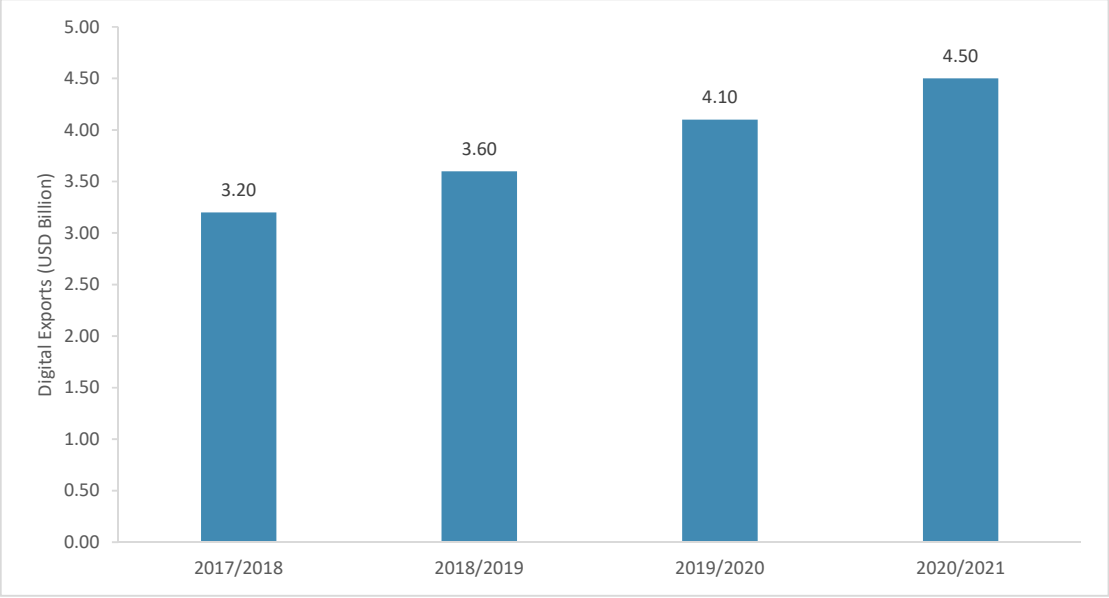
This report uses microdata from 13 annual waves of the Labour Force Survey (LFS) from 2009 to 2021. As, for the analysis of skills, some of the findings are based on the Egypt Labour Market Panel Survey (ELMPS). Additionally, the report makes use of some of the results stemming from 17 Key Informant Interviews (KII), conducted by GIZ between November and December 2022 to provide potential insights and reasons for some of our quantitative findings.

[2] See "*Qualitative Profiling of the Information and Communication Technology (ICT) Sector in Egypt: Skills, Enablers and Challenges"* for more details on the qualitative study conducted by GIZ as a complementary study to this quantitative report.

CHAPTER 3 Promising Performance for ICT Industries at the Macroeconomic Level

The ICT sector,[3] composed of the communication and information industries, has been identified as one of three promising sectors in the second phase of the **National Structural Reform Programme (NSRP)** launched in 2021, in the framework of Egypt's Vision 2030 (MPED, 2022). This is owing to the high growth, exports, and employment potential of the ICT sector, its strong interlinkages with other sectors in the economy, and its international competitiveness.[4] For instance, ICT industries' real GDP (in 2021 prices) grew rapidly from EGP 117.8 billion in 2016 to EGP 175.79 billion in 2021, reaching an average annual growth rate of 8% during this period.[5] This is in comparison to an average annual growth rate of 4.3% in total GDP over the same period. Also, from 2016 to 2021, real value-added per worker in ICT industries was, on average, around 4-6 times higher than that of the total economy; achieving one of the highest value-added per worker in the economy (ILO, 2021). Moreover, ICT industries bring a sizable amount of revenues to the Egyptian economy through the offshoring industry that includes Information Technology Outsourcing (ITO) and BPO. Over the same period, digital exports increased from $3.2 billion to $4.5 billion as shown in Figure 1; an average annual growth rate of 8.8% (German Outsourcing Association, 2022). In the framework of Egypt's digital strategy for the offshoring industry 2022-2026, the country aims to triple the size of its exports from the offshoring industry by 2026 (MCIT, 2022).

Figure 1 Evolution of digital exports (USD billion)



Source: German Outsourcing Association (2022)

[3] We use the term ICT sector interchangeably with ICT industries.
[4] See Section 5 for more details on the national measures to promote the ICT sector in the framework of the NSRP.
[5] GDP data from The Ministry of Planning and Economic Development (https://mped.gov.eg/GrossDomestic?lang=en. Last Accessed March 23rd, 2023)

In 2020/2021, the total size of investments in ICT industries reached EGP 30.5 billion, that is around 24% of the industries' value added in the same year. Also, due to the large amount of investments injected in the sector in the framework of the NSRP, the share of public ICT investments in total ICT investments jumped to 50% in 2020/2021, up from an average of 6% during 2011/2012 – 2019/2020, as most of ICT investments during this period were made by the private sector.

The offshoring industry in Egypt, traditionally classified into IT Services (ITS), Business Process Services (BPS), knowledge services (KS), Engineering Research & Development (ER&D), can potentially play an important role in ICT job creation. According to the Ministry of Communications and Information Technology (MCIT), offshoring provides services to more than 400 world offshoring players, including more than 10 of the Fortune 500 companies, serving offshoring demand for all of the four segments of the offshoring industry (MCIT, 2022). In 2020, the total size of export-focused employment in the industry was estimated to be more than 85,000 individuals, which constitutes around 0.32% of total employment in Egypt in the same year. Most of those workers were in BPS (60%), followed by ITS (32%), then by ER&D and KS (6.5% and 1.5%, respectively). Large companies provide around 70% of the total employment in the industry, while the remaining 30% is provided by small and medium companies (MCIT, 2022). The call centre segment of the BPS industry is estimated to have the highest employment potential not only among segments of the BPS industry but also among those of the offshoring industry as a whole (MCIT, 2022).

The Call Centre Industry in Egypt

The call centre industry started in Egypt in the 1990s and was dominated by the provision of customer service for the mobile telecommunication industry. Afterwards, the industry has increasingly developed to target providing customer and technical support services to the outsourcing markets of many countries such as the United Kingdom, France, Germany, the United States, Canada, and many other Arab countries. Workers are mostly young university graduates from diverse specialisations such as computer engineering, business administration, finance, tourism, etc., whose age ranges between 22 and early 30s (Staritz & Reis, 2013). Nevertheless, despite the high employment potential of the call centre industry in Egypt, its expansion raises inequality concerns between men and women and between high and low-skilled workers. Although women make up between 30-60% of the call centre workforce (depending on the segment in which they work in), men tend to get better positions and wages compared to women. For instance, women mainly hold frontline call centre positions, while men are concentrated in high-value segments that require engineering background and complex technical support. Men also are more likely to get promoted and move to high-value segments compared.

Table 2 Traditional Structure of the Offshoring Industry

Main Category	Subcategories
IT Services (ITS)	IT consulting - applications - testing - infrastructure services outsourcing - support and training - network consulting and integration
Business Process Services (BPS)	Contact centre - corporate services (e.g., finance and accounting - supply chain management) - vertical specific activities (e.g., banking and financial services – insurance – healthcare - travel and transportation - other high-tech services such as content moderation and speech recognition)
Knowledge Services (KS)	Program and change management - digital agency and marketing – analytics - market research and data services - legal services
Engineering Research & Development (ER&D)	Software - embedded (electronics) - core engineering

Source: MCIT(2022)

CHAPTER 4 Key Results: The Size and Evolution of ICT Employment in the Egyptian Labour Market

This chapter presents key findings on the four research areas of this study, specifically (1) the size and evolution of ICT employment (and its components) in total employment, (2) the composition of the ICT workforce in terms of education credentials and in terms of having ICT-specialised education, as well as the skills needed in ICT jobs, (3) the fastest growing occupations among the ICT workforce, and the main indicators on working conditions of the ICT workforce (share of wage employment, social security coverage, and monthly wages).

4.1 Size of ICT Employment in the Labour Market and Its Evolution Over Time

ICT employment is a small share of overall employment, yet it grew rapidly. Figure 2 shows that although ICT employment represents a small share of total employment, it grew rapidly from 1.4% (304,284 jobs) in 2009 to 1.9% (494,612 jobs) in 2021, at 4.1% per annum (p.a.) on average.[6] ICT employment, as defined in Table

[6] See
ANNEX 2 **TABLES**
Annex Table 1 the ISCO codes for ICT occupations.

Groups of occupations	ISCO-88 Title	ISCO-88 code	ISCO-08 Title
1. Computing professionals	Computer systems designers and analysts	2131	Systems analysts
	Computer systems designers and analysts	2131	Software developers
	Computer systems designers and analysts	2131	Web and multimedia developers
	Computer systems designers and analysts	2131	Software and applications developers analysts not elsewhere classified
	Computer systems designers and analysts	2131	Database designers and administrator
	Computer systems designers and analysts	2131	Systems administrators
	Computer systems designers and analysts	2131	Computer network professionals
	Computer programmers	2132	Web and multimedia developers
	Computer programmers	2132	Applications programmers
	Computer programmers	2132	Software and applications developers analysts not elsewhere classified
	Computing professionals not elsewhere classified	2139	Web and multimedia developers
	Computing professionals not elsewhere classified	2139	Software and applications developers analysts not elsewhere classified
	Computing professionals not elsewhere classified	2139	Database and network professionals n elsewhere classified

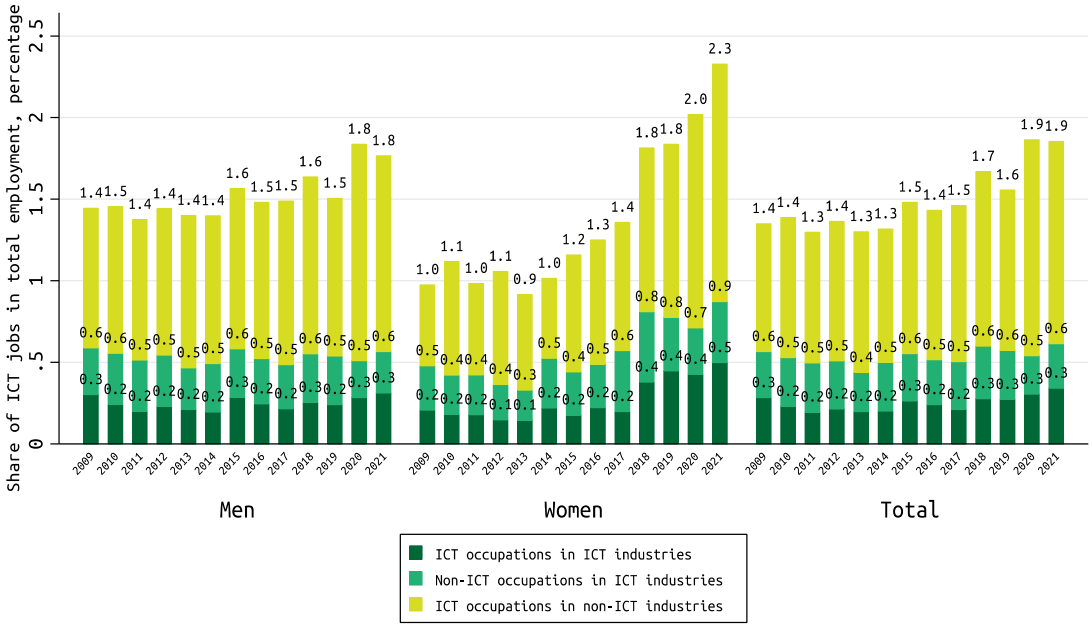
1, consists of all jobs in ICT industries (including ICT or non-ICT occupations) which represent 0.6% of total employment on average between 2009 and 2021, and of ICT occupations in non-ICT industries which represented 0.8% of total employment in 2009 and increased to 1.3% in 2021 (Figure 2).

2. Electronics and telecommunications engineers	Electronics and telecommunications engineers	2144	Electronics engineers
	Electronics and telecommunications engineers	2144	Telecommunications engineers
3. Electronics and telecommunications engineering technicians	Electronics and telecommunications engineering technicians	3114	Electronics engineering technicians
	Electronics and telecommunications engineering technicians	3114	Telecommunications engineering technicians
	Photographers and image and sound recording equipment operators	3131	Broadcasting and audio-visual technic
	Broadcasting and telecommunications equipment operators	3132	Telecommunications engineering technicians
4. Computer assistants	Computer assistants	3121	Information and communications technology user support technicians
	Computer assistants	3121	Computer network and systems technicians
	Computer assistants	3121	Web technicians
	Computer equipment operators	3122	Information and communications technology operations technicians
	Computer equipment operators	3122	Web technicians
5. Process control technicians not elsewhere classified	Industrial robot controllers	3123	Process control technicians not elsewh classified
6. Technical and commercial sales representatives	Technical and commercial sales representatives	3415	Information and communications technology sales professionals
7. Data entry & calculating machine operators	Data entry operators	4113	Data entry clerks
	Calculating-machine operators	4114	Data entry clerks
8. Receptionists and information clerks (including call centres)	Receptionists and information clerks	4222	Contact centre information clerks
	Receptionists and information clerks	4222	Client information workers not elsewhe classified
9. Telephone switchboard operators	Telephone switchboard operators	4223	Telephone switchboard operators
10. Electronics fitters, mechanics, and servicers	Electronics fitters	7242	Electronics mechanics and servicers
	Electronics fitters	7242	Information and communications technology installers and servicers
	Electronics mechanics and servicers	7243	Information and communications technology installers and servicers
	Telegraph and telephone installers and servicers	7244	Information and communications technology installers and servicers
	Electrical line installers, repairers and cable jointers	7245	Information and communications technology installers and servicers
11. Electrical and electronic equipment assemblers	Electrical-equipment assemblers	8282	Electrical and electronic equipment assemblers
	Electronic-equipment assemblers	8283	Electrical and electronic equipment assemblers

Source: Extracted from https://www.ilo.org/public/english/bureau/stat/isco/isco08/ [last accessed May 29th, 2023]

Annex Table 2 for the number of employed in ICT jobs by type of occupations and industries.

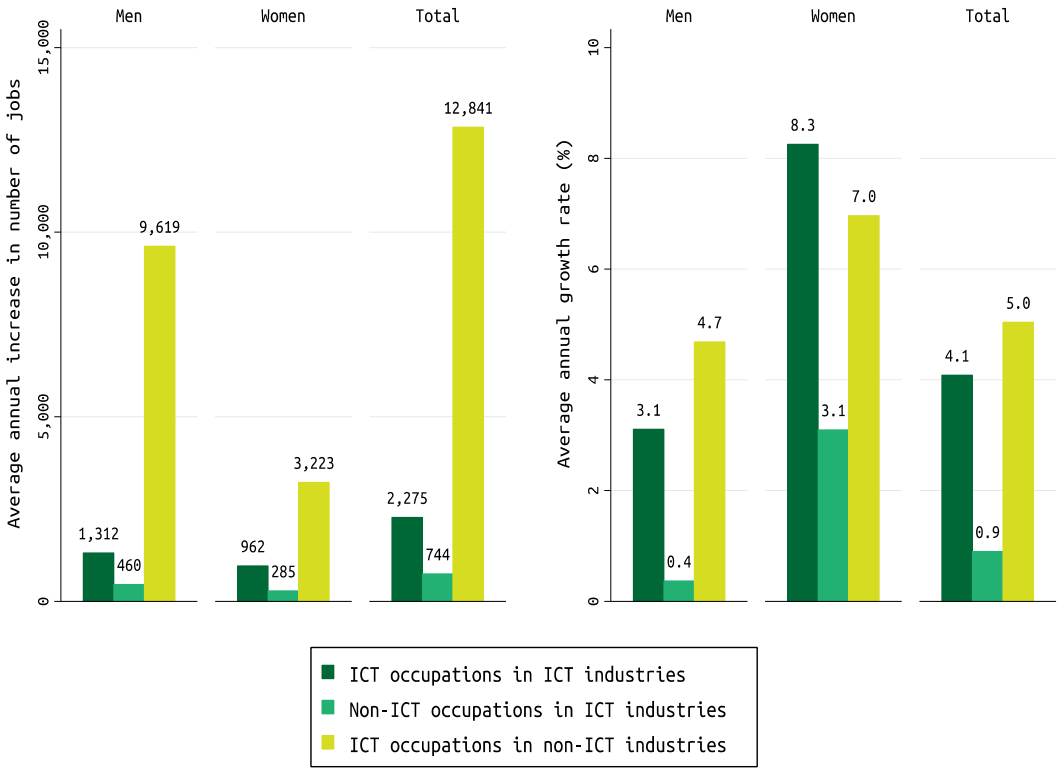
Figure 2 Share (%) of ICT employment in the labour market by type of ICT jobs, both public and private sectors



Source: Authors' calculations based on LFS 2009-2021.

The growth of ICT employment is driven by growth in ICT occupations in non-ICT industries. ICT occupations in non-ICT industries exhibited the largest increase in number of jobs between 2009 and 2021, with an average of 12,841 new jobs per year (left panel of Figure 3). This indicates the ongoing digital transformation of the economy, where non-ICT industries are increasingly hiring ICT specialists. ICT occupations in ICT industries had the second largest increase, with an average of 2,275 new jobs per year. ICT occupations in non-ICT industries increased in absolute terms more than ICT occupations in ICT industries as the size of employment (in terms of number of jobs) of non-ICT industries is substantially larger than that of the ICT industries. Figure 3 shows a relative measure of the growth of ICT jobs by showing the average annual growth rate in employment. It confirms that the most rapid growth rate was among ICT occupations in non-ICT industries, averaging 5.0% p.a. overall, faster for women (7.0% p.a.) than for men (4.7% p.a.). The second most rapid growth was among ICT occupations in ICT industries, at 4.1% p.a. overall, again growing much faster for women (8.3% p.a.) than for men (3.1% p.a.)

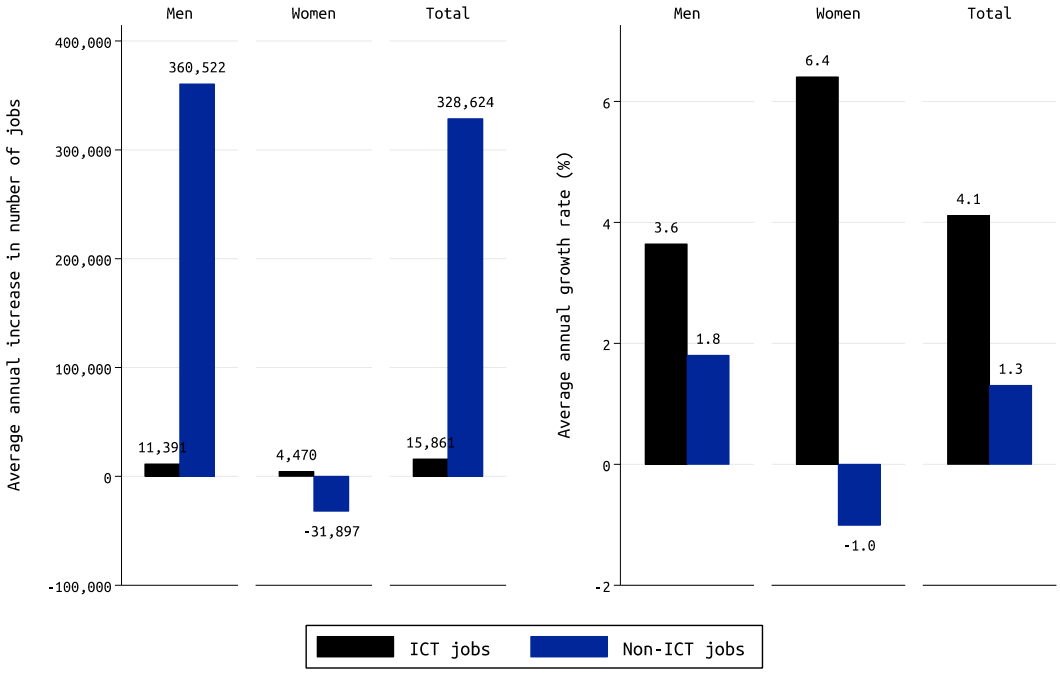
Figure 3 The increase in number of jobs (average annual) and growth rate (average annual, percentage) in ICT jobs by type of occupation/industry between 2009 and 2021, both public and private sectors, ages 15-64



Source: Authors' calculations based on LFS 2009-2021.

ICT jobs grew three times as fast as non-ICT jobs and is a source of expanding work opportunities for women. Figure 4 shows that the number of ICT jobs grew at 4.1% p.a. on average, that is three times as fast as the average annual growth rate of non-ICT employment (1.3% p.a.). Figure 4 also shows that women's employment in ICT jobs expanded at an average rate of 6.4% p.a., almost double the growth rate of men's ICT employment (3.6%). As a result of this fast expansion, women became more than twice as likely in 2021 to work in ICT jobs than in 2009 (2.3% vs 1.0% of total female employment). Women's employment in non-ICT jobs declined at a steady rate of 1% p.a. on average, reflecting the generally adverse opportunity structure for women in the Egyptian labour market (Assaad, Krafft, et al., 2022; ILO, 2021). ICT jobs are therefore a source of expanding opportunities for women in Egypt in an otherwise inhospitable labour market.

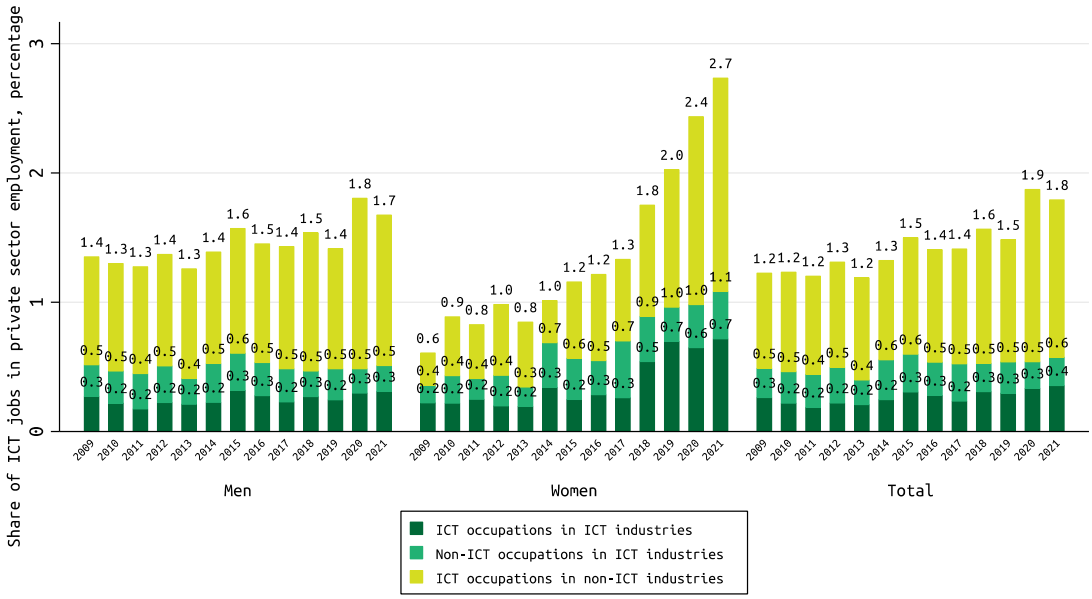
Figure 4 The increase in number of jobs (average annual) and growth rate (average annual, percentage) by sex between 2009 and 2021, ICT jobs versus non-ICT jobs, both public and private sectors, ages 15-64



Source: Authors' calculations based on LFS 2009-2021.

ICT jobs grew even faster in the private sector. Figure 5 shows the ICT employment share in total employment and its evolution over time for the private sector. The share of ICT employment in the private sector grew on average at 5.5.% p.a. between 2009 and 2021 to reach 1.8% in 2021, up from 1.2% in 2009. Such an average annual growth rate of ICT employment in the private sector outweighs that of ICT employment in both public and private sectors (4.1% as in Figure 4) and is 2.6 times the growth rate of non-ICT employment in the private sector (Figure 7)

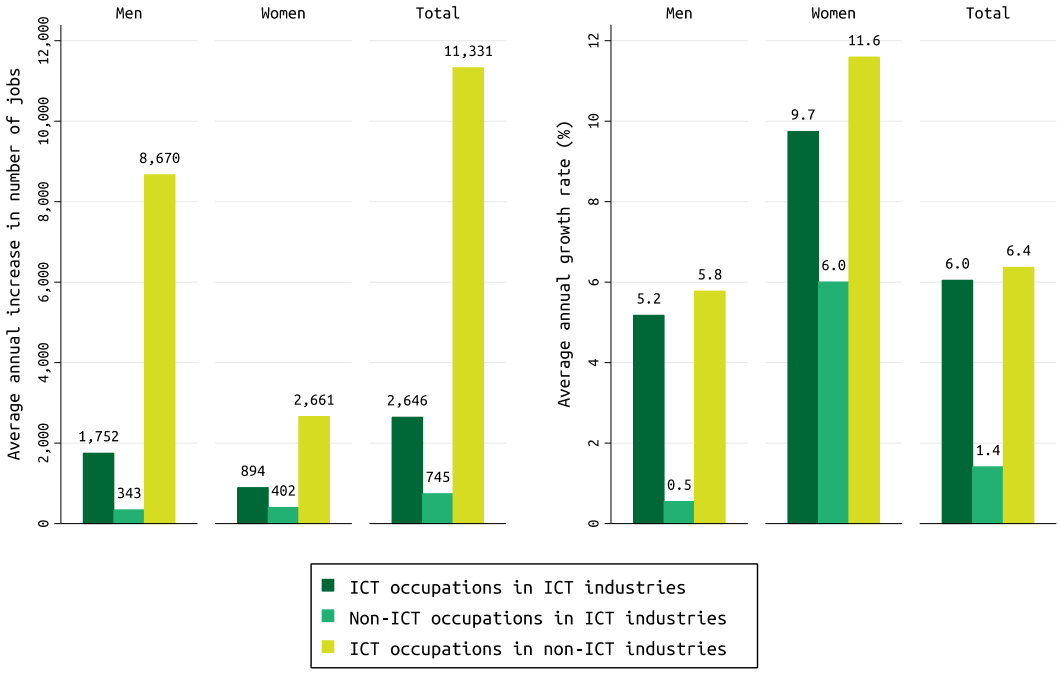
Figure 5 Share (%) of ICT employment (number of jobs) in private sector employment by type of ICT jobs, ages 15-64



Source: Authors' calculations based on LFS 2009-2021.

As with the overall national picture, the largest increase in ICT employment in the private sector happened in ICT occupations in non-ICT industries, again reflecting the increasing adoption of digital technology in the private sector (Figure 6). The increase in ICT occupations in non-ICT industries is higher than that in ICT industries as the size of non-ICT industries are substantially larger than the ICT industries. The number of private sector jobs in ICT occupations in non-ICT industries increased by 11,331 new jobs annually on average (Left panel of Figure 6). ICT occupations in non-ICT industries also exhibited the most rapid growth rate (6.4% p.a.), faster for women (11.6% p.a.) than for men (5.8% p.a.), as shown in the right panel of Figure 6). The second most rapid growth rate was among ICT occupations in ICT industries which grew at 6.0% p.a., on average, again faster for women (9.7% p.a.) than for men (5.2% p.a.).

Figure 6 The increase in number of jobs (average annual) and growth rate (average annual, percentage) in ICT jobs in the private sector by type of occupation/industry between 2009 and 2021, ages 15-64

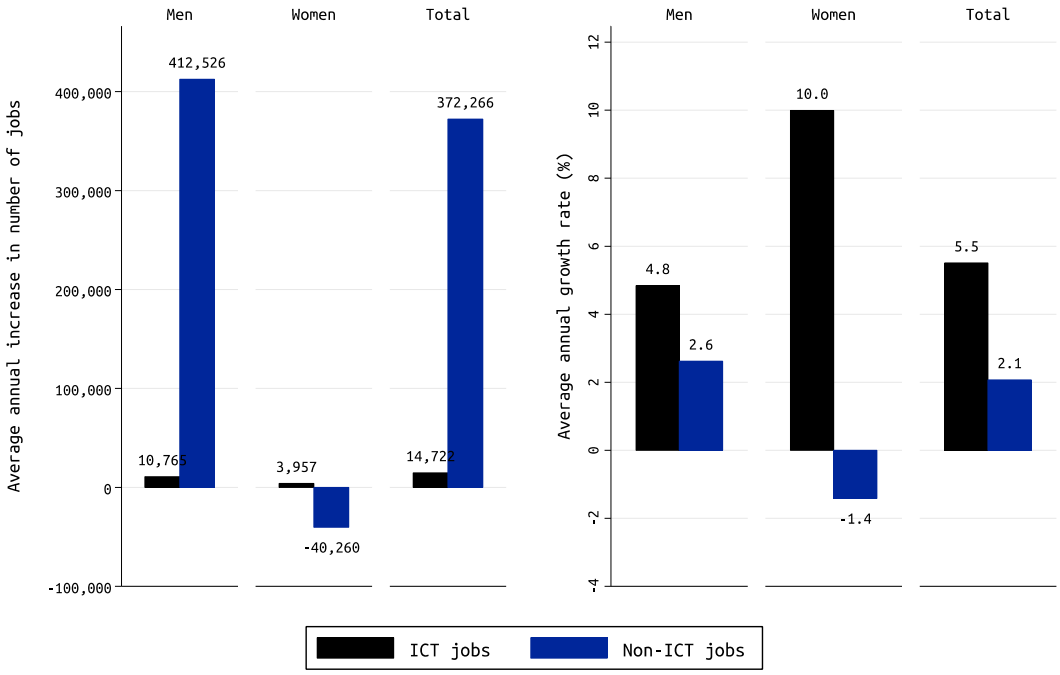


Source: Authors' calculations based on LFS 2009-2021.

ICT employment is a potential source for increasing women's work in the private sector. The number of women employed in ICT jobs in the private sector grew rapidly at an average rate of 10% p.a. (Figure 7), with the ICT share among women increasing from 0.6% in 2009 to 2.7% in 2009 (Figure 5). As with the overall national picture, women's ICT employment in the private sector grew twice as fast as men's ICT employment.

In contrast to this rapid expansion of women's ICT employment in the private sector, women's non-ICT employment in the private sector declined at a rate of 1.4% p.a., which underscores the promising role of ICT jobs in providing opportunities for women in an otherwise inhospitable private sector labour market.

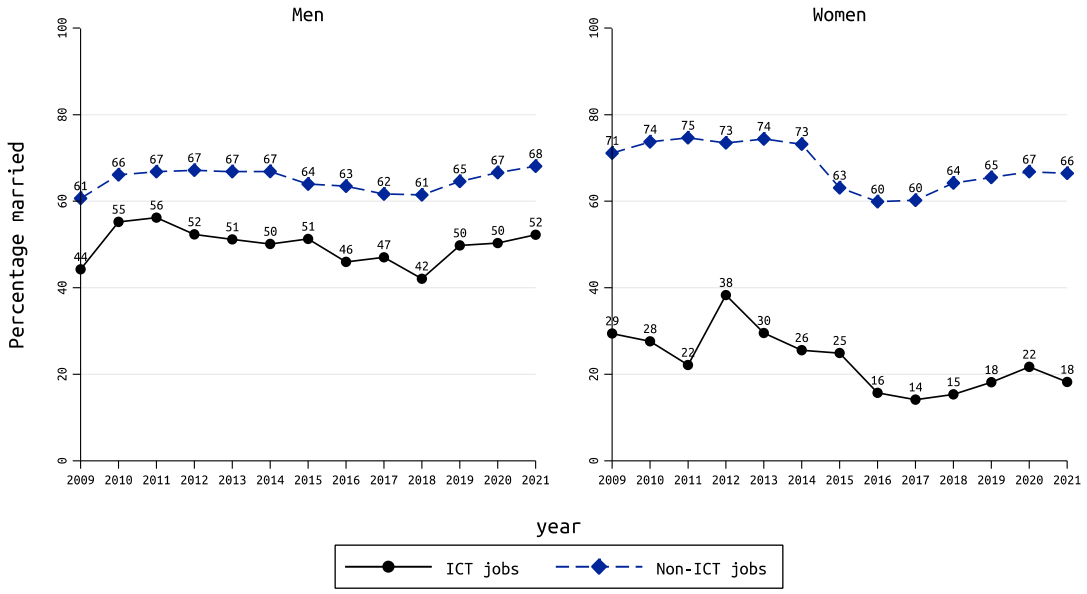
Figure 7 The increase in number of jobs (average annual) and growth rate (average annual, percentage) by sex between 2009 and 2021, ICT jobs versus non-ICT jobs in the private sector, ages 15-64



Source: Authors' calculations based on LFS 2009-2021.

Much of the increase in women's employment in ICT jobs happened among unmarried women. Figure 8 shows the proportion married among male and female ICT workers in the private sector compared to their non-ICT peers. Women employed in ICT jobs are substantially less likely to be married (18% in 2021) than those who work in non-ICT jobs (66% in 2021). Between 2009 and 2021, the proportion married among women employed in ICT jobs dropped 11 percentage points (p.p.) from 29% in 2009 of the female ICT workforce to 18% in 2021.

Figure 8 Percent married among workers in the private sector by sex, ICT jobs versus non-ICT jobs, ages 15-64



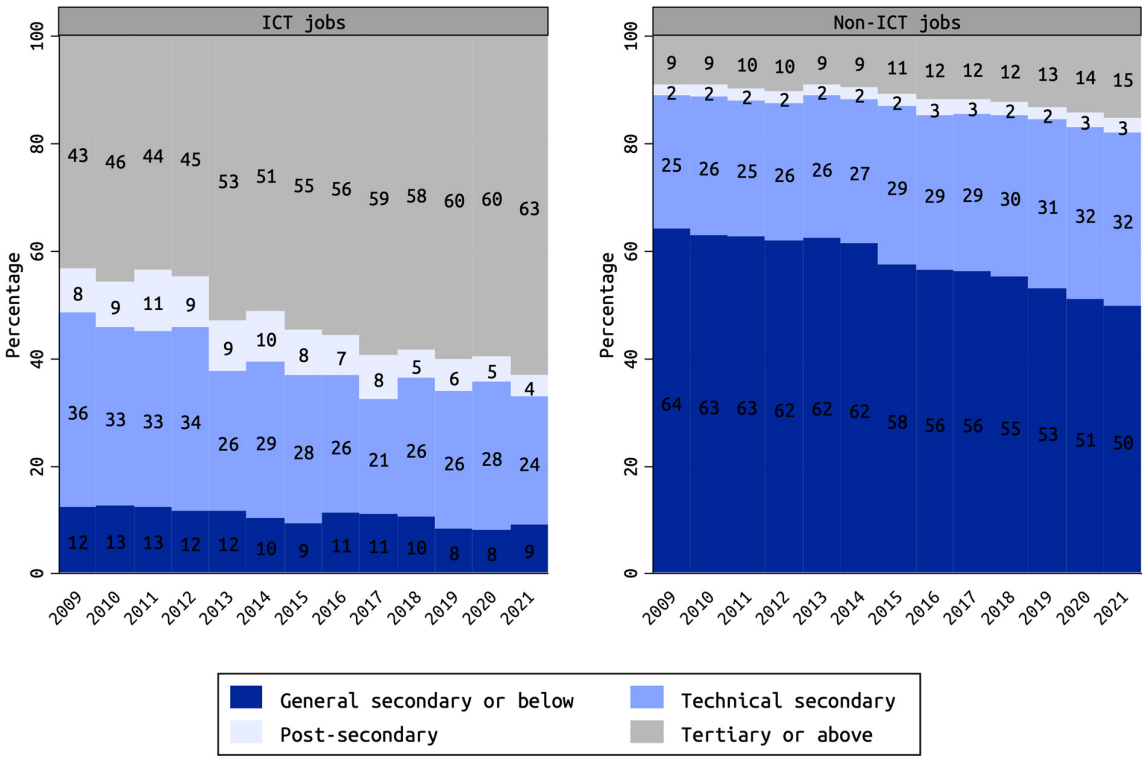
Source: Authors' calculations based on LFS 2009-2021.

Following the discussion of the main trends in ICT jobs evolution in both the public and private sector, the rest of this analysis focuses on the private sector. This is because the trends in jobs in the private sector better capture the transformation and evolution of the Egyptian labour market in which the share of public sector employment has been declining over the past 20 years (Assaad, AlSharawy, et al., 2022; Assaad & Barsoum, 2019).

4.2 Education Credentials of The ICT Workforce and Patterns of ICT Specialisation

Workers with tertiary education or above make up a substantial proportion of the ICT workforce in the private sector. Figure 9 (left panel) illustrates that, between 2009 and 2021, the proportion of ICT workers with tertiary education increased from 43% to almost 63% of the total ICT private sector workforce. As a result, the proportion of ICT workers with technical secondary education, who represent the second largest pool of workers in ICT private sector employment, contracted by 12 (p.p.) from 36% in 2009 to 24% in 2021. In contrast, the non-ICT workforce (right panel of Figure 9) is primarily composed of workers with below secondary (or general secondary) education although their proportion decreased over time (from around two-third of all non-ICT workforce in the private sector in 2009 to almost half in 2021), and workers with technical secondary education whose proportion rose from 25% of total non-ICT workforce in 2009 to 32% in 2021.

Figure 9 Educational composition (%) of ICT workforce versus non-ICT workforce in the private sector, ages 15-64



Source: Authors' calculations based on LFS 2009-2021.

To what extent is ICT specialised education prevalent in the labour market?[7]

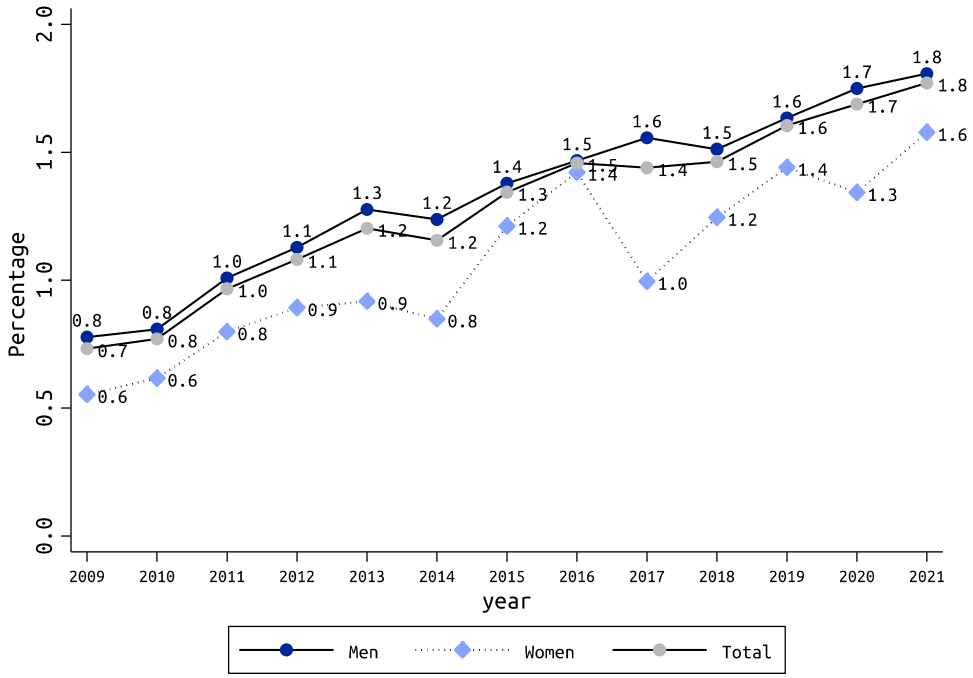
Overall, workers with an ICT specialised education represent a small but increasing proportion of the total Egyptian workforce. Figure 10 shows that the proportion of workers with ICT specialised education increased from 0.8% of total employment in 2009 to 1.8% in 2021. This proportion does not reflect the total size of ICT specialised graduates, but only those who are employed in Egypt's labour market. In comparison to other global markets in ICT and offshore industry, Egypt is lagging in the proportion of ICT specialised workforce. A recent study indicates that the share of ICT specialists in the total workforce reached 5% in Singapore, and 3% in India (ILO, 2020).

> *"I find it difficult to hire the needed expertise with the skill required… it is difficult to find specialists with a master's degree or in a very specific field, I usually get tired looking for an ICT specialist with 5-6 years of experience."*
>
> **ICT Services Business Owner-Communications Sector**

This shortage in ICT specialists in Egypt highlights the importance of investing in ICT specialised education, through new applied schools at the technical secondary education level, new departments in existing universities, or new universities as needed.

[7] The report uses available information on the specialisation of the education credential for workers, at the most detailed level available for technical secondary graduates and tertiary graduates, separately. The list of education specialisations that are considered as ICT specialised are provided in Annex Table 3

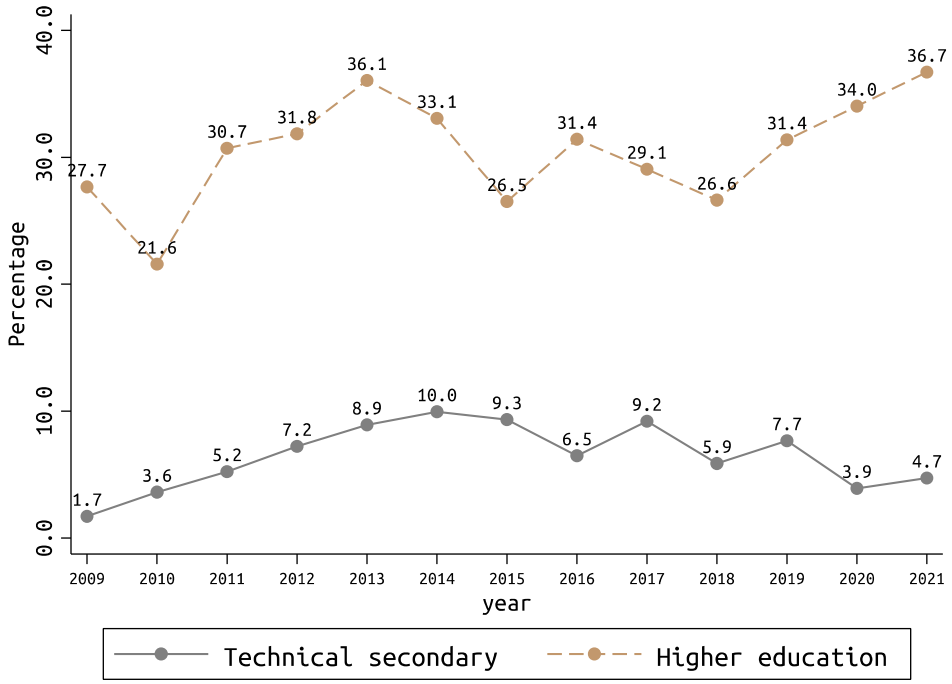
Figure 10 Proportion of workers with ICT specialized education in total employment (public and private sectors), ages 15-64



Source: Authors' illustration based on LFS 2009-2021.

Focusing on the ICT workforce, they are increasingly likely over time to have ICT specialised education, more so among the tertiary educated than among those with technical secondary education. Figure 11 shows the proportion of ICT workers who have an ICT specialised education, distinguishing between workers with technical secondary education and those with tertiary education. Among workers with tertiary education, ICT specialists represented 28% in 2009 increasing to 37% in 2021. As for workers with technical secondary education, ICT specialists are much fewer than among workers with tertiary education, indicating a potential gap in the availability of ICT specialised degrees in technical secondary education. Only 2% of ICT workers with technical secondary education had an ICT specialised education in 2009. This proportion accelerated to reach 10% of ICT workers with technical education in 2014 before plummeting to 5% in 2021.

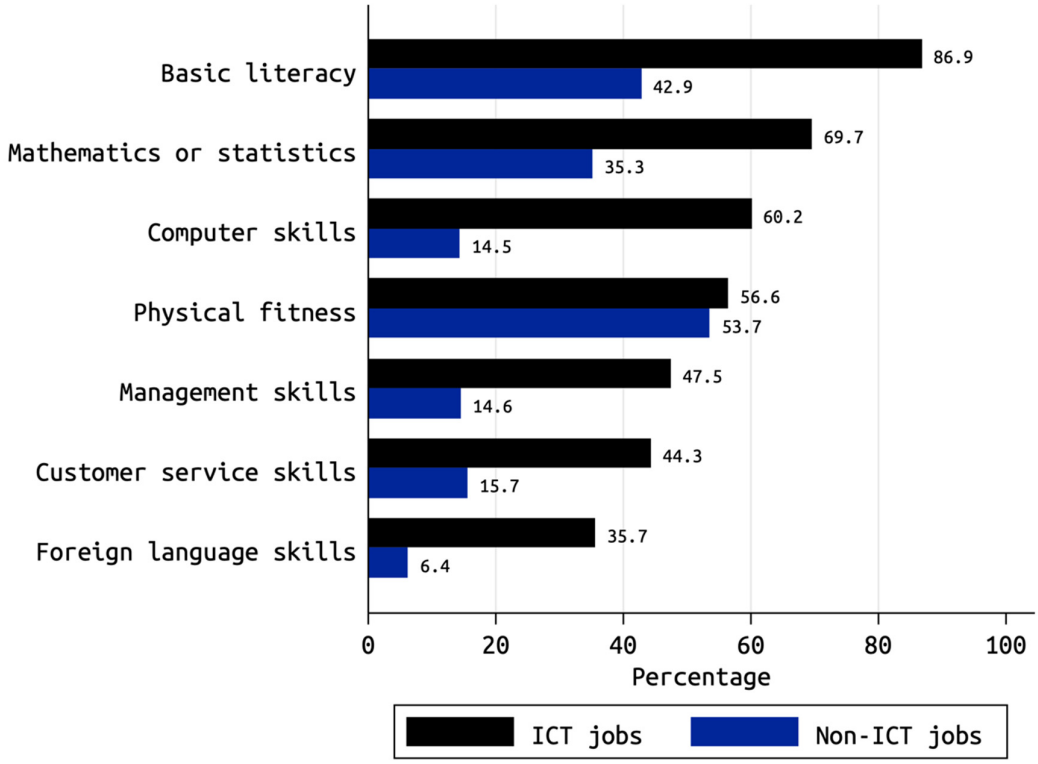
Figure 11 Proportion of ICT specialists in ICT employment in the private sector by type of education, ages 15-64



Source: Authors' illustration based on LFS 2009-2021.

Basic literacy, mathematics, and statistics, as well as computer skills are key for ICT jobs. As for the skills that employees perceive to be mostly required in ICT jobs, Figure 12, based on microdata from the ELMPS in 2018, shows that most workers (87%) in ICT jobs perceive basic literacy as key skill for their jobs relative to less than half of workers in non-ICT jobs (43%). Basic literacy skills are vastly required as they represent the foundation for basic digital skills. Around 70% of ICT workers need mathematics or statistics in their jobs, which represent another foundational requirement for basic digital skills. This is compared to around 36% of workers in non-ICT jobs who need mathematics or statistics. Computer skills are the third most needed skills by 60% of ICT workers, which is four times the proportion of non-ICT workers who need computer skills (15%). ICT workers are also five times more likely to need customer service skills (44%) and foreign language skills (36%) than non-ICT workers (16% for customer service skills and 6% for foreign language skills).

Figure 12 Percentage of workers reporting skills required in ICT jobs versus non-ICT jobs in the private sector, ages 15-64



Source: Authors' calculations based on ELMPS 2018.

In line with Figure 12 based on ELMPS 2018, the O*NET data on the skills for each occupation also confirm the importance of basic literacy skills.[8] Figure 13 shows the percentage of employment that has each skill among the five most important skills for the ICT workforce and the non-ICT workforce. Active listening and reading comprehension are top-five skills for 87% and 76% of the ICT workforce. There is an important difference in the top-five skills between the ICT and the non-ICT workforce. For instance, reading comprehensive is twice as likely to be a top-five skill in ICT jobs (76%) than in non-ICT jobs (33%). Compared to non-ICT workforce, those who work in ICT jobs are three to four times more likely to have writing (29%), complex problem solving (18%), and troubleshooting (13%) among the five most important skills.

[8] See *"The Future of Skills in the Egyptian Labour Market*" for more details on the use of O*NET in the analysis of skills in Egypt.

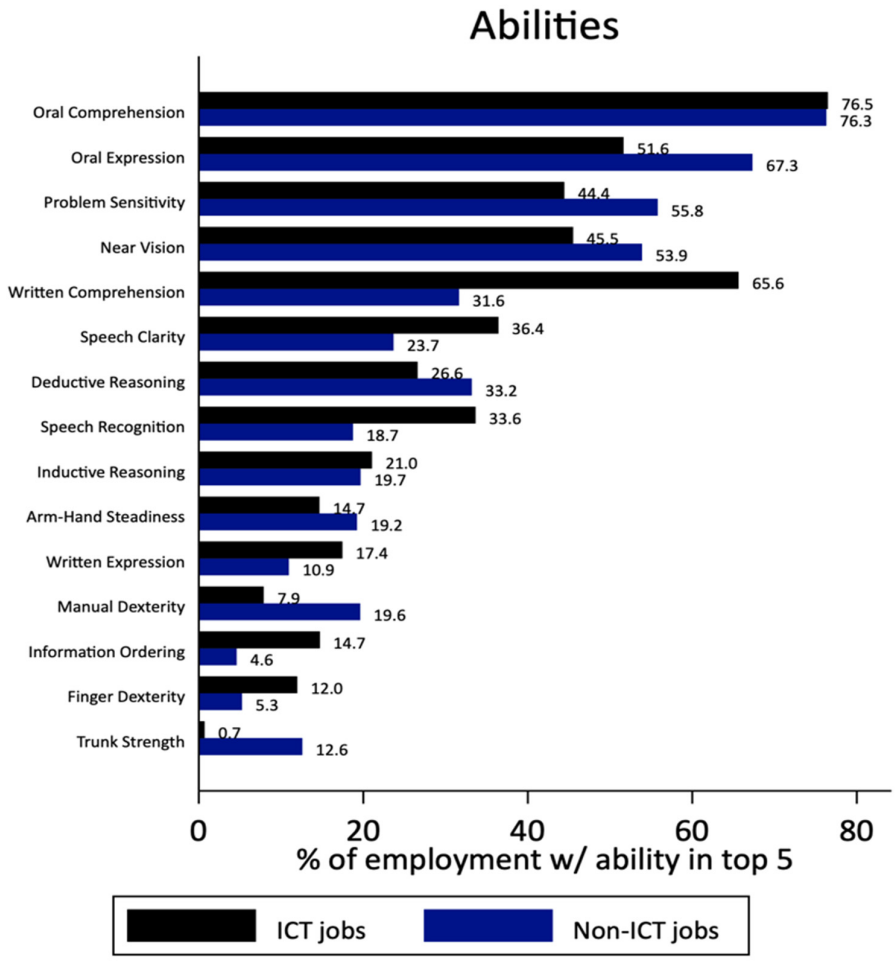
Figure 13 Percentage of employment that has each skill among the five most important skills, ICT jobs versus non-ICT jobs.

Source: O*NET 26.2 and LFS 2017-2021 data

In addition to reading comprehension as a top-five skill, written comprehension is more than twice as likely to be a top-five ability emphasising the importance of basic literacy as a foundation for digital skills. Figure 14 shows that written comprehension is a top-five ability in 66% of ICT-jobs relative to only 32% of non-ICT jobs.

Because of the importance of the offshoring industry and customer service skills in ICT employment, the ICT workforce is particularly likely to be in jobs where speech clarity (36%) and speech recognition (34%) are top-five abilities compared to the non-ICT workforce (24%, and 19%, respectively). This is also in line with the evidence from ELMPS shown in Figure 12. Information ordering is another top-five ability that differentiates ICT jobs and non-ICT jobs. For instance, those who work in ICT jobs are three times more likely to have information ordering (15%) among the five most important abilities than those in non-ICT jobs (5%).

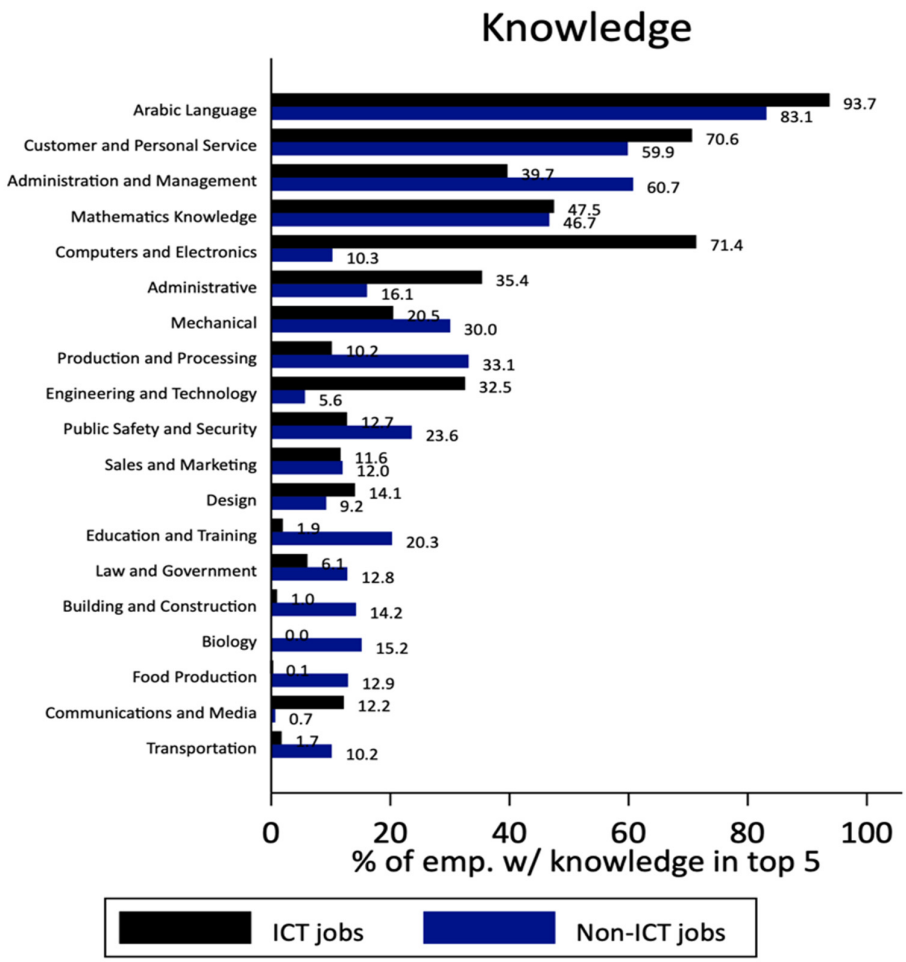
Figure 14 Percentage of employment that has each ability among the five most important abilities, ICT jobs versus non-ICT jobs.



Source: O*NET 26.2 and LFS 2017-2021 data

Computer and electronics (71%) as well as customer and personal service (71%) represent the two most common top-five types of knowledge for ICT jobs (Figure 15). There are substantial differences between ICT and non-ICT jobs in specific types of knowledge required. This is the case of computer and electronics knowledge that is seven times likely to be required in ICT jobs (71%) than in non-ICT jobs (10%); engineering and technology knowledge that is required almost six times more in ICT (33%) than in non-ICT jobs (6%); and administrative knowledge that is twice as likely to be required in ICT (35%) than in non-ICT jobs (16%). ICT workers are also particularly likely to be in jobs where communications and media is a top-five knowledge (12%), relative to non-ICT workers (1%).

Figure 15 Percentage of employment that has each knowledge among the five most important types of knowledge, ICT jobs versus non-ICT jobs.

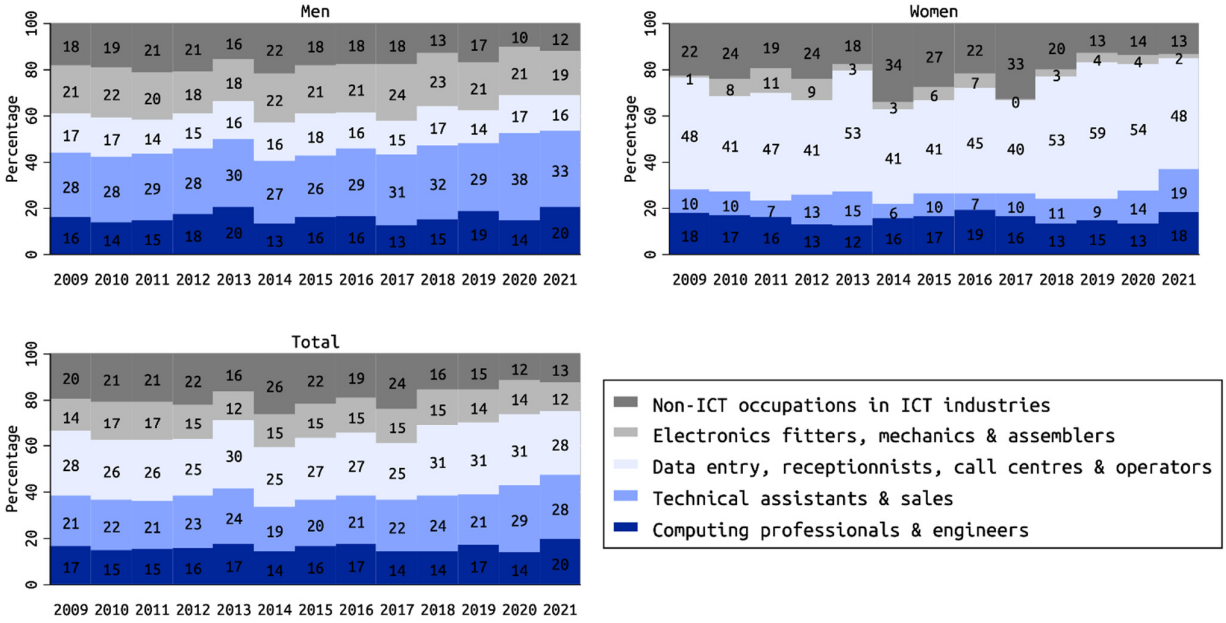


Source: O*NET 26.2 and LFS 2017-2021 data

4.3 Fastest Growing Occupations

Data entry, receptionists, call centres and operators, followed by technical assistants and sales represent the largest two occupations in ICT employment (in the private sector). Figure 16 shows that by 2021 these two groups of occupations make up slightly more than half (57%) of the ICT workforce (with 28% as data entry and call centres and 28% as technical assistants and sales). There is an important gender difference in the occupational composition of ICT workers. Women employed in ICT mostly work in 'data entry, receptionists, call centres and operators' occupations (48% of ICT female workforce in the private sector in 2021), whereas men are increasingly concentrated in 'technical assistants and sales' occupations (reaching 33% of the ICT male workforce in the private sector in 2021), followed by computing professionals and engineers (reaching 20% of the ICT male workforce in the private sector in 2021).

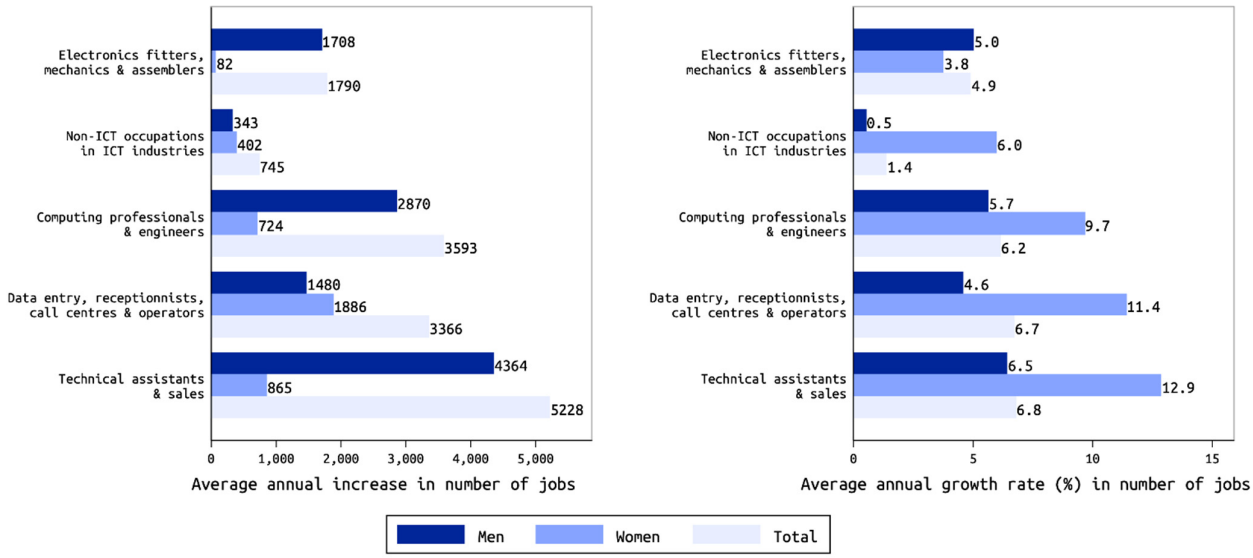
Figure 16 The structure (%) of occupations in ICT employment in the private sector by gender, ages 15-64



Source: Authors' calculations based on LFS 2009-2021.

As for the occupational structure evolution over time, technical assistants and sales followed by data entry, receptionists, call centre and operators exhibited the most rapid annual growth rate during 2009-2021. Employment as technical assistants and sales increased on average at 6.8% (right panel) and 5,228 new jobs (left panel) per year (Figure 17), followed by employment as data entry, receptionists, call centre and operators, which increased at 6.7% and 3,366 new jobs per year. The largest increase in the number of ICT jobs for women was for 'data entry, receptionists, call centres and operators' occupations (+1,886 news jobs per year, on average) as shown in the left panel of Figure 17. As for men, the largest increase in the number of ICT jobs were for 'technical assistants and sales' occupations (+4,364 new jobs per year, on average).

Figure 17 Average annual increase in number of ICT jobs and growth rate (%) by occupations and sex between 2009 and 2021, private sector employment, ages 15-64



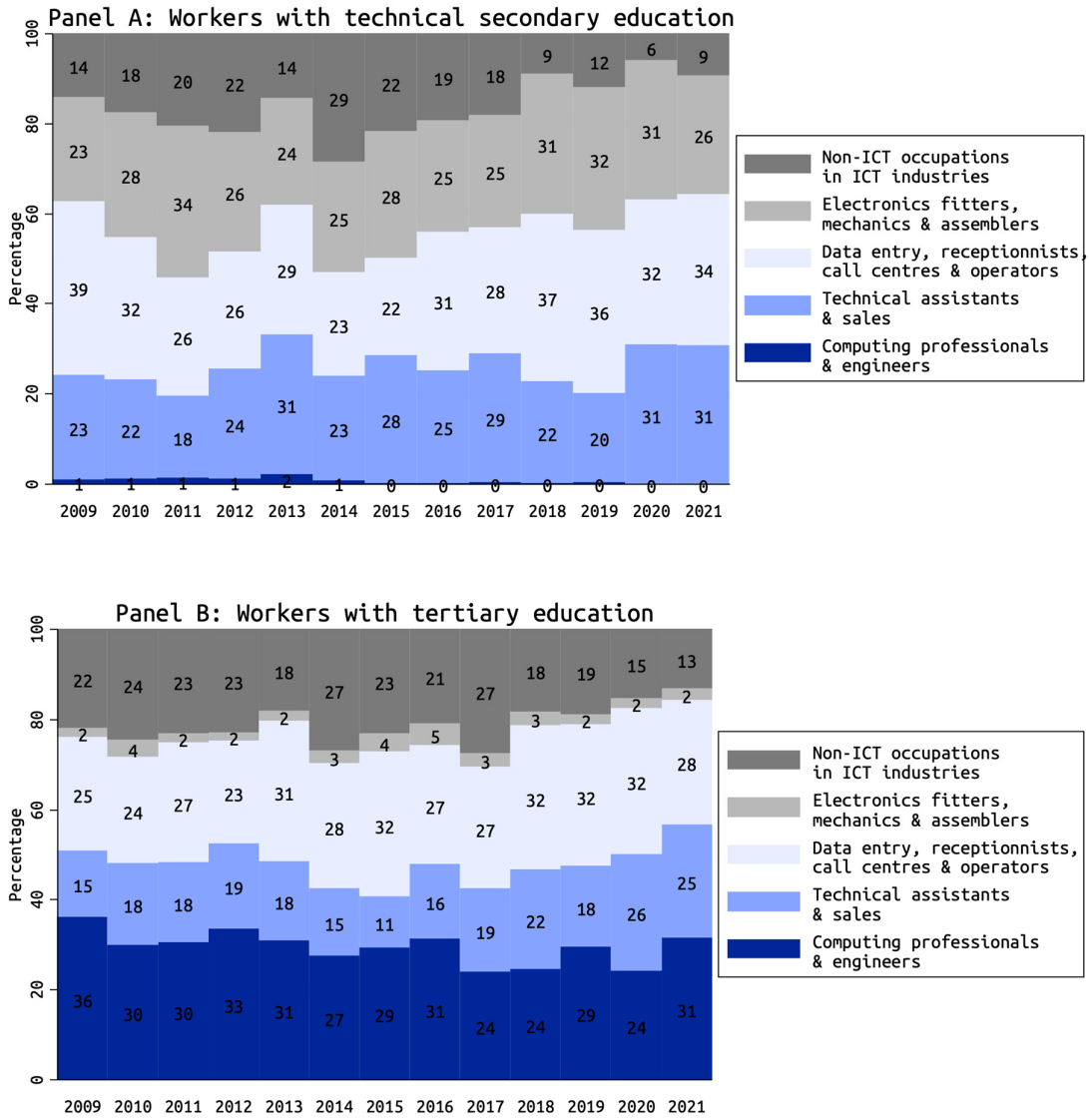
Source: Authors' calculations based on LFS 2009-2021.

Workers with technical secondary education have different ICT occupations than workers with tertiary education. Figure 18 demonstrates that ICT workers with technical secondary education are particularly likely to work in two occupations: (i) electronics fitters, mechanics, servicers, and assemblers employing 34% of workers with technical secondary education, up from 32% in 2009; and (ii) technical assistants and sales whose share in employment increased from 29% in 2009 to 37% of workers with technical secondary education. The occupational concentration of workers with technical secondary education is also confirmed through the KIIs.

As for workers with tertiary education, their occupations are more diverse, with a relatively high concentration in 'computing professionals and engineers' occupations (reaching 33% of tertiary educated ICT workforce in 2021), followed by almost even shares of technical assistants and sales (27%) along with data entry and call centres (24%). Their work as electronics and fitters is minimal. Feedback from the KIIs highlight that employers prefer the tertiary to the technical secondary educated, potentially because of the higher propensity of basic digital skills among university graduates.

> *"In the Egyptian labour market, the competition for ICT employment is between university graduates with no ICT specialised degree and technical secondary education graduates (even if ICT specialised) … that's why firms choose the tertiary educated, even if not-ICT specialised – over the technical secondary educated."*
>
> **Feedback from an ICT expert in Taskforce meeting**

Figure 18 Structure (%) of occupations in the private sector, technical secondary education versus tertiary education, ages 15-64

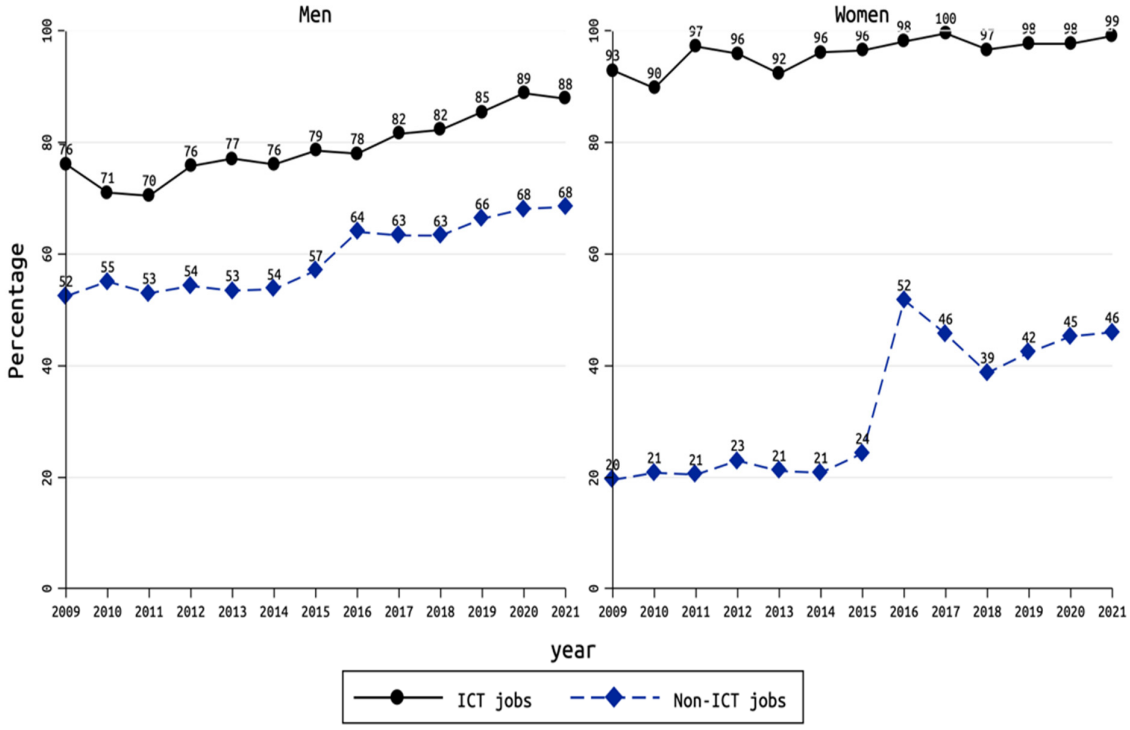


Source: Authors' calculations based on LFS 2009-2021.

4.4 Working conditions of ICT Employment and Evolution Overtime

Most of the ICT workforce are wage employees, more so for women than for men. Figure 19 shows that in 2021, 99% of women in ICT jobs (up from 93% in 2009) and 88% of men in ICT jobs (up from 76% in 2009) were wage workers. In comparison, the non-ICT workforce are considerably less likely to work for a wage than the ICT workforce although there is a tendency over time towards wage work for non-ICT jobs that is similar to that for ICT jobs. The gap in wage work between ICT and non-ICT employment is much larger for women and indicates the high prevalence of non-wage work for women in non-ICT employment.

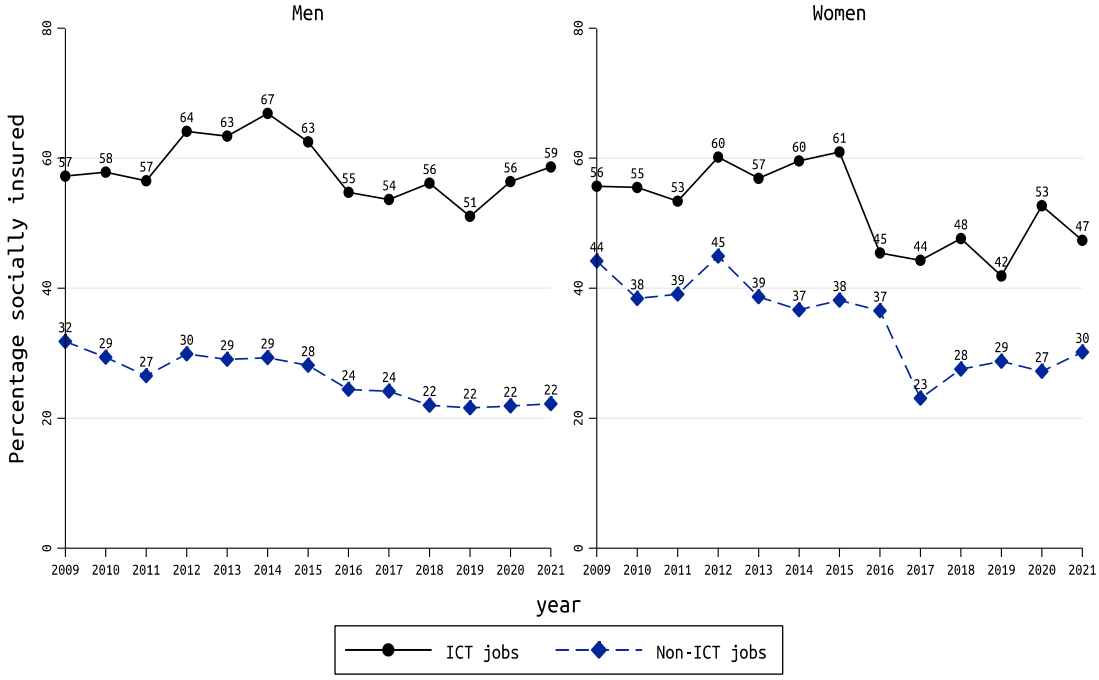
Figure 19 Incidence of wage employment in the private sector, ICT jobs versus non-ICT jobs, ages 15-64



Source: Authors' calculations based on LFS 2009-2021.

ICT workers are substantially more likely than non-ICT workers to be in jobs that provide social insurance coverage in the private sector. For instance, between 2009-2021, 57-59% of ICT male workers had social security coverage relative to 22-32% of non-ICT workers (Figure 20). For women, social insurance coverage rates in ICT jobs are higher than that in non-ICT jobs, but the difference in coverage between ICT and non-ICT jobs is not as large as that for men, reflecting women's preferences and self-selection into formal employment in the Egyptian labour market (Assaad et al., 2020; Assaad, Krafft, et al., 2022). However, women became significantly less likely to work in socially insured jobs (i.e., formal jobs) for the non-ICT workforce where social insurance coverage rates dropped from 44% of the female non-ICT workforce in 2009 to 30% in 2021. Such challenging working conditions in the Egyptian labour market likely fuel women's withdrawal from employment, especially at marriage. Women abstain from work when their "reservation working conditions" are not met (Dougherty, 2014; Selwaness & Krafft, 2021). The decrease in social insurance coverage rates also affected the female ICT workforce who experienced a 9 p.p. drop in their access to social insurance from 56% in 2009 to 47% in 2021. This indicates a potential deterioration in working conditions in ICT jobs. The question is how to maintain ICT jobs quality to capitalise on the rapid expansion of women's ICT work and potentially reverse women's declining employment in Egypt.

Figure 20 Incidence of social insurance coverage, ICT jobs versus non-ICT jobs, private sector wage employment, ages 15-64



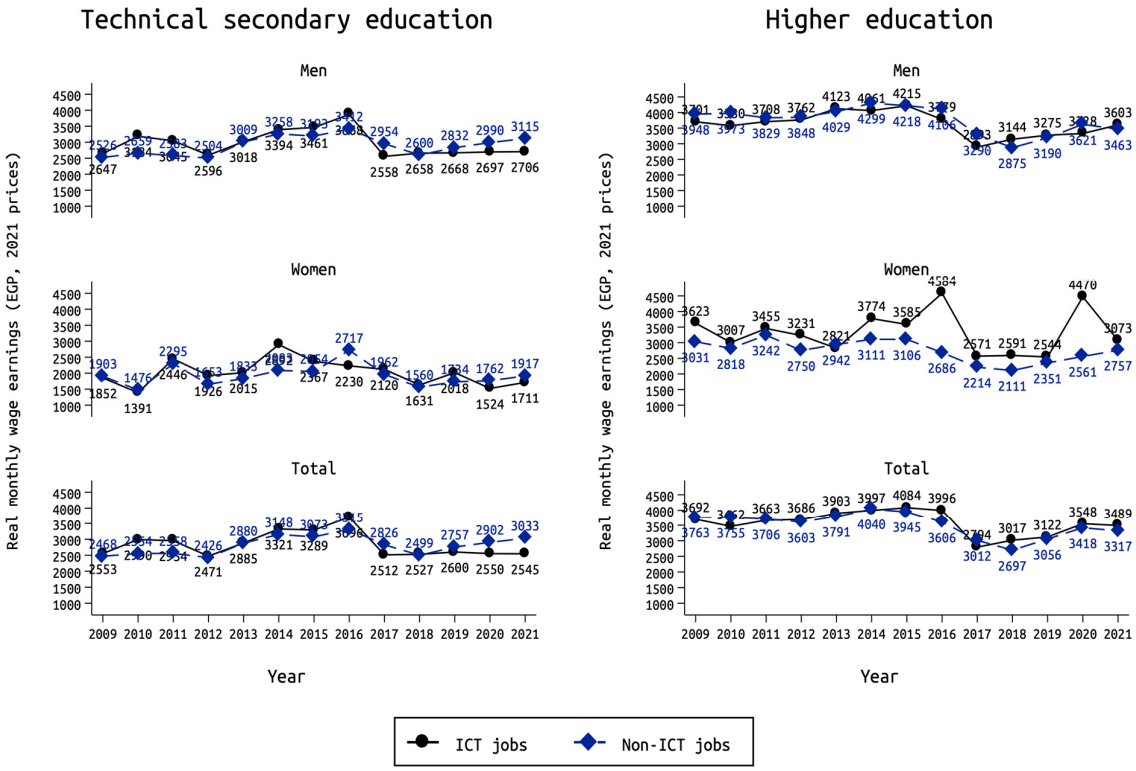
Source: Authors' calculations based on LFS 2009-2021.

The level of real monthly wages varies by education levels and by gender. Figure 21 shows that workers with technical secondary education have lower monthly wages (EGP 2,545 per month in 2021) than workers with tertiary education (EGP 3,489 per month in 2021). This is attributed to the different occupations that these two groups of workers have (Figure 18), as the technical secondary educated are mostly concentrated in low-skilled types of occupations (e.g., electronics fitters and assemblers). Also, women in ICT jobs receive on average lower monthly wages than men, regardless of the education level. For instance, in 2021, women with tertiary education earned EGP 3,073 monthly, compared to EGP 3,603 earned monthly by their male peers, indicating a male to female gender wage ratio of around 1.2. This gender wage gap could be partially due to the difference in the occupational structure between men and women.

How different are real monthly wages between ICT and non-ICT jobs?

There are different patterns in the wage gap between ICT and non-ICT jobs depending on the education level but also on gender. Figure 21 shows that for instance in 2021, there were not much difference in real wages between ICT (EGP 3,603 per month) and non-ICT jobs (EGP 3,463 per month) for tertiary educated men, but tertiary educated women received, on average, higher wages in ICT jobs (EGP 3,073 per month) than in non-ICT jobs (EGP 2,757 per month). As for workers with technical secondary education, real wages in ICT jobs were much lower (EGP 2,545/month in 2021) than in non-ICT jobs (e.g., EGP 3,033/month in 2021) for both men and women.

Figure 21 Average real monthly wages (EGP, 2021 prices) for workers by education level and sex, ICT jobs versus non-ICT jobs, private sector wage employment, ages 15-64

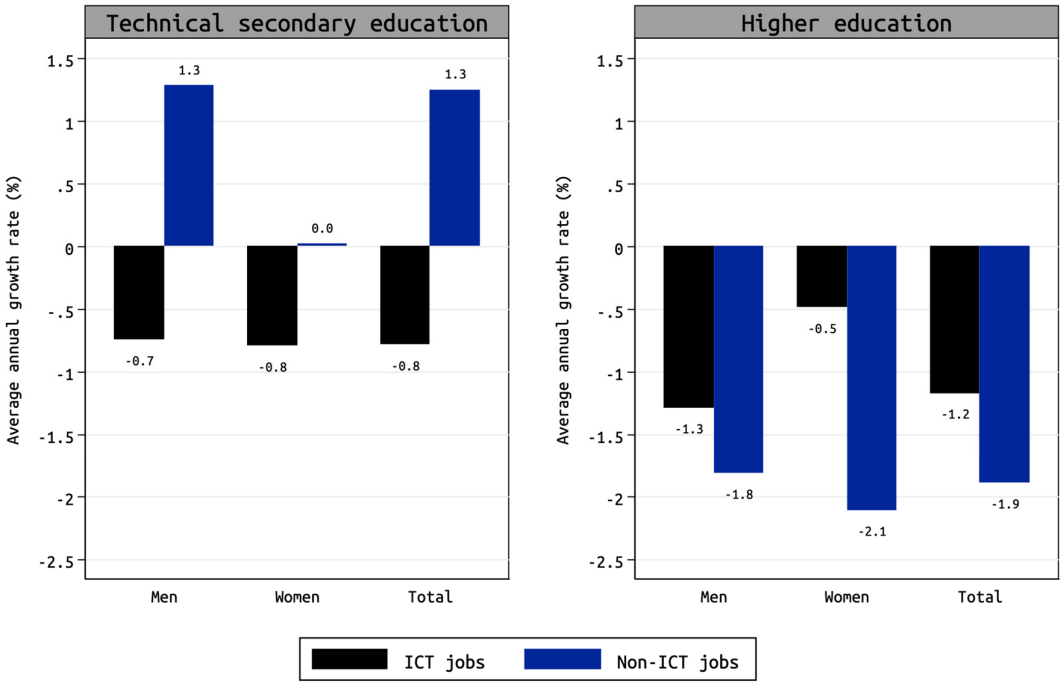


Source: Authors' calculations based on LFS 2009-2021.

Real monthly wages declined over time, more so in non-ICT jobs than in ICT jobs for the tertiary educated, and only in ICT jobs for the technical secondary educated. Figure 22 shows the average annual growth rate in real monthly wages (2021 prices) for workers in ICT versus non-ICT jobs, by their education level and gender. Between 2009-2021, real monthly wages of the tertiary educated declined on average in the labour market, but more so for non-ICT jobs (-1.9% p.a.) than for ICT jobs (-1.2% p.a.). The drop in tertiary educated women's real wages was much slower in ICT jobs (-0.5% p.a.) than in non-ICT jobs (-2.1% p.a.), and that for their male peers (-1.3% p.a.). As for the technical secondary educated whose propensity to work in ICT jobs fell over time, their real wages also fell on average in ICT jobs (-0.8% p.a.) yet increased in non-ICT jobs (+1.3% p.a.). For both types of education, there was a noticeable decline in real wages in 2017, following Egypt's currency devaluation in 2016 that led to strong inflationary pressures with the inflation rate peaking at 32%.[9] It is also expected that real wages continue to decline substantially following the most recent currency devaluation in 2022.

[9] Data on headline inflation rates from the Central Bank of Egypt website: https://www.cbe.org.eg/en/economic-research/statistics/inflation-rates/historical-data. [Last accessed March 29th, 2021]

Figure 22 Average annual growth rate (%) in average real monthly wages (EGP, 2021 prices) for workers by education level and sex, ICT jobs versus non-ICT jobs, the private sector, ages 15-64



Source: Authors' calculations based on LFS 2009-2021.

The drop in real wages of ICT, stalling social insurance coverage rates for men but falling ones for women, and the increasing share of unmarried women in ICT jobs, highlight potential struggles in the patterns ICT job creation. Therefore, more needs to be done to enable a sustainable and inclusive growth in ICT jobs of good quality, which is the focus of the next section.

CHAPTER 5 Policy Implications and Recommendations

5.1 Main Findings

5.1.1 Growth Patterns of ICT Employment

Although ICT makes up a small share of total employment – 1.4% (304,284 jobs) in 2009 to 1.9% (494,612 jobs) in 2021 – ICT jobs grew rapidly at 4.1% p.a. on average. This growth is around 3 times as fast as the average annual growth rate in non-ICT employment (1.3% p.a.). The share of ICT employment in the private sector grew even faster over time to reach 1.8% of the private sector total workforce in 2021, up from 1.2% in 2009. Much of the increase in ICT employment happened in non-ICT industries, where the number of ICT occupations in non-ICT industries increased by 11,331 new jobs annually on average in the private sector.

5.1.2 ICT Jobs as a Potential Source of Women's Employment in the Private Sector

Women became more than twice as likely in 2021 to work in ICT jobs than in 2009 (2.3% vs 1.0% of total female employment). The number of women employed ICT jobs in the private sector grew very rapidly at 10% p.a. on average between 2009 and 2021. As a result, women became more than four times as likely in 2021 to work in ICT jobs than in 2009 (2.7% vs. 0.6% of female private sector employment). At the same time, women's employment in non-ICT employment declined, which magnifies the important role that ICT jobs can play in reversing the deteriorating opportunity structure for women in the Egyptian labour market. However, much of the increase in women's employment in ICT jobs happened among unmarried women. This raises questions on quality of jobs but also how reconcilable ICT jobs are with the care and domestic responsibilities that are shouldered by women in Egypt. Women in ICT jobs experienced a 9 p.p. drop in their access to social insurance coverage from 56% in 2009 to 47% in 2021, indicating a potential deterioration in the quality of ICT jobs. The question is how to maintain ICT jobs quality to capitalise on the rapid expansion of women's ICT work and potentially reverse women's dwindling employment in Egypt.

5.1.3 Education Characteristics of the ICT Workforce and Skills

The findings of this report also indicate that ICT jobs recruit increasingly more tertiary educated workers over time. The proportion of ICT workers with tertiary education increased from 43% to 63% of the total ICT private sector workforce from 2009 to 2021. As a result, the proportion of ICT workers with technical secondary education, who represent the second largest pool of workers in ICT private sector employment fell from 36% in 2009 to 24% in 2021 of the total ICT workforce. Also, the share of workers with ICT specialised education, although growing, is still limited, representing only 1.8% of the total Egyptian workforce. In ICT jobs, workers are increasingly likely over time to have ICT specialised education, more so among the tertiary educated than among those with technical secondary education. For instance, ICT specialists represented 37% of tertiary educated ICT workers in 2021, up from 28%. But this is

not the case for ICT workers with technical secondary education who are considerably less likely to be ICT specialised, potentially owing to limited ICT specialised technical secondary schools. As for the skills needed in ICT jobs, basic literacy skills (e.g., reading, and written comprehension), mathematics and statistics, as well as computer skills are the most required skills according to ELMPS. These three form the foundation for basic digital skills. Knowledge of computer and electronics as well as customer and personal service represent the two most common top-five types of knowledge for ICT jobs.

5.1.4 Occupational Structure of the ICT Workforce and its Evolution

Data entry, receptionists, call centres and operators, followed by technical assistants and sales represent the largest two groups of occupations in ICT employment (in the private sector). They were also the fastest growing ICT occupations over time. The report findings indicate that ICT male and female workers have different occupations, with women mostly working in 'data entry, receptionists, call centres and operators' occupations (48% of ICT female workforce in the private sector in 2021), whereas men are increasingly concentrated in 'technical assistants and sales' occupations (33% of ICT male workforce in the private sector in 2021). Moreover, occupations also differ by education levels. Workers with technical secondary education mostly work as electronics fitters, mechanics, servicers, and assemblers or technical assistants and sales demonstrators, whereas the occupations of workers with tertiary education are more diverse, with a relatively high concentration in computing professionals and engineers, and minimal prevalence in electronics and fitters' occupations.

5.1.5 Job Characteristics of the ICT Workforce

Most of the ICT workforce are wage employees, more so for women than for men. Also, ICT workers are substantially more likely than non-ICT workers to be in jobs that provide social insurance coverage in the private sector. A positive development is that although there was an overall decline in social security coverage in the labour market, ICT jobs – for men – did not exhibit such erosion in social insurance coverage. However, for women and as mentioned above, ICT jobs became more informal (i.e., without social insurance coverage). The research findings also indicate that real monthly wages declined more so in non-ICT jobs than in ICT jobs for the tertiary educated, and only in ICT jobs for the technical secondary educated.

5.2 Major National Efforts Underway to Promote the ICT Sector

There is a growing national attention to promote the ICT sector. As mentioned in Section 2, the ICT sector has been identified as one of three promising sectors in addition to manufacturing and agriculture sectors in the NSRP. The reform programme included three strategic objectives to promote the ICT sector (MPED, 2022):

1. **Increasing the contribution of the ICT sector in total GDP and accelerating digital transformation.** The Government targets to increase the contribution of the ICT sector to GDP to reach 5.0% of GDP by 2024, up from 2.8% of GDP in 2020. This requires steadily high annual growth rates of the ICT sector's GDP of about 16% on average. Also, the Government aims at accelerating the digital transformation process through the 'Digital Egypt" strategy launched by the

MCIT. This strategy aims to carry on the digital transformation process in the digital provision of public services. For instance, the government aims to provide 400 e-government services in 2024, up from 170 e-services in 2021 through the 'Digital Egypt" platform, and to improve Egypt's rank in three indices: The Network Readiness Index from 84 in 2020 (out of 134 countries)[10] to 64 in 2024, the Inclusive Internet Index from 78 in 2020 (out of 120 countries) to 60 in 2024, and the digital inclusion from 50 in 2020 to 48 in 2024. The digital transformation strategy also extends to the Ministry of Higher education (MoHE) to pilot and launch online exams for the medical education institutions that are to be generalised for the rest of specialisations. The strategy also includes measures for digitising the provision of services of other governmental institutions, e.g., the Ministries of Justice and Interior Affairs, real-estate licensing/penalties/exemptions, and several other governmental institutions.

2. **Boosting ICT exports in Business Process Outsourcing/Knowledge Process Outsourcing, electronic products, and Information Technology consultancy services.** The NSRP program aims to increase Egypt's digital services exports by 15% annually, and to double both services and goods digital exports from $4 billion in 2020 to $8 billion by 2024. The NSRP aims to launch a set of incentives for ICT firms to promote the value-added and to increase the exports from BPO. However, the program does not include what these incentives are. Under this objective, the government aims to improve the competitiveness of Egypt and entails activation of the protection of personal data regulations through enacting the executive regulations for the personal data protection law and establishing a centre for personal data protection. To boost BPO, the government intends to develop industrial zones for the BPO with adequate infrastructure to provide an enabling environment for large international BPO companies to further invest in Egypt.

3. **Raising the private sector capacity in job creation, promoting necessary skills for the future of work, and supporting SMEs.** The NSRP program targets creating 120,000-140,000 jobs by 2024 and increasing the number of beneficiaries of different education and training programmes provided by the MCIT (and its affiliated institutions) by an average of 20-25% yearly. Within this objective, there are more than 81 initiatives by the MCIT and its affiliated institutions (see Annex Figure 1 for more details on those institutions). Annex Table 4 presents a few examples (and not an exhaustive list) of the most relevant initiatives that are related directly to boosting ICT job growth.[11] The objectives of these initiatives vary between education, training and capacity building, and supporting entrepreneurship and fundraising. In addition, there are other initiatives led by the MoETE (e.g., through the new applied schools for technical education, and IT curricula development), and by the MoHE (e.g., through the introduction of new information technology colleges, departments, or specialisations in existing universities, the new Community Universities prioritising new IT specialisations).

[10] The Network Readiness Index measures the application and impact of ICT in economies around the world. Egypt ranked 73rd in 2022 (Portulans Institute, 2022a, 2022b).
[11] There are many other initiatives, some of which relate to the digital provision of government service. All initiatives can be found on the MCIT website (https:\\mcit.gov.eg\en\)

5.3 Key *Areas of Policy Recommendations*

Egypt is achieving steady progress in terms of the objectives of the NSRP. For instance, Egypt's rank in the Network Readiness Index jumped 11 places in 2022 to 73 (13 places away from the 60th rank target) (Portulans Institute, 2022a). Also Egypt ranked 57 (however not out of 120 countries as in 2020 but out of 100 countries only) in the Inclusive Internet Index in 2022 (Economist Impact, 2022), that is even a higher ranking than the NSRP target (60). Also, several of Egypt's reform measures aim to address some challenges that previous studies on the MENA region discussed, including the digital infrastructure and services. For example, Cusolito et al. (2022) argue that fully digitising the MENA region requires expanding the coverage of its digital infrastructure and services (e.g., internet coverage, broadband subscriptions, cellular subscriptions, usage of emails and websites by firms, digital payments, and Business to Consumer (B2C) digital marketing). This could lead to an increase in its GDP per capita by at least 46%, double the female labour force participation, and reduce frictional unemployment from 10% to 7% (Cusolito et al., 2022). In the same vein, McKinsey and Company (2016) argue that the region is characterised by a digital paradox in which the adoption of digital technologies at the consumer level (e.g., smartphone penetration and social media usage) is above the average performance of many high-income countries, while its performance at the business and government-levels, and the strength of its ICT supply and innovation is still underdeveloped. Hence, several of Egypt's reforms are towards improving the coverage of digital infrastructure and services and digital transformation of businesses and government.

There exist areas of developments that need further intervention measures to ignite and sustain inclusive growth in ICT employment broadly, and not only in the ICT sector, to fully capitalise on the ICT potential of creating good quality jobs.

5.3.1 The Quality of the Business Environment and the Transaction Cost of Doing Business

The quality of the business environment and the transaction cost of doing business are among the main barriers for expansion in ICT job creation in the private sector**.** According to the World Bank's Doing Business Report, Egypt's rank in terms of the ease of doing business fluctuated between 2009 and 2020, reaching the same rank in both years that is 114 out of 190 countries. From 2009, Egypt experienced a deterioration in its rank from 114 in 2009 to 128 in 2014, then improved to 122 in 2017 (potentially following the first phase of the NSRP in 2016), before reaching 114 again in 2020 (World Bank, 2008, 2013, 2016, 2020). This volatility means that the ease of doing business remains a key policy area. In these times of worldwide economic challenges, improving the quality of the business environment and raising the trust in government is now more important than ever and should be on top of the national agenda.

> *"The transaction cost of doing business here is extremely high and sometimes even limits their ability to compete internationally."*
>
> **ICT expert and representative of the private sector - IT Consulting Services**

Measures to ease doing business in Egypt should focus on several dimensions that represent a bottleneck for the quality of business environment, growth, and job creation. These include:

1. **The ease of paying taxes**. According to the 2020 Doing Business Report, Egypt ranks 156 in the world in this dimension, 11 places behind where it ranked in 2009 (World Bank, 2008, 2020). Making tax payments easier and more predictable is a major factor in igniting and enabling ICT job growth.

2. **Further simplifying the procedures of establishing a business**. Although there have been improvements in the number of procedures required to start a business between 2009 and 2014 declining from 9 to 5, and the cost falling from 45% of per capita income to 20%, the number of days needed to start a business stalled at 12, with a rise to 16 between 2016 and 2018 (World Bank, 2008, 2020). This highlights that the cost and time for starting business is still high and volatile, which potentially harms the competitiveness of Egypt in the offshoring industry.

> *"When a company reaches a certain size, they move abroad to Dubai or to the States. The main reason is that the business environment here is not conducive, there are lots of problematic and bureaucratic barriers and controls that make the transaction cost of doing business here extremely high and sometimes even limit their ability to compete internationally."*
>
> **ICT expert and representative of the private sector**

3. **Trading across borders**. Egypt ranks 171 out of 190 countries in this dimension in 2020. Reducing the high costs (in terms of time, cost, and number of documents) of trading services across borders is absolutely essential to harness the potential role of the ICT offshoring industry in boosting exports in Egypt. In particular, expanding free zones for firms exporting ICT services and providing workspaces for those companies with high-quality digital infrastructure is critically necessary.

5.3.2 The Supply of ICT Specialists and the Prevalence and Quality of Basic Digital Skills

The supply of ICT specialists and the prevalence and quality of basic digital skills is another key policy area (Fardoust & Nabil, 2022; Kamel, 2021). While the national reform measures are positive developments to bridge the gap in skills, yet the analysis of this report indicates that there remain some areas of intervention where reforms are necessary.

1. **Consolidation of the substantial number of initiatives that could potentially have the same objective and deliver the same content**. Also, little is known on the impact of these initiatives in terms of job outcomes. Therefore, it is mandatory to consolidate the different ICT initiatives, and to raise awareness about these initiatives. Also, ensuring the funding sustainability of ITI and the education initiatives that are introduced by the government is another key question on the policy agenda. Towards a more mature and sustainable framework, the government/the public sector should

create a regulatory framework for these initiatives to be led by the private sector, rather than the government (as is the case in most of these initiatives now), to ensure training competitiveness, quality, and alignment with the labour market demand.

> *(...) Yet the calibre [of the workers] is the main challenge, I mean, it is the enabler that we want to work on*
>
> **Fintech Expert - banking & financial services**

2. **Mainstreaming basic digital skills at all levels of education since early childhood.** This is necessary for Egypt to fully reap the benefits of the digital technology and to cope with the rapid digitalization worldwide, as the lack of digital skills represents a major barrier towards achieving this (Fardoust & Nabil, 2022; Kamel, 2021). Mainstreaming basic digital skills requires raising the quality of education in basic literacy, mathematics and statistics, and computer skills. This is critically needed given Egyptian students' extremely poor performance in Mathematics. Results from latest Trends in International Mathematics and Science Study (TIMSS) shows that Egypt ranks very low in basic skills (55 out of 64 countries) followed by standard skills (43) (Fardoust & Nabil, 2022). [12]

> *There is no company that is tech-enabled that is not complaining about the lack of good software developers.*
>
> **Fintech Expert-banking & financial services**

3. **Investment in foreign languages and continuous learning of ICT skills.** This report shows that the ICT workforce are five times more likely to use foreign languages in their jobs. Combined with investing in basic literacy, fostering foreign language knowledge is critically needed.

> *We have a lot of skills, especially technical skills in the market, and a lot of youth who are willing to learn (…) The main focus, of course, is English since most accounts come from English speaking countries.*
>
> **Business Process Outsourcing Manager - Contact Centre**

Efforts to raise the quality of foreign language education should be cross-cutting in all types/levels of schools (technical versus vocational schools, etc.) to ensure equal access to all groups of the population, particularly the marginalised ones.

> *Technical secondary students did not have access to language schools, and therefore, they have a disadvantage [in terms of language] in learning ICT skills.*
>
> **ICT Expert Representative of the Private Sector - IT Consulting**

4. **Increasing the share of ICT specialists in the total workforce.** One of the findings of this report is that the share of workforce who are specialised in ICT as a field of study is still small in Egypt, compared to much-higher proportions in countries that succeeded in benefiting from the global growing

[12] "Basic skills are defined as copying or moving a file or folder, using copy and paste tools, sending emails and attached files, and transferring files between a computer and other devices" and "Standard skills include using basic arithmetic formula in a spreadsheet; connecting and installing new devices; creating electronic presentations; and finding, downloading, and configuring software." (Fardoust & Nabil, 2022, p. 57)

demand in ICT specialists like Singapore (5%) or India (3%). Focusing on tertiary educated, previous studies found that although the education system in the MENA region has achieved great developments with respect to the number of high school graduates who are willing to continue their tertiary education, it does not sufficiently prepare them to pursue a career in ICT-related fields, potentially due to the poor performance in Mathematics. This emphasises again the importance of investing in basic and standard mathematics skills, as it will eventually lead to higher shares of students in ICT education specialisations. As for technical secondary education, there is a limited number of ICT specialised schools. The national ongoing efforts in establishing new applied schools (6 WE schools, IBM school and AI school), developing IT curricula, and establishing the German Development Bank (KFW) fund for ICT in technical schools are steps in the right direction that need to be further strengthened, monitored, and expanded.

5.3.3 Adapting Social Insurance Schemes for the Growing ICT Workforce to All Forms of Employment, Including Non-Standard Ones.

> *"The problem is more on the operational side, especially dealing with the tax administration and social security."*
>
> **ICT expert and private sector representative- IT consulting *services***

The paper findings indicate an overall decline in social insurance coverage rates for non-ICT employment, but stable coverage rates for men in ICT (around 57-59%) and falling ones for women (reaching 30% of female workforce). Measures should be taken to reverse the drop in social security coverage overall in the Egyptian labour market, and particularly among men and women in ICT employment given the rising potential of their jobs to be non-standard through digital platforms.

Specific policy actions could involve:

1. Taking advantage of digitalization to ease the procedures of affiliating/unaffiliating workers to the social insurance system. This is important given that ICT employment is characterised with relatively higher turnover than other jobs, that is likely due to the growing demand in ICT jobs, but also to the fast technological evolution in the nature of work.

> *"The existing insurance system is a real waste of money and time for the companies and their employees especially for the industries with high turnover, as it takes a lot of time to finalise the procedure of hiring or releasing employees, while it takes only 5 minutes in other countries."*
>
> **Business Process Outsourcing Manager - Contact centre.**

2. Legal reforms to amend social insurance laws to include platform/gig workers.
3. Encouraging platforms to set up collective funds to support gig workers, through proactive collaboration from the government, until social insurance laws are adapted to include and cover platform and gig workers.

5.3.4 Sustaining Women's Employment Growth in ICT Jobs.

The fourth and final key policy area is to sustain women's employment growth in ICT jobs. This could be achieved through several actions, including but not limited to:

1. **Improving the working conditions of ICT jobs in terms of social security provisions, safety of workplaces, and transportation.** Generally speaking, and not only related to ICT, despite women's excellent performance in STEM education results and the higher percentage of female STEM graduates than the OECD average in the region, women are less likely than men to pursue careers in STEM fields. Recent results from students' attitudes and expectations towards science and towards pursuing a career in science-related careers indicate that, on average, students in the Middle East, especially girls, are considerably less likely to report that they are willing to pursue a career in ICT jobs compared to their counterparts in OECD countries (ESCWA, 2018). This is closely related to the labour market environment as shown in previous studies.
2. **Building on the ongoing national efforts in investment in child-care** to ensure affordable child-care facilities of adequate quality and duration, to make ICT jobs reconcilable with care/domestic responsibilities. This area of intervention has also been emphasized in the KIIs.

> *"When women get married, the probability for them to exit the market increases, (...) & when they get their first child…. because of [care and domestic] commitments (...)"*
>
> **Fintech Expert - banking & Financial Services Sector**

3. **Further supporting girls and young women to pursue studies in ICT**. For instance, recent results from the UNESCO Science report in 2021 shows that ICT tertiary education (in addition to engineering which can also lead to pursuing ICT jobs) is largely dominated by men in Egypt in 2018. Only 37% of ICT tertiary graduates were women and even a lower proportion (21%) of engineering graduates were (UNESCO, 2021).

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ANNEX 2 TABLES

Annex Table 1 the ISCO codes for ICT occupations.

Groups of occupations	ISCO-88 Title	ISCO-88 code	ISCO-08 Title	ISCO-08 Code	ISCO-08 part (*there is more than one ISCO88 code for this ISCO08 code)*
1. Computing professionals	Computer systems designers and analysts	2131	Systems analysts	2511	
	Computer systems designers and analysts	2131	Software developers	2512	
	Computer systems designers and analysts	2131	Web and multimedia developers	2513	p
	Computer systems designers and analysts	2131	Software and applications developers and analysts not elsewhere classified	2519	p
	Computer systems designers and analysts	2131	Database designers and administrators	2521	
	Computer systems designers and analysts	2131	Systems administrators	2522	
	Computer systems designers and analysts	2131	Computer network professionals	2523	
	Computer programmers	2132	Web and multimedia developers	2513	p
	Computer programmers	2132	Applications programmers	2514	
	Computer programmers	2132	Software and applications developers and analysts not elsewhere classified	2519	p
	Computing professionals not elsewhere classified	2139	Web and multimedia developers	2513	p
	Computing professionals not elsewhere classified	2139	Software and applications developers and analysts not elsewhere classified	2519	p
	Computing professionals not elsewhere classified	2139	Database and network professionals not elsewhere classified	2529	p
2. Electronics and telecommunications engineers	Electronics and telecommunications engineers	2144	Electronics engineers	2152	
	Electronics and telecommunications engineers	2144	Telecommunications engineers	2153	

3. Electronics and telecommunications engineering technicians	Electronics and telecommunications engineering technicians	3114	Electronics engineering technicians	3114	p
	Electronics and telecommunications engineering technicians	3114	Telecommunications engineering technicians	3522	
	Photographers and image and sound recording equipment operators	3131	Broadcasting and audio-visual technicians	3521	p
	Broadcasting and telecommunications equipment operators	3132	Telecommunications engineering technicians	3522	
4. Computer assistants	Computer assistants	3121	Information and communications technology user support technicians	3512	
	Computer assistants	3121	Computer network and systems technicians	3513	p
	Computer assistants	3121	Web technicians	3514	p
	Computer equipment operators	3122	Information and communications technology operations technicians	3511	
	Computer equipment operators	3122	Web technicians	3514	p
5. Process control technicians not elsewhere classified	Industrial robot controllers	3123	Process control technicians not elsewhere classified	3139	p
6. Technical and commercial sales representatives	Technical and commercial sales representatives	3415	Information and communications technology sales professionals	2434	
7. Data entry & calculating machine operators	Data entry operators	4113	Data entry clerks	4132	p
	Calculating-machine operators	4114	Data entry clerks	4132	p
8. Receptionists and information clerks (including call centres)	Receptionists and information clerks	4222	Contact centre information clerks	4222	
	Receptionists and information clerks	4222	Client information workers not elsewhere classified	4229	
9. Telephone switchboard operators	Telephone switchboard operators	4223	Telephone switchboard operators	4223	
10. Electronics fitters, mechanics, and servicers	Electronics fitters	7242	Electronics mechanics and servicers	7421	p
	Electronics fitters	7242	Information and communications technology installers and servicers	7422	p
	Electronics mechanics and servicers	7243	Information and communications technology installers and servicers	7422	p

	Telegraph and telephone installers and servicers	7244	Information and communications technology installers and servicers	7422	p
	Electrical line installers, repairers and cable jointers	7245	Information and communications technology installers and servicers	7422	p
11. Electrical and electronic equipment assemblers	Electrical-equipment assemblers	8282	Electrical and electronic equipment assemblers	8212	p
	Electronic-equipment assemblers	8283	Electrical and electronic equipment assemblers	8212	p

Source: Extracted from https://www.ilo.org/public/english/bureau/stat/isco/isco08/ [last accessed May 29th, 2023]

Annex Table 2 Number of employed in ICT jobs by type of occupations and industries, LFS 2009 and 2021

	Men		Women		Total	
	2009	2021	2009	2021	2009	2021
All						
ICT occupations in ICT industries	54,384	70,133	9,371	20,921	63,755	91,055
Non-ICT occupations in ICT industries	51,557	57,074	12,315	15,729	63,872	72,803
Total ICT industries	**105,941**	**127,208**	**21,686**	**36,650**	**127,627**	**163,858**
ICT occupations in non-ICT industries	154,158	269,582	22,499	61,173	176,657	330,754
Total ICT jobs	**260,099**	**396,789**	**44,185**	**97,823**	**304,284**	**494,612**
Public sector						
ICT occupations in ICT industries	17,362	12,086	3,186	4,005	20,548	16,091
Non-ICT occupations in ICT industries	18,132	19,535	8,496	7,086	26,627	26,621
Total ICT industries	**35,494**	**31,621**	**11,682**	**11,091**	**47,176**	**42,712**
ICT occupations in non-ICT industries	40,062	51,449	15,516	22,257	55,578	73,706
Total ICT jobs	**75,556**	**83,070**	**27,198**	**33,347**	**102,753**	**116,418**
Private sector						
ICT occupations in ICT industries	37,022	58,047	6,185	16,916	43,207	74,963
Non-ICT occupations in ICT industries	33,425	37,539	3,820	8,643	37,245	46,183
Total ICT industries	**70,447**	**95,587**	**10,004**	**25,560**	**80,451**	**121,146**
ICT occupations in non-ICT industries	114,096	218,133	6,983	38,916	121,079	257,049
Total ICT jobs	**184,543**	**313,719**	**16,987**	**64,475**	**201,530**	**378,195**

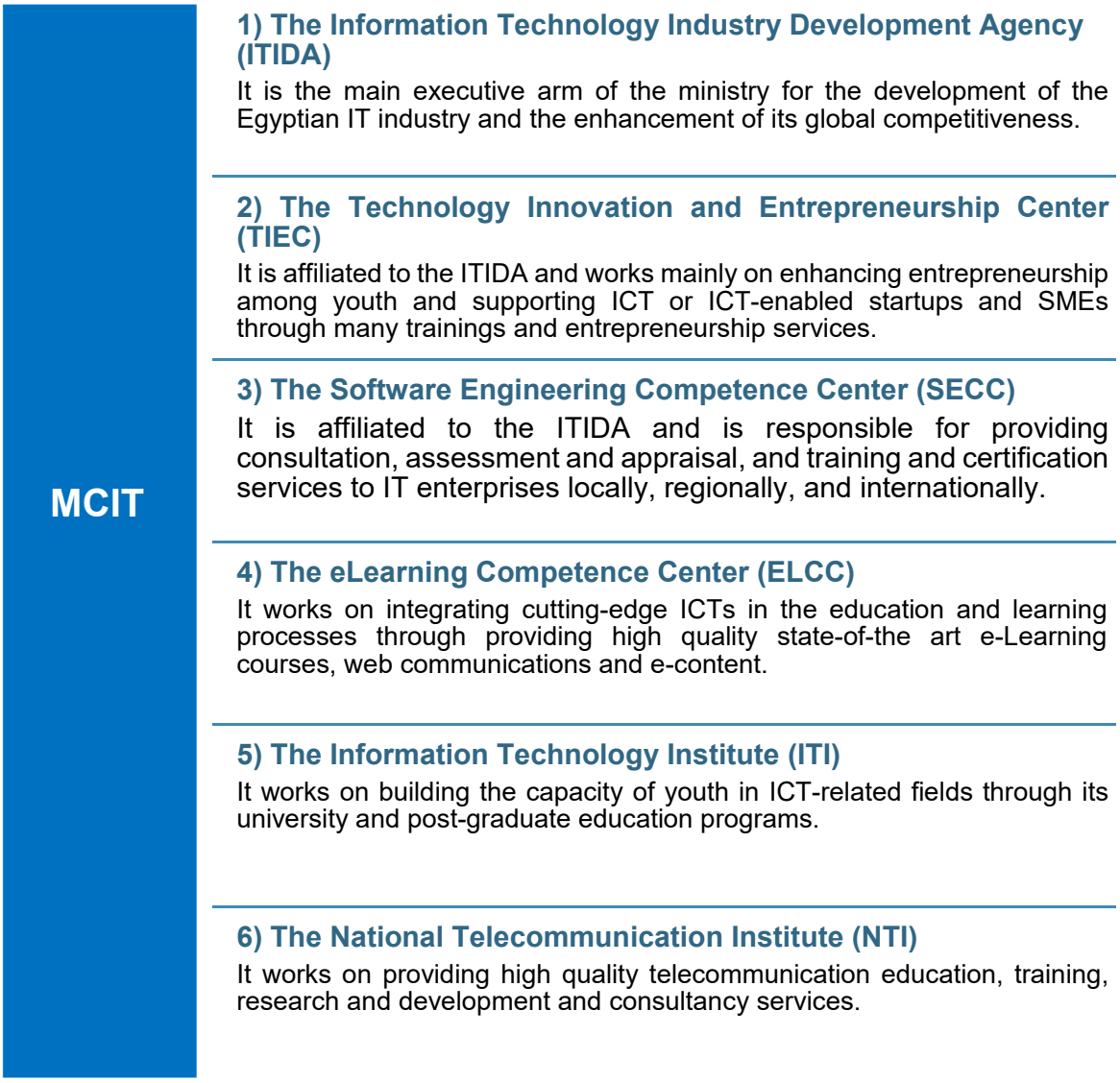
Source: Authors' calculations based on LFS 2009-2021.

Annex Table 3 ICT education specialisation programs by education level and CAPMAS education codes.

CAPMAS code of 2006 codebook (6-digit) Codebook (6-digit)	Specialised Degree
Secondary Level	
301067	Telecommunications devices
301070	Electric engineering
301071	Electronics and computer engineering
301072	Robot and industrial electronics
301073	Electronics
301074	Electronic computers
301075	Networking
301076	Network specialists
Above Intermediate: Post-secondary institute	
401006	ICT business administration
401023	Diploma in electronics
401035	Diploma in computers
401038	Diploma in wireless communications
Higher Education: University degree and 4 years institute	
548xxx	Computer science
552008	Power and communications engineers
552009	Marine technology and communications engineering
552010	Wired and wireless telecommunications engineering
552012	Computer engineering
552025	Mechatronics
552028	Aero communications engineering
Postgraduate	
648xxx	
652046	Diploma in power engineering (communications)
652074	Diploma in computer and control equipment
652077	Diploma in systems and computers
652078	Diploma in electronic computers
652079	Diploma in electronics of computers
652083	Diploma in communications and electronics
652214	Masters in communications
652215	Masters in communications engineering
652216	Masters in wireless engineering
652219	Masters in engineering of computers and electronic control
652220	Masters in control engineering
652221	Masters in industrial electronics
652222	Masters in computers engineering
652223	Masters in computers electronics engineering
652604	PhD in electronic communications engineering
652615	PhD in wireless engineering
652616	PhD in communications engineering
652618	PhD in computers and electronic control
652619	PhD in industrial economics
652620	PhD in control engineering
652621	PhD in computers
652622	PhD in electronics
652623	PhD in computers electronic engineering

Source: Authors' compilation based on CAPMAS education codebook of 2006 that were used in coding LFS data from 2009 to 2019. Note: For LFS waves 2020 and 2021, CAPMAS adopted a new education codebook published in 2017 that the authors matched to the 2006 codebook that was used for subsequent LFS waves.

Annex Figure 1 Affiliated institutions to MCIT



Source: Compiled by authors based on information available on the official website of the MCIT (https://mcit.gov.eg/en/Human_Capacity/ELCC#tabM)

Annex Table 4 Examples of relevant Initiatives to Promote ICT Jobs

Number	Initiative	Partners	Location	Target
CB.1	Digital Egypt Builders Initiative (DEBI) in 2020	MCIT, international universities, & local & global companies specialising in ICT, leadership, or language skills	Cairo	Targets providing annual free scholarships to 1,000 top graduate students nationwide in ICTs related fields nationwide. Students need to be graduates of Faculties of Engineering (departments of Computer, Communications, Electronics, Biomedical), or Faculties of Computer Science, or Faculty of Science (Department of Mathematics Computer Science)
CB.2	Youth Enablement for Freelancing in 2020	MCIT & Ministry of Youth and Sports	Virtual	Providing online training to 20,000 young people nationwide, including people with disabilities, to find freelancing jobs through. Training covers areas of computer networks, programming, operating systems, digital marketing, graphic design, mobile application, website development, among others like soft and leadership skills
CB.3	Egypt Future Work is Digital (Egypt FWD) in 2020	MCIT & the Information Technology Industry Development Agency (ITIDA).	Virtual	Providing fully funded scholarships to train 200,000 young people nationwide on future skills and jobs (e.g., web applications, data science, digital marketing, cloud, and more demanded tech skills in the job markets) through a virtual academy created and managed jointly by both public and private sectors
CB.4	Digital Tomorrow Initiative in 2020	MCIT & Ministry of Youth and Sports	Port Said	Providing training programs to youth in the age range between 14-40 years old nationwide on the importance of digital transformation, career planning, AI, goal setting, data analysis and entrepreneurship, digital literacy, Windows, Microsoft Office, etc.
CB.5	Practical Data Scientist Academy- Amazon Web Services (AWS) in 2021	MCIT & AWS	Virtual	Providing a free professional training to 500 young people nationwide, including those working in SMEs and start-ups, on data analytics and big data to become certified data scientists
CB.6	Egypt University of Informatics (EUI) in 2021	MCIT & international universities	The New Capital City	A not-for-profit ICT university that provides dual degrees in ICT-related specialisations to graduates from Egyptian (*Thanaweyya Amma*) nationwide in partnership with top-ranked international universities
CB.7	AI Training Program in 2021	ITI & the French EPITA School of Engineering and Computer Science.	Nasr City, Mansoura, Smart Village, Ismailia, & Alexandria	Providing a nine-month post-graduate professional training program to fresh graduates from Egyptian universities nationwide in Machine Learning (ML) and Artificial Intelligence (AI)
CB.8	Digital Egypt Cubs Initiative (DECI) in 2022	MCIT	Nationwide (Training centres booked based on applicants' governorates)	Training 3,000 top-performed students aged 12-17 years old in Egyptian schools nationwide (from the first year of preparatory school to the second year of secondary school) on IT, soft, and leadership skills

Number	Initiative	Partners	Location	Target
CB.9	Basic Digital Skills Development Programs	MCIT & (ICDL Arabia, Cisco, & Certiport of Pearson VUE/ Skills Plus)	Virtual	Providing necessary digital skills to all Egyptians at all levels (e.g., school and university students, youth, housewives, etc.). These programs include social media and Internet Safety Initiative, Distance Learning for Cybersecurity Initiative, and AI Initiative for Higher Education Students initiative
CB.10	Expanding ICT-related specialisations in all Egyptian universities	Ministry of Higher Education and Scientific Research	All Egyptian Universities	* Granting dual degrees in highly required specialisations related to ICTs through partnerships between Egyptian public, private, and non-for-profit universities, and international universities * Inauguration of many ICT-related faculties in all universities
CB.11	Government Employees Programs	MCIT & (The National Training Academy & The National Anti-Corruption Academy)	Virtual	Building the digital capacities of employees in the governorates and subordinate directorates at different governmental institutions (e.g., public service providers, government services centres owners and representatives, etc.).
CB.12	State's Administrative Apparatus' Employees Programs	MCIT & (The Information Technology Industry Development Agency ITIDA, The National Telecommunication Institute NTI, ICDL Arabia, among others)	Virtual	Building the digital capacities of employees at the State's administrative apparatus through many programs that target developing digital culture, digital skills, the skills of employees at the information systems and digital transformation units, and the administrative capital applications
CB.13	Establishing Technological Universities	Ministry of Higher Education and Scientific Research	(e.g., Gharbiya, New Assiut, New Taiba in Luxor, 6th of October City, Borg Al Arab, and East Port Said	Improving digital competences of technical school graduates through giving them the opportunity to develop their educational path in a way that makes them able to cope with the new requirements of the labour market.
EE.1	InnovEgypt	TIEC, ITIDA	CREATIVA Hubs Inside Public Universities (Aswan, South Valley, Minya, Sohag, Mansoura, Menoufia, & Suez Canal Universities) & TIEC premises (Smart Village, Borg El-Arab and Assiut Technology Parks)	Providing entrepreneurship training to university students and graduates nationwide, especially those who are specialising in ICT fields, on entrepreneurship and innovation and encouraging them to develop innovative ideas and solutions and implement them to help them become future entrepreneurs

Number	Initiative	Partners	Location	Target
EE.2	TIEC-Innovation Ambassadors	TIEC, ITIDA	Cairo, Giza, Damietta, Minya, Gharbia, Menoufia, Kafr El Sheikh, Luxor, Mansoura, New Valley, Port Said, Qalyubia, Qena, Sharqia, Sohag, Suez, Tanta, Zagazig	
EE.3	Introduction to Innovation & Technology Program	TIEC, ITIDA	CREATIVA Hubs in Ismailia, Mansoura, Shebin El-Kom, Minya, Sohag, Qena, & Aswan.	
EE.4	ibTIECar marathon	TIEC, ITIDA	Cairo, Aswan, Qena, Sohag, Assuit, Minya, Menoufia, Mansoura, Ismailia, & Alexandria	
EE.5	Creativa Innovation Hubs	TIEC, ITIDA	Inside Six Public Universities (Sohag, South Valley – Qena, Menoufia, Minya and Mansoura)	Aiding students, entrepreneurs, SMEs, and start-ups nationwide in developing their business plans, reaching innovative solutions, networking, and working with each other, launching their products, among other activities
EE.6	Women Entrepreneurship Program	TIEC, ITIDA	Virtual	Targeting early women entrepreneurs nationwide whose product is technology or who use technology to commercialise their products to help them grow their business
EE.7	African App Launchpad (AAL)	TIEC, ITIDA	Virtual	Encouraging 10,000 early Egyptians and Africans entrepreneurs to compete and present their innovative ideas and rewards them with cash prizes
EE.8	TIEC Entrepreneurship Accelerator		Virtual	Supporting early-stage ICT or ICT-enabled startups nationwide to pitch their business idea through education and mentorship
EE.9	TIEC Incubation Program (Start IT)	TIEC, ITIDA	Working spaces at TIEC premises (Smart Village, Borg El-Arab and Assiut Technology Parks)	Supporting newly initiated ICT or ICT-enabled startups nationwide with many incubation services

Number	Initiative	Partners	Location	Target
EE.10	Access to Talent Program (Jobathon)	MCIT & TIEC	CREATIVA Hubs (Sohag, South Valley – Qena, Menoufia, Minya and Mansoura) & TIEC premises (Smart Village, Borg El-Arab and Assiut Technology Parks)	Facilitating business enterprises' access to needed ICT skills for both hiring and internship opportunities
EE.11	Startup Launchpad	TIEC, ITIDA & American University in Cairo (AUC) Venture Lab	-------	Providing intensive training to entrepreneurs in ICT fields nationwide on how to develop their entrepreneurial projects
EE.12	Breakfast with investor	TIEC, ITIDA	-------	A monthly event organised to empower existing SMEs and entrepreneurs nationwide in the ICT related fields through different capacity building programs and exposing them to world-class investors to get inspired and share experience, opportunities, and partnerships
PO.1	Export-IT Rebate program	ITIDA	Online	Targeting increasing ICT exports and increasing the competitiveness of ICT companies in global markets
PO.2	Technology Parks	MCIT	e.g., Maadi Technology Park in Maadi, Silicon Waha in Borg El Arab, among others	These parks are established to capitalise on the very high growth of the outsourcing industry in Egypt by creating a dynamic environment for both local and international companies to collaborate
PO.3	German Training Initiative in Upper Egypt	ITIDA & Goethe-Institute in Egypt	Beni Suef, Minya, Assuit, Sohag, South Valley, Luxor & Aswan Universities	Targeting to train second, third-, and fourth-year students of non-technical faculties as well as unemployed graduates in Upper Egypt on German language skills to help them find call centre jobs for German speaking countries.
PO.4	German Language Academies Program for Outsourcing Sector	ITIDA	-------	Targeting qualifying students, employees, and job seekers nationwide with German language skills that are highly demanded by outsourcing companies, especially those in the call centre industry

Source: By authors based on a detailed review of recent ICT initiatives available on the websites of MCIT (https://www.mcit.gov. eg/) and MPED (https:\\mped.gov.eg\GrossDomestic?lang=en)

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