European Training Foundation

BIG DATA FOR LABOUR MARKET INFORMATION (LMI) IN TUNISIA

Methodological overview and Analytics insights on Tunisian Web Labour Market

WORKING PAPER

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CONTENTS

FIGURES AND TABLES

1 INTRODUCTION – PURPOSE OF THE PROJECT

Governments and socioeconomic partners in most ETF partner countries are unanimous on the need to develop and better use information on labour market and skills dynamics to improve the performance of education and training, the availability of qualifications and skills for employment, and the lifelong societal and personal development of individuals. In this context, most partner countries have been reinforcing their systems, capacities and methods to identify, analyse and anticipate demand and skills needs in a context of changing economic structures, new types of work, and rapid digital transformation of occupations and tasks.

While conventional labour market intelligence (LMI), based on regular statistics, specific-purpose surveys and qualitative methods, has gained ground in ETF partner countries, there is room to further innovate data sources, improve analytical capacities and modernise the formats and instruments to visualise and disseminate insights for users (policy makers, socioeconomic partners, education and training players).

Big Data analytics offers new opportunities to improve LMI and deliver real-time and fine-grained skills analysis and insights for users. Big Data is all around us. Big Data is characterised by volume, variety, velocity and – eventually – value. Machine learning and artificial intelligence (AI) algorithms, combined with immense computing power anytime and anywhere, allow data science to exploit specific Big Data sources that have great potential to supplement and enrich conventional LMI. This is the case for online job vacancies (OJVs) managed by a large variety of online job portals and boards.

Creating knowledge out of large volumes of data that are available at high velocity and with great variety is the major goal of Big Data analysis. It is about value. Analysis of thousands of millions of job vacancies can describe much about the skills that employers want, in almost real time and in fine-grained detail. Screening and ranking of OJV portals – the first step of the methodology – can tell us much about the overall panorama of the online/digital labour market in countries and regions, the features of the individual job portals, the volume of OJVs posted, and the sectoral and occupational coverage of OJVs. Most importantly, analysis of OJVs reveals specifics of how employers describe jobs/tasks, the mix of skills they seek, and the importance they attribute to credentials/qualifications.

OJVs are a rich source of information about the skills and other job requirements that employers require, information that is difficult to gather via other conventional methods. Data from OJVs do not replace other types of LMI, but add value and can be combined with conventional statistical data.

2 BIG DATA FOR LABOUR MARKET INTELLIGENCE

The characteristics of job vacancies and the way they are advertised have changed radically over the past few years. Technological progress, globalisation and the reorganisation of production processes have seen not only the introduction of new professional profiles (typically linked to technological factors), but also the redefinition of consolidated professions through the introduction of new skills, which are increasingly becoming essential for many professions. In fact, it is observed that the

demand for digital skills plays an increasing role within all professional profiles, even those not necessarily related to the information and communication technology (ICT) sector. Knowledge of these current changes can certainly be gained through the study and analysis of the data that companies publish on the web when searching for professionals to meet to their needs. An example in this direction is the growing diffusion of services for online recruitment (e-recruitment) which make it possible to publish a job request through various web sources, such as online newspapers, employment agencies, specialised websites and job vacancy aggregators. The development of algorithms, methodologies and systems for labour market analysis for the synthesis of useful information for decision making has recently been termed 'labour market intelligence', by which we mean the definition and implementation of AI and Big Data techniques for the processing and synthesis of labour market data with the aim of supporting decision-making processes.

LMI is an emerging cross-disciplinary field of study that is attracting research interest in both industrial and academic communities, as summarised below. Since the early 1990s, text classification (TC) has been an active research topic. It has been defined as 'the activity of labelling natural language texts with thematic categories from a predefined set' (Sebastiani, 2002). Most popular techniques are based on the machine learning paradigm, according to which an automatic text classifier is created by using an inductive process that is able to learn, from a set of preclassified documents, the characteristics of the categories of interest. Recently, TC has been shown to give good results in categorising much real-life web-based data such as news and social media, and sentiment analysis. Skills extraction from OJVs can also be associated to the information extraction and named entity recognition frameworks. The latter has been applied to solve numerous domain-specific problems in the areas of information extraction and normalisation. In recent years, public administrations have started to explore new ways of supporting knowledge management and of obtaining detailed and fresh information about the labour market. Here, administrative information collected by public administrations has been used to study labour market dynamics, conducting both data quality and knowledge discovery activities through AI techniques. Unfortunately, administrative data are collected when people are hired (and only in countries where the state collects such information), so do not provide information about labour demand.

This problem is also relevant for businesses, and this has motivated the development of several commercial products providing job seekers and companies with skill-matching tools. Firms have a strong need to automate human resource department activities; consequently, a growing number of commercial skill-matching products have been developed in recent years.

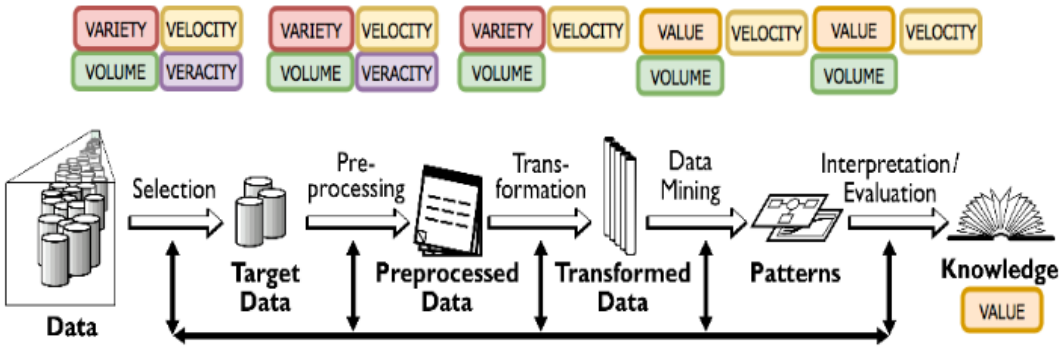
We aim to classify OJVs according to a target classification system for building a (language-independent) knowledge base for analysis purposes, rather than matching resumes on job vacancies. Our approach aims to build a knowledge-graph to support fact-based decision-making activities for LMI.

3 THE KDD PROCESS

Bias, abnormalities or inconsistencies, duplication and volatility are some of the aspects that need to be removed to improve the accuracy of Big Data. As one might imagine, for a given data source the greater the variety, the greater the veracity. The use of natural language brings into the text a great deal of 'noise' containing no information (e.g. prepositions, terms not related to the topic of interest, conjunctions and acronyms that must be expanded). All these issues must be properly addressed to

enable unstructured data to produce knowledge through the knowledge discovery in databases (KDD) process. This approach enables management of Big Data for LMI and consists of five main steps (Figure 3.1): selection, preprocessing, transformation, data mining and machine learning, interpretation/evaluation. Clearly, this needs to be adapted to the domain of interest, adjusting one task or step in relation to another.

Figure 3.1. The KDD process



Source: Fayyad et al. (1996).

Selection. Selection of data sources is the first step. Each internet source must be evaluated and ranked in terms of the reliability of the information. This phase should consider, for example, the vacancy publication date, the website's update frequency, the presence of structured data, and any downloading restrictions. At the end of this phase, a ranking of reliable web sources is produced.

Preprocessing. This step includes data cleaning to remove noise from the data or inappropriate outliers (if any), deciding how to handle missing data, and identifying a function to detect and remove duplicated entries (e.g. duplicated vacancies or vacancies with missing values). Data quality and cleaning are essential tasks in any data-driven decision-making approach, to guarantee the credibility of the overall process. Identification of duplicated job vacancies is far from straightforward. Job vacancies are usually posted on multiple websites, and this is a duplication, whereas re-use of the same text to advertise a similar position is not. Identification of appropriate features for correct recognition of duplicates in the internet labour market domain is crucial. The preprocessing step reduces the complexity of the Big Data scenario, mitigating the impact of the veracity dimension through data quality and cleaning.

Transformation. This step includes data reduction and projection, which aim to identify a unified model to represent the data, depending on the purpose of the exercise. Furthermore, it may involve the use of dimensionality reduction or transformation methods to reduce the effective number of variables or to find invariant representations for the data. Like preprocessing, the transformation step reduces the complexity of the data set by addressing the variety dimension. It is usually performed by the usage of extraction, transformation and loading (ETL) techniques, which support the data preprocessing and transformation phases in the KDD process. Roughly speaking, through ETL, the data extracted from a source system undergo a series of transformation routines that analyse, manipulate and then clean the data before loading them into a knowledge base. By the end of this step, the outcome of which is a clean, well-defined data model, the Big Data variety issue should be resolved.

Data mining and machine learning. The aim of this step is to identify appropriate AI algorithms (e.g. classification, prediction, regression, clustering, information filtering) by searching for patterns of interest in a particular representational form, based on the purpose of the analysis. More specifically, in the context of LMI, it usually requires the use of TC algorithms (e.g. ontology based or machine learning based) to build a classification function for mapping data items into one of several predefined classes. This step is crucial as it is mainly devoted to the extraction of knowledge from the data.

Interpretation/evaluation. This final step employs visual paradigms to visually represent the knowledge obtained, depending on the user's objectives. In the LMI context, it means considering the user's ability to understand the data and their main goal in the LMI field.

The collection of OJVs aims to extract the following variables, classified according to international standards so that the data are comparable, regardless of the country analysed:

■ occupation → International Standard Classification of Occupations (ISCO) v.1 down to level 4

■ skill → European Skills/Competences, qualifications and Occupations (ESCO)[1] v.1

■ educational level → International Standard Classification of Education (ISCED) level 1

■ working hours → custom taxonomy ('part-time' and 'full-time')

■ type of contract → custom taxonomy ('temporary', 'permanent', 'self-employed')

■ industry → NACE[2] level down to level 2

Once internet labour market data have been produced, they must be delivered to end users according to the needs of stakeholders. For labour market analysts, interactive dashboards have been built that allow analysis of internet labour market dynamics and trends following a predefined model, ensuring data integrity and protection. It should be emphasised that a key role in data validation is that of the national expert. These experts' knowledge of the country analysed allows them on the one hand to verify and validate what emerges from the analysis of OJVs and on the other hand to help in the interpretation of any phenomena that emerge. Only those who know the local area can make the most effective use of web data, always with the intention of integrating rather than replacing official statistical data, which represent a stock figure in effect and therefore a 'snapshot' at a certain time, in contrast to web data.

[1] ESCO is a multilingual classification system for European skills, competences, qualifications and occupations, developed by the European Commission. The ESCO classification corresponds to the International Standard Classification of Occupations (ISCO-08) up to the fourth-digit level. It then extends ISCO through an additional level of occupations and skills, organised as a graph rather than a tree (i.e. a skill may belong to multiple occupations).

[2] Statistical classification of economic activities in the European Community, see: https://ec.europa.eu/eurostat/web/nace-rev2

4 DEFINITION OF ONLINE JOB VACANCY

The analysis of OJVs and the skills specified in them makes it possible to identify – at a given moment in time – the main skills required by the company for the professional profile demanded. For example, the skill of 'programming' is unlikely to be explicitly mentioned by the employer in an advertisement for a software analyst as it is deemed to be implicit; meanwhile, the same skill could be made explicit for a statistician if this is considered as enabling the profession. In this sense, therefore, a vacancy listing should not be understood as an enumeration of the skills of the professional profile; standard taxonomies offer a complete and comprehensive description. Instead, the job advertisement must be understood as a specification of the competences and skills of the profession that are considered essential for companies when the data is collected or observed. In other words, vacancy listings allow attention to be focused on the skills required in real time by the labour market, and thus represent a valuable tool for investigating changes over time in professions and skills in the different dimensions of analysis.

OJVs, which are job advertisements, contain two main text fields: a title and a full description. The title briefly summarises the job position, while the full description field usually includes details of the position and the relevant skills the employee should hold.

5 ONLINE JOB VACANCIES: TUNISIA

The analysis below was carried out on data collected monthly from April to September 2020 consisting of over 37 500 unique job advertisements published on the web and coming from different and heterogeneous sources aimed at the national territory of Tunisia. These are announcements that are published daily on selected portals and that – when properly elaborated – make it possible to analyse the professions required, their characteristics in terms of competences and skills (extracted from the description in the text of the advertisement), the economic sector of the companies concerned and other variables of interest, such as type of contract and years of previous experience required. The portals selected capture the characteristics of the job demand as completely as possible on the web in the national territory. Through the landscaping phase, 16 sources were selected; of these, 10 have a national geographical scope, while the remaining 6 have an international scope; 13 sources of the 16 are **job search portals** while the remaining 3 are **classified ads portals**.

Regarding small companies, generally they don't use web channel to recruit staff, using instead more traditional channels. Then, there will almost certainly be few OJVs collected regarding those companies.

5.1 What do the data tell?

- ***Ratio deduplicated/total***

The deduplicated/total ratio is a very relevant indicator for the job market on the web for the analysed countries. Comparison of data for the two countries analysed, namely Tunisia and Ukraine, shows a

substantial difference for this indicator, with the latter having a much lower duplication rate. This is hypothetically indicative of a business difference applied by the different portals: the market on the Tunisian web, which is presumably in a phase of growth and consolidation, has rather generalist portals that are transversal to the various sectors and probably have a high percentage of announcements in common. Meanwhile, the Ukrainian market is more multifaceted, with portals that over the years have developed specific markets for different business roles and sectors, specialising and, consequently, reducing duplication. This index, based on a solid selection of sources obtained through the landscaping phase, is therefore very interesting and is suggestive of a dynamic of maturity of the job market on the web.

- ***The COVID-19 pandemic***

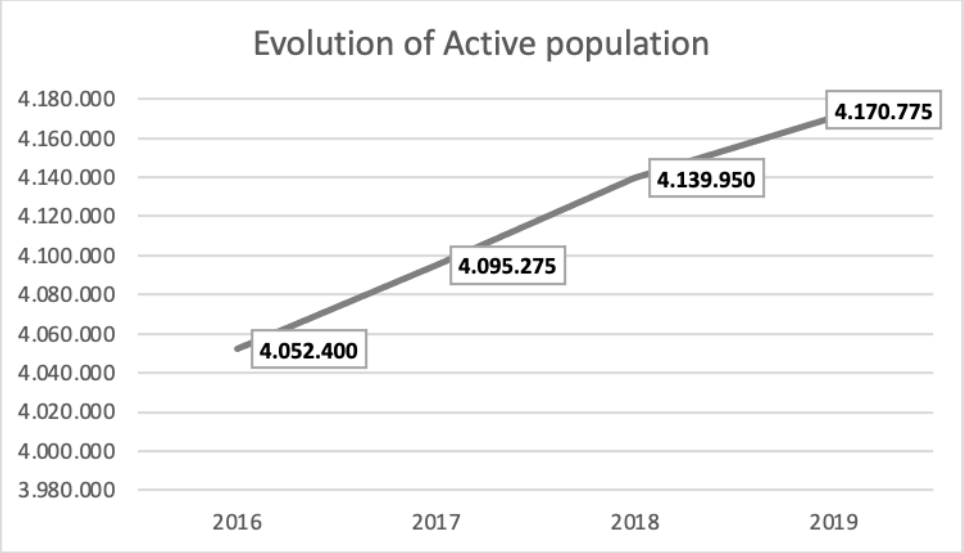
The current period we are experiencing represents a unique and unprecedented moment in time. The study and analysis of how the pandemic is reflected on the one hand in the employment/unemployment data extracted from official statistics and on the other in the web data certainly represents an interesting aspect. Although we do not have up-to-date data that we can use for our analysis for the former, for the latter it is possible to make initial observations by analysing the monthly historical series (April–September 2020). April is the month with the lowest number of advertisements published (2 521), and this corresponds with the most stringent COVID-19 measures put in place by the Tunisian authorities. There is a significant increase in announcements precisely corresponding to the gradual withdrawal of the measures, i.e. from 29 April onwards. The significant increase in the number of announcements starting from May and even more so from June is therefore entirely logical, following the recovery of various economic activities. It should be pointed out that the reduced length of the historical series does not allow for clear and irrefutable conclusions to be drawn. Thus, this growth will have to be verified to understand whether it is an extemporaneous factor linked to the exit from the lockdown or a seasonal factor that will recur in 'normal' conditions. It is therefore impossible to estimate the dynamics. Nevertheless, it is important to assess and monitor what is happening in order to understand how the market is adapting to this historic event. In the future, we will be able to understand better how the dynamics have stabilised, with what growth rates (already visible today, after the first months of collection and observation) and with what new emerging skills and professions. In this sense, the freshness and timeliness of the web data allow us to understand aspects in almost real time, something that is not possible with the official data.

6 DATA FROM OFFICIAL STATISTICS

This section provides a summary description of the labour market in Tunisia through the analysis of the main indicators developed with respect to the available dimensions, starting with official statistics (http://www.ins.tn/en/statistiques).

In 2019 the active population was over **4 170 000**, 71% of whom (over 2 960 000) were male. Figure 6.1 shows the evolution of the active population from 2016 to 2019; there is a continuously increasing trend, and 2.9% growth over the period[3].

Figure 6.1. Evolution of active population, 2016–2019

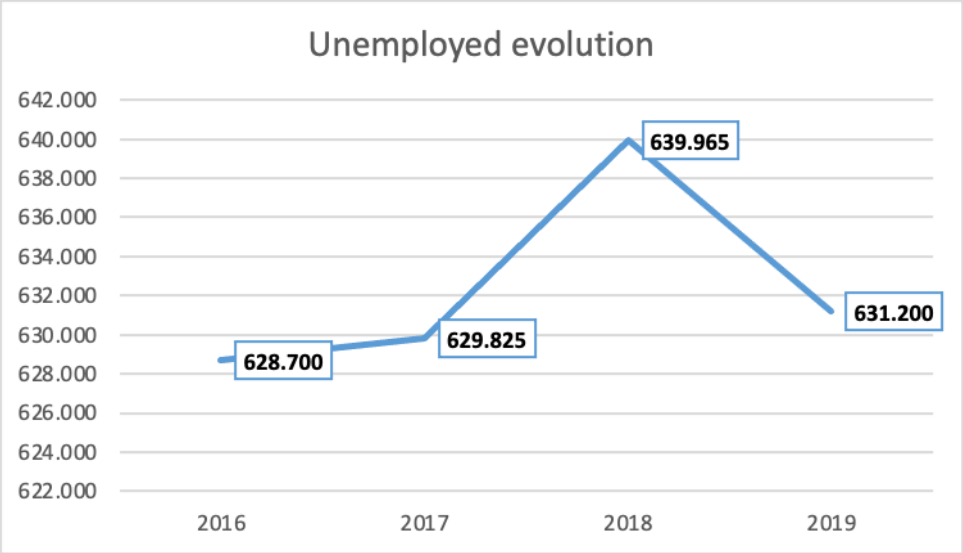


6.1 Unemployed and unemployment rates

In 2019 the unemployed population was ***over 631 000***. There was a marked decrease from 2018 to 2019 (−1.4%, corresponding in absolute terms to over 8 700 fewer unemployed individuals), after a significant increase from 2017 to 2018 (+1.6%, or over 10 000 more unemployed people). The male component represented 58% of the total unemployed population (over 363 000 people); there were no gender variations during this period with respect to the composition of the unemployed population.

Figure 6.2. Evolution of the unemployed population, 2016–2019

[3] The active population is defined as the total number of unemployed people plus the employed civilian workforce.



The unemployment rate is high, especially for young people and women.

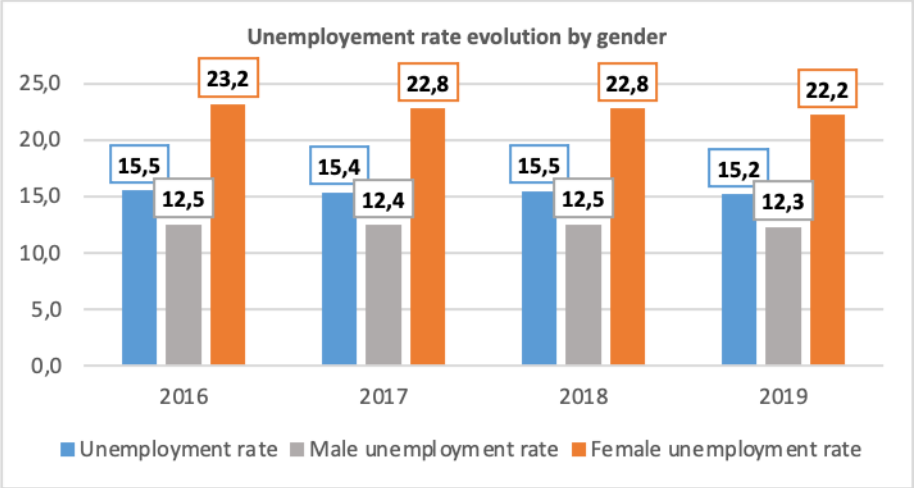
The overall unemployment rate in 2019 was 15.2%, a slight decrease on the previous year, when it was 15.5%. With regard to gender, the female unemployment rate, at 22.2% in 2019, was significantly higher than the male rate, at 12.3%, with a difference of about 10 percentage points[4].

The gap between the male and female employment rates is the result of discriminatory attitudes on the part of employers, based on sociocultural values. In the provinces, the high rate of unemployment among women may also be caused by their lower mobility, which prevents them leaving their home to apply for a job, and by the distance to the nearest job centre. A further factor is that women often study for qualifications that are less in demand on the labour market. Overall, women work in lower-skilled jobs than men with the same level of qualification.

Female entrepreneurs face many obstacles in Tunisia, the most significant being: i) cultural barriers to starting a business; ii) a lack of collateral for bank loans, since women own little property in their own right; and iii) the general scarcity of women in the working population and in executive posts (OECD, 2018).

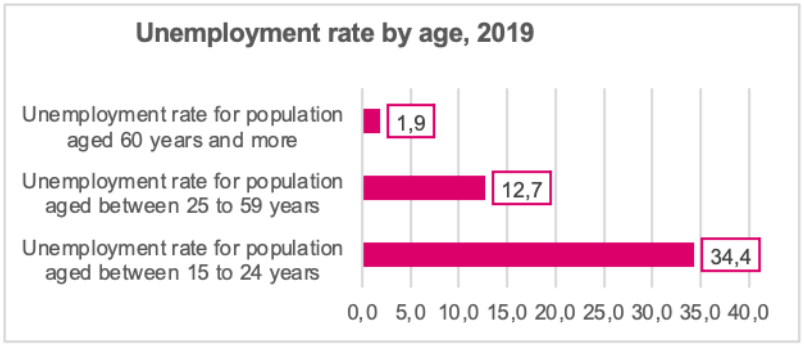
Figure 6.3. Unemployment rate by gender, 2016–2019 (%)

[4] The unemployment rate is calculated as the number of unemployed people as a percentage of the active population. Unemployed people are those of working age who are without work, who are available for work and who have taken active steps to find work.



With regard to age groups, in 2019 the unemployment rate was 34.4% for young people aged 15–24, falling to 12.7% for those aged 25–59 and finally to 1.9% for those over the age of 60.

Figure 6.4. Unemployment rate by age, 2019 (%)

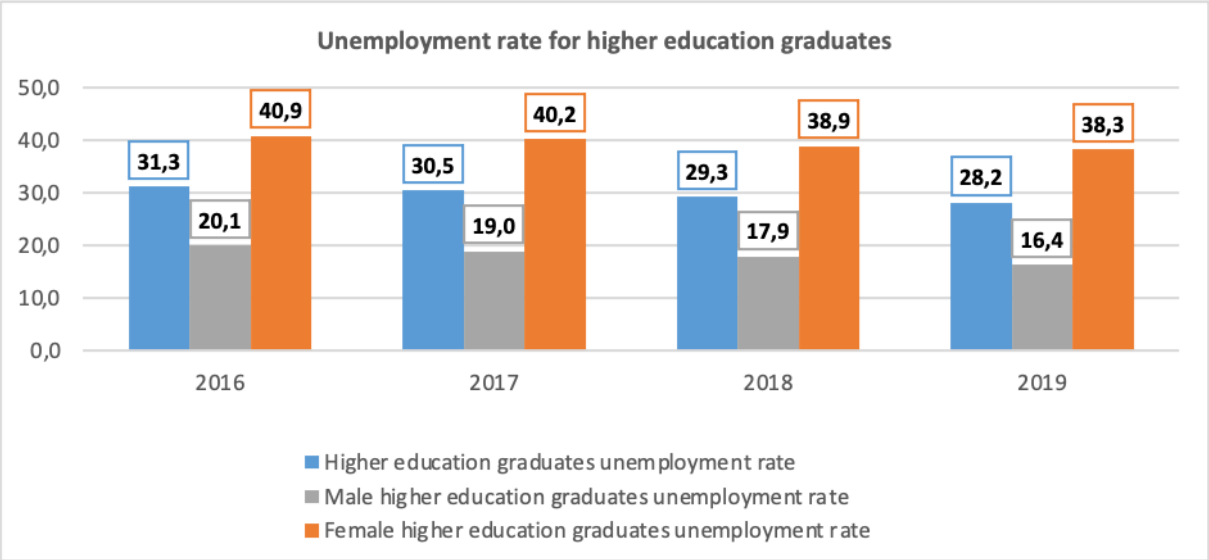


Unemployment is high, particularly among young graduates.

There is a higher unemployment rate among graduates of higher education than for individuals with primary or secondary schooling. There is a significant mismatch between the skills acquired by young Tunisians and employers' needs, and this represents an obstacle to their employability. Employers need to be more involved in the design of programmes. The public sector recruitment policy, which gives priority to the long-term unemployed, seems to have worsened the problem of unemployment among graduates. This policy is clearly an incentive to register as unemployed with the employment agency and await a job in the public sector that offers a higher salary, greater job security and more generous social benefits (OECD, 2018).

Figure 6.5 shows that the unemployment rate for graduates was 28.2% in 2019 (higher than the overall unemployment rate, 15.2%); the female unemployment rate is the most worrying, reaching a value of 38.3%, compared with 16.4% for the male unemployment rate.

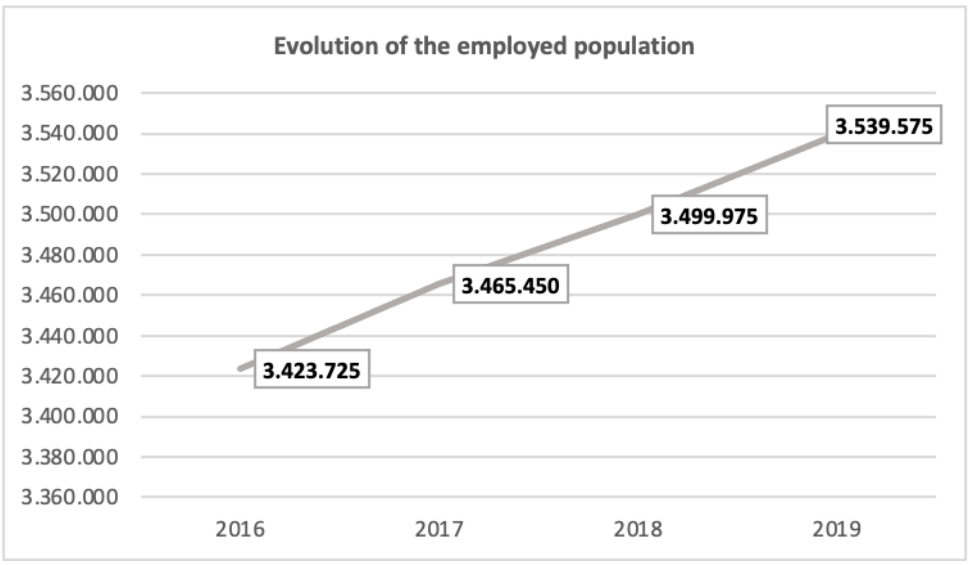
Figure 6.5. Unemployment rate for higher education graduates, 2016–2019 (%)



6.2 Employment

There has been a positive and increasing trend in the number of employees, the number having risen from over 3 423 000 in 2016 to over 3 539 000 in 2019, an increase of 3.4%.

Figure 6.6. Evolution of the employed population, 2016–2019



The gender composition of the employed population shows a clear prevalence of men: the share was 73% in 2019, and this has remained constant over the period observed.

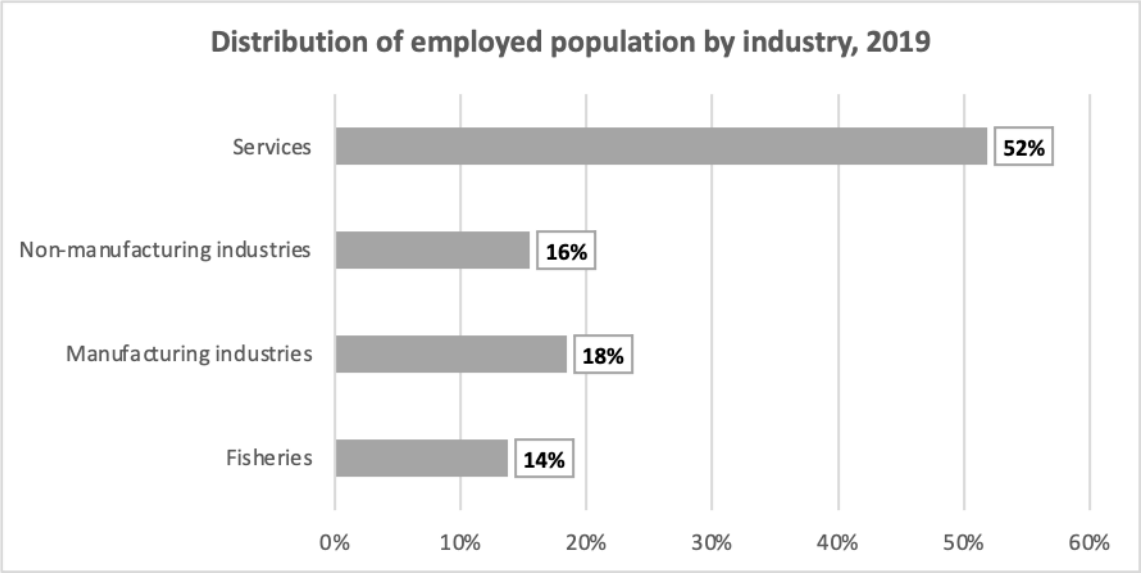
Gender gaps are smaller than in other MENA countries. However, the employment rate is much lower for women than for men, and women often have less skilled jobs. Policies that promote women's participation in the labour market and their employment, and that provide better guidance on training courses that help to ensure employment, should be implemented.

The female employment rate is one of the highest in the Middle East and North Africa (MENA) region, but it still falls well short of that of the OECD (23% versus 63%). The proportion of women holding management positions in the public and private sectors in Tunisia is the highest among MENA countries, at 14.8% (OECD, 2018).

Employees and sectors of economic activity

The distribution of employees by sector of economic activity in Tunisia shows a significant share associated with the services sector, which accounts for over half of the employed population (52%), followed by the manufacturing sector (18%), non-manufacturing industry (16%), and finally the agricultural sector (14%). Analysis of the period 2016–2019 shows the same distribution share for all sectors.

Figure 6.7. Distribution of employed population by industry, 2019

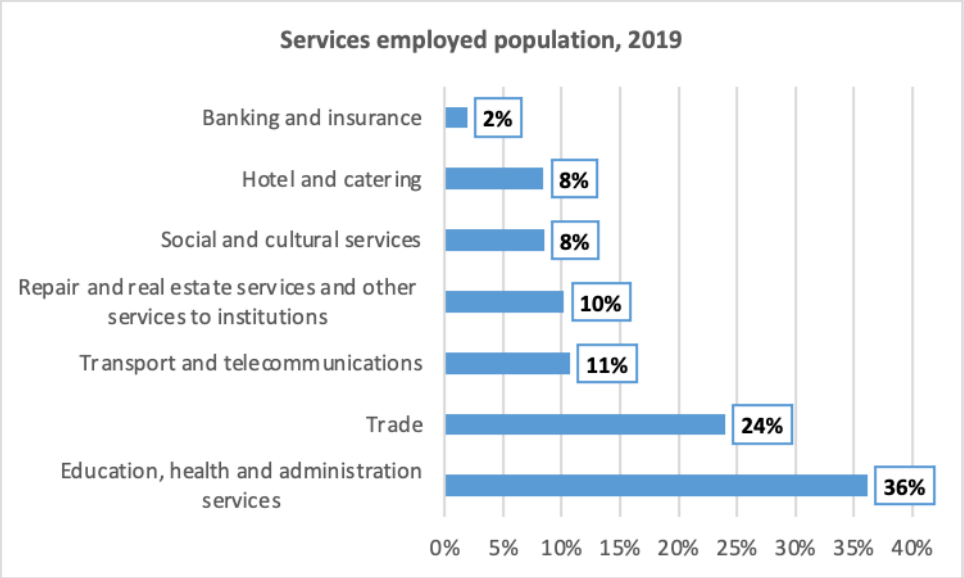


The data from the official statistics offer a further level of detail, allowing us to analyse which sub-sectors show the highest and lowest employment rates in Tunisia.

- ***Services*** (52% of the employed population)

Figure 6.8 shows the percentage of employees in the various sub-sectors of the services sector.

Figure 6.8. Services employed population, 2019



- ***Manufacturing industries*** (18% of the employed population)

Figure 6.9 shows the shares of employees in the various sub-sectors of the manufacturing sector.

Figure 6.9. Manufacturing industries employed population, 2019

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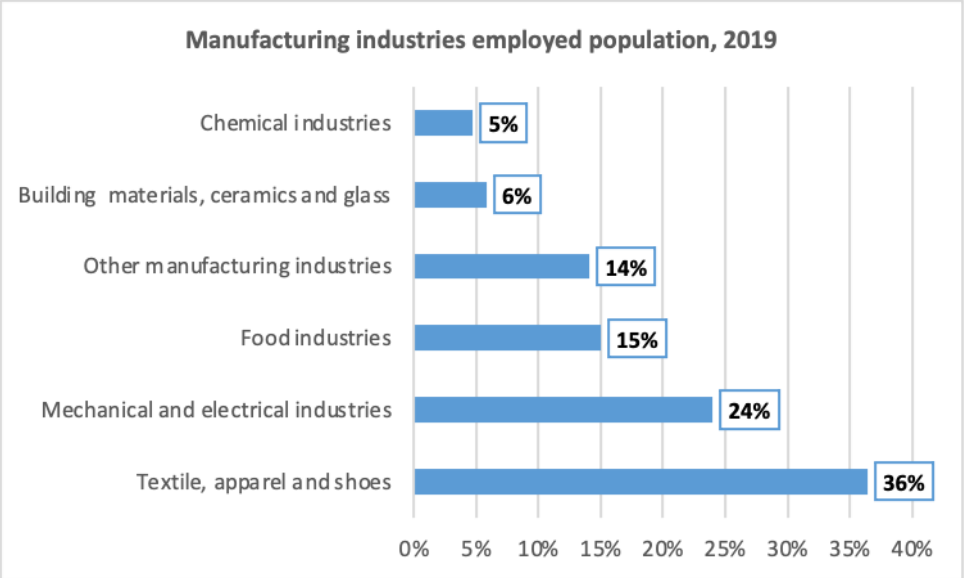
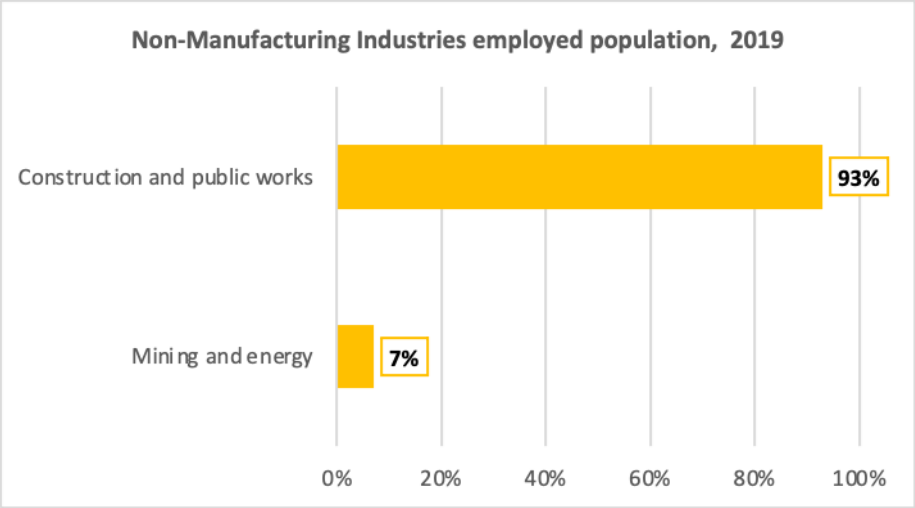


- ***Non-manufacturing industries*** (16% of the employed population)

For this sector, almost all employees are in the construction and public works sub-sector, which accounts for 93% of the total employed population.

Figure 6.10. Non-manufacturing industries employed population, 2019



6.3 Conclusions

The analysis of data from official statistics in Tunisia allows us to extract the following evidence.

1. The active population in 2019 was over 4 170 000, 71% of whom were male. The trend was positive from 2016 to 2019.

2. The unemployed population in 2019 was over 631 000, down by 1.4% (over 8 700 fewer people) on the number in 2018.

3. The unemployment rate is high, especially for young people and women. Female unemployment was 22.2% in 2019, compared with a rate of 12.3% for men. The gap between the male and female employment rate is the result of discriminatory attitudes on the part of employers, based on sociocultural values. A further factor is that women often study for qualifications that are less in demand on the labour market. Overall, women work in lower-skilled jobs than men who have the same level of qualification.

4. Unemployment is high, particularly among young graduates. There is a higher unemployment rate among graduates of higher education than for individuals with primary or secondary schooling. There is a significant mismatch between the skills acquired by young Tunisians and employers' needs, and this represents an obstacle to their employability. Employers need to be more involved in the design of training programmes.

5. The female employment rate is one of the highest in the MENA region, but it still falls well short of that for the OECD (23% versus 63%). The proportion of women holding management positions in the public and private sectors in Tunisia is the highest among MENA countries, at 14.8% (OECD, 2018).

6. In 2019 more than half of the population (52%) was employed in the services sector, followed by the manufacturing sector (18%), non-manufacturing industry (16%), and finally the agricultural sector (14%).

7 USE OF THE INTERNET

Micro and small firms are unlikely to recruit through formal employment agencies or using the internet. Their vacancies are hard to classify by type and level of skill. However, they may have computers and mobile phones that allow them to access the internet. The existing data show that the use of the internet will not be a major barrier to monitoring job vacancies and the labour market online. According to a recent survey conducted in 2019 by the National Telecommunication Agency (the Tunisian telecommunication regulator), two thirds of mobile phone owners use their phones to access the internet (75% of women and 90% of young people). Overall, almost 70% of individuals use the internet (80% of women and 90% of young people). The Internet Users Statistics for Africa in 2018 gives a smaller number, 66.8% instead of 70%. The difference could reflect growth from 2018 to 2019. Compared to the data for Africa and to the world average (58.8%), Tunisia scores relatively well.

Individuals use the internet for a number of purposes, both personal and professional; the survey results show that ***45% of individuals use the internet at work***. This percentage reflects quite accurately the depth of internet penetration in the production system, and it may be explained by the size of the informal sectors: about half of labour is in the informal sector where the use of the internet is limited.

In 2015, according to a survey by the National Institute of Statistics (L'Institut National de la Statistique, INS) (INS, 2017), 84.7% of firms in the private sector used the internet, even though fewer than half of their employees did; this proportion must be significantly higher by now. The survey sample included small enterprises; the number must be close to 100% for medium and large firms. As shown Table 7.11, some sectors are outliers, such as restaurants, where most of the enterprises are small and rather informal. But even in this case, 61.1% use the internet. All public sector enterprises are connected to the internet.

Table 7.1. Proportion of enterprises using the internet in Tunisia by sector, 2015 (%)

Sector	***%***
ICT	99.2
Specialised, scientific and technical activities	98.5
Education	98.5
Other services	97.4
Real estate	94.2
Other administrative services	94.0
Health and social services	90.9
Mining	87.4
Commerce and car maintenance	86.9
Transports and logistics	85.0
Manufacturing	82.8
Construction	81.9
Arts and recreation	80.2
Utilities (electricity, gas, water)	77.7
Hotels and restaurants	61.1
Total	**84.7**

8 ONLINE JOB VACANCIES

The number of OJVs published on the web for Tunisia in the observed period, from 1 April to 30 September 2020, was 37 535.

The source that published the highest number of job advertisements was **Tanitjobs**, with over 19 000 and a share of 52%, followed by **Jora** with around 5 500 (15%), **Keejob** with over 4 800 (13%) and **emploi.nat** with over 2 200 (6%).

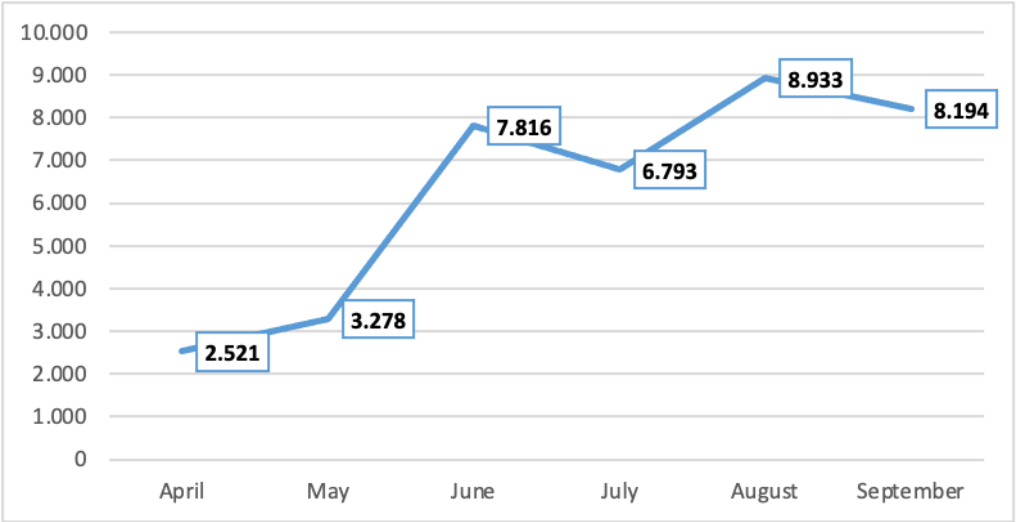
Analysis of the historical series allows us to identify, where present, the seasonal factors that characterise the territory analysed and detect any critical issues. However, it should be remembered that the shortness of the historical series does not allow us to draw clear and irrefutable conclusions, but only to identify the inputs to be kept in mind as the observed period progresses. April was the month in which the lowest number of advertisements were published (2 521).

This data can be attributed to the effects of the COVID-19 pandemic. The Tunisian authorities announced on 29 April that the measures aimed at curbing the spread of the virus would be gradually revoked starting from 4 May, thus putting an end to the lockdown. With the measures loosened, parts of the food and construction sectors resumed operations, as did government employees and public transport services, at least partially. The restrictions were then further relaxed on 11 May with the reopening of clothing stores and shopping centres. It would therefore be logical to expect a significant increase in announcements starting from May, and even more so from June, following the return of various economic activities. However, this growth will have to be verified when there is a longer historical series available in order to understand whether it is an extemporaneous factor linked to the exit from the lockdown or a seasonal factor that will recur in 'normal' conditions.

However, the overall trend of advertising on the web is growing, with web channels increasingly used by companies to advertise profiles that are difficult to fill and/or are highly specialised, and not always reachable by standard recruitment channels.

As shown in Figure 8.1, the number of advertisements grew by 30% from April to May, increased by 138% from May to June, suffered a slight decline from June to July (−13%), and then returned to growth in August, reaching the highest value during this period, with almost 9 000 advertisements.

Figure 8.1. Publication of OJVs by month, April–September 2020



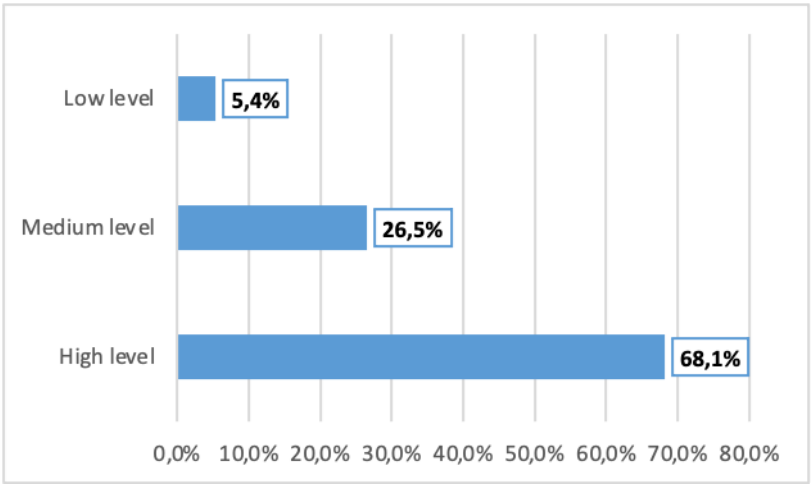
8.1 Occupation

The type of profession demanded on the labour market in OJVs Tunisia is one of the most important dimensions. The highest number of advertisements were for highly specialised levels, that is, professionals, with 34.2% of the total, followed by technicians and associate professionals with approximately 26.63%, service and sales workers with 12.14% and clerical support workers with 11.13%. In last position in terms of the number of advertisements posted on the web are elementary occupations, professions with a low level of specialisation, with a share of 3.21%. Thus, the analysis shows that companies looking for staff use the web to search for high- and medium-specialisation profiles, while they almost certainly resort to more 'standard' channels to search for low-specialisation profiles.

Figure 8.2. OJVs by occupation (level 1)

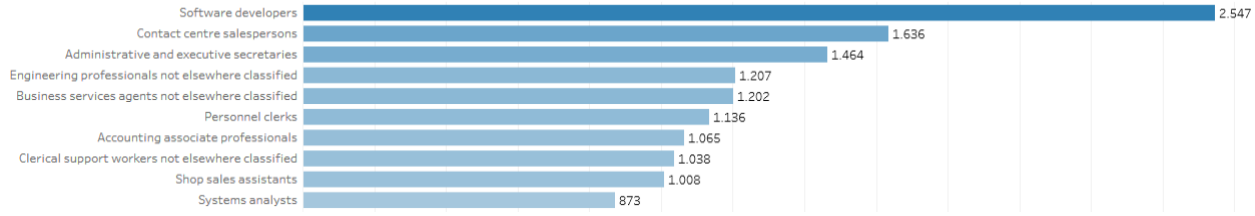
An analysis of professions by skill level shows that the profiles in most demand on the web are those that are ***highly skilled***. High-skill profiles account for 68.1% of the total advertisements, followed by medium-skill profiles with 26.5%, and finally low-skill profiles with only 5.4%.

Figure 8.3. OJVs by skill level



The profession most requested in Tunisia during the period observed is software developer, with over 2 500 advertisements. This profile has a high level of specialisation and belongs to the category of professionals. It is followed by contact centre salesperson with over 1 600 advertisements and administrative and executive secretary with over 1 400 advertisements.

Figure 8.4. OJVs by occupation (level 4)



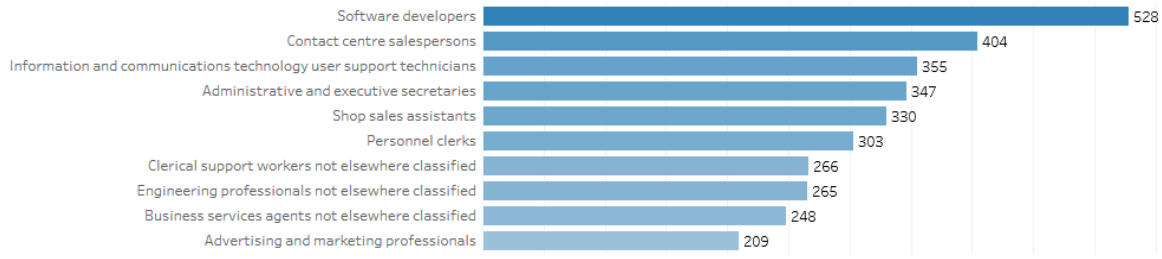
For August, which saw a peak in the number of advertisements, the analysis of professions reveals a slight reduction in the share of professionals and managers, and an increase for service and sales workers (13.27%, compared with 12.14% overall) and those with a low level of specialisation.

Figure 8.5. OJVs by occupation (level 1), August 2020

Considering the professions in most demanded, in August the first two positions were held by software developer and contact centre salesperson; in third position was information and communication technology user support technician. The profession of shop sales assistant ranked fifth compared to ninth in the overall ranking for the period as a whole; this rise could be linked directly to the

seasonality of August, when there is an increase in tourism and therefore in the search for professions linked to this economic activity.

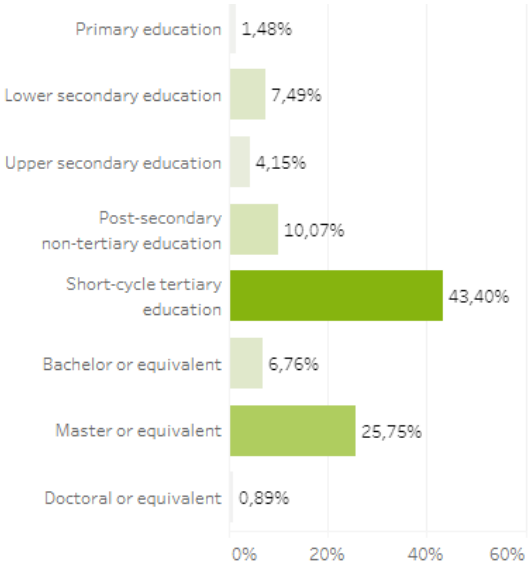
Figure 8.6. OJVs by occupation (level 4), August 2020



8.2 Educational level

Analysis of the qualification requirements in advertisements confirms that OJVs are used to recruit to medium- and high-level profiles. The total share of advertisements on the web calling for 'master or equivalent' (25.75%) and 'bachelor or equivalent' (6.76%) is significant. The highest share (43.4%) is for profiles calling for 'Short-cycle tertiary education'; this is mainly requested for professionals, with a share of 28.87% of advertisements, followed by technicians and associate professionals with 28.65%, while only 6.47% of such advertisements are for managers.

Figure 8.7. OJVs by educational level



Meanwhile, the majority of announcements requiring a master or equivalent qualification are aimed at professionals, with a share of over 59%; the same is observed for announcements that require a bachelor or equivalent, with professional profiles accounting for 56%, while the demand for announcements aimed at managerial profiles increases for this specific education requirements (10.91%).

In contrast, the proportion of advertisements that mention primary education is not very significant, with a value of only 1.48%; this demonstrates that employers' research and recruitment for these

profiles takes place using other channels, as the official statistics indicate that such profiles are very significant for the country.

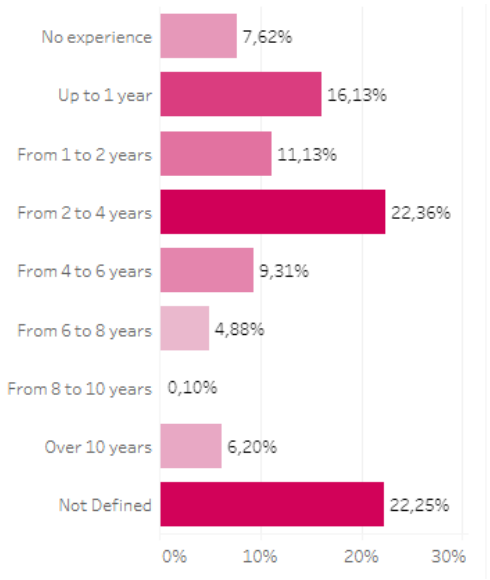
8.3 Experience

Analysis of the previous professional experience dimension reveals that a significant share of advertisements (22.25%) do not specify the years of experience required.

In general, OJVs ask for previous experience of 2–4 years (22.36%), followed by profiles with little quantifiable experience (less than 1 year) (16.13%) and 1–2 years' experience (11.13%); the share of advertisements aimed at those who have no experience is significant, at 7.62%.

Overall, profiles requiring significant previous experience (over 2 years) account for a total of 36.65% of the advertisements analysed and the share of those requiring more than 10 years of experience is 6.2%. For the latter, it is observed that these advertisements, in addition to calling for such a significant amount of experience, ask for a master or equivalent qualification in 35.88% of cases and relate to the role of manager in 13.92% of cases.

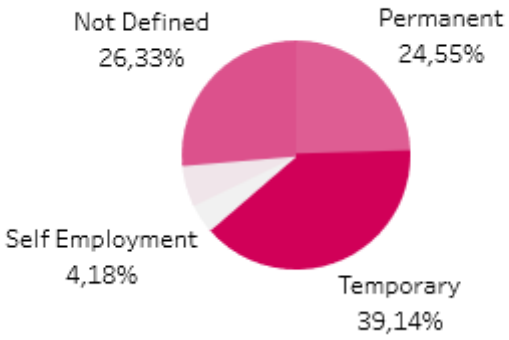
Figure 8.8. OJVs by experience



8.4 Type of contract

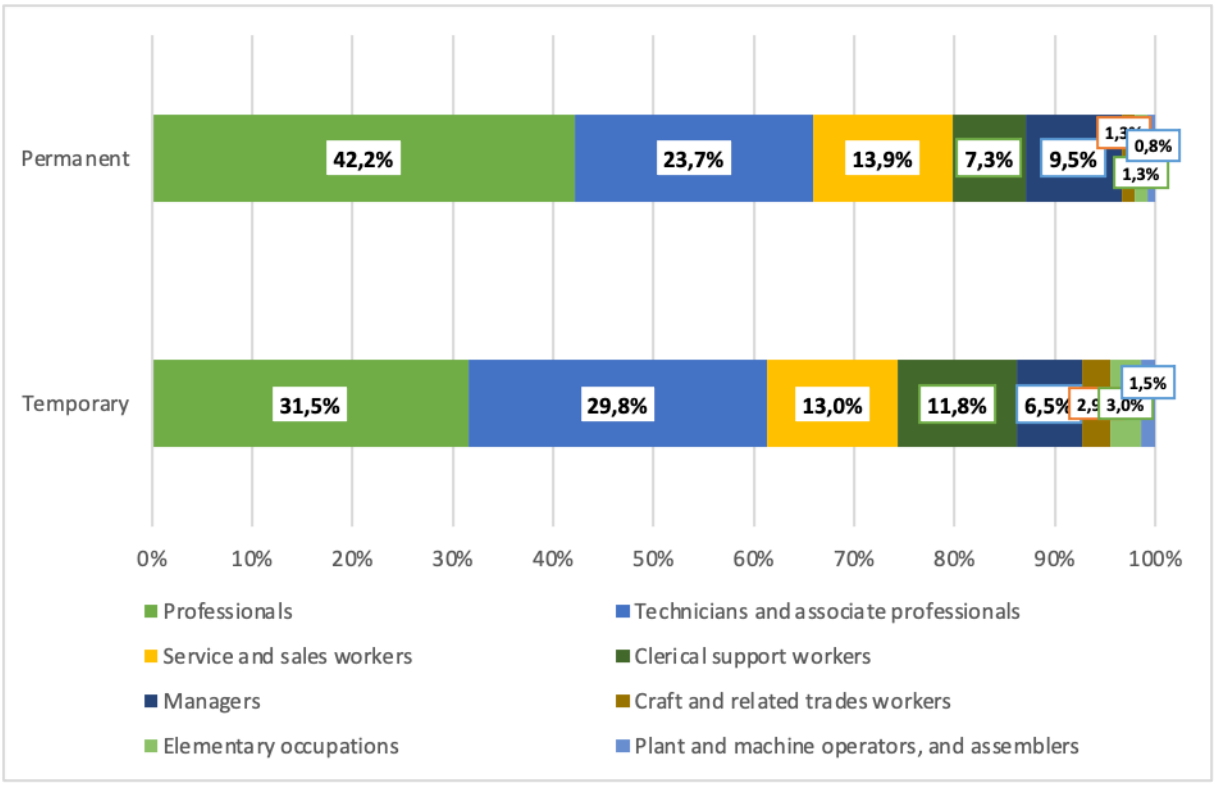
Generally, temporary contracts are the type offered most in web advertisements in the six-month period observed. They represent a share of 39.14%, followed by permanent contracts (24.55%), while self-employment accounts for only 4.18%. In 26.33% of advertisements the type of contract offered is not specified. The web channel therefore seems to be used mainly for jobs of a temporary nature, while it is not suitable for, and therefore not representative of, self-employment jobs.

Figure 8.9. OJVs by type of contract



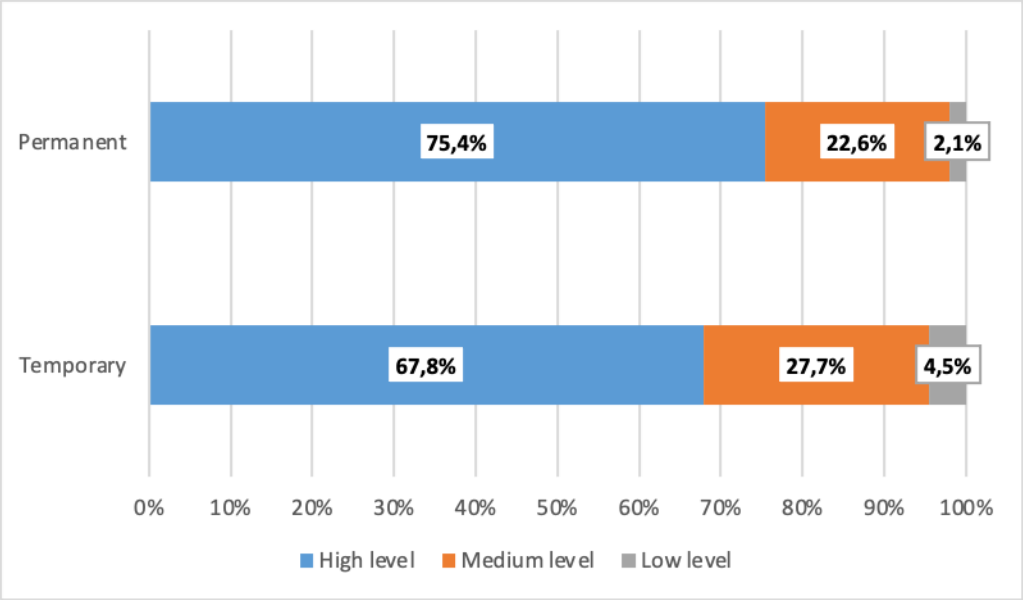
Analysis of the relationship between profession and type of contract indicates that a larger share of permanent than temporary contracts are for highly specialised profiles; 42.4% of permanent contracts are for professionals, compared to 31.5% of temporary contracts, and 9.5% of permanent contracts are for managers, compared to 6.5% of temporary contracts. In contrast, low-specialisation profiles, and in particular elementary occupations, account for 3.0% of temporary contracts compared to 1.3% of permanent ones.

Figure 8.10. OJVs by contract and occupation



Summarising with regard to the level of specialisation, 75.4% of the advertisements offering permanent employment contracts are for the high level of specialisation, while 67.8% of temporary contracts relate to this level. A larger proportion of temporary contracts than permanent contracts are at the medium and low levels of specialisation.

Figure 8.11. OJVs by contract and skill level

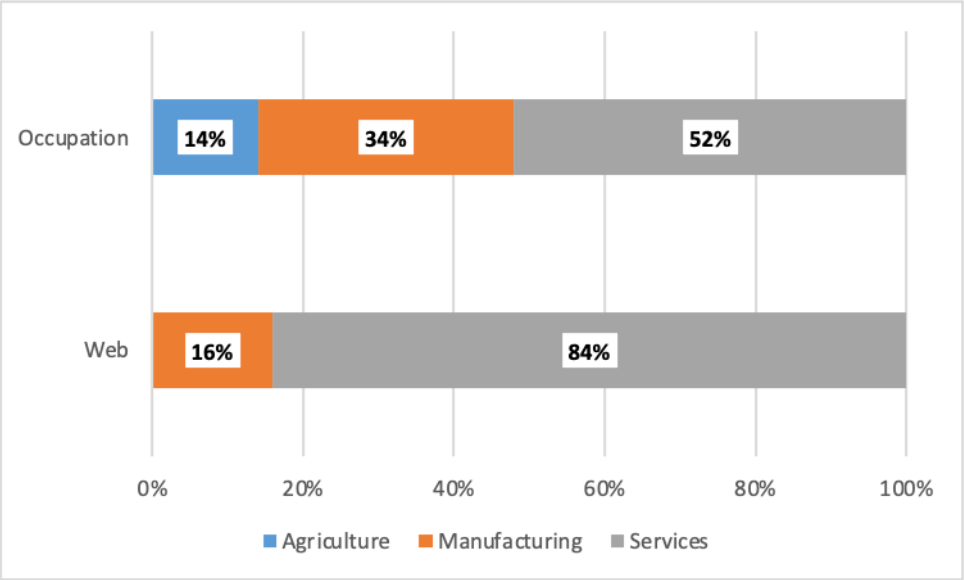


8.5 Industry

The services sector accounts for the most vacancies on the web, with an 84% share of advertisements in the observed period, followed by the manufacturing sector (16%) and finally the agricultural sector with an insignificant share (0.2%).

Comparing the web data with the official statistics data – in terms of employees by sector – immediately reveals that the web channel underestimates employment in the agricultural sector: in fact, this sector is very significant, accounting for 14% of the workforce. The same is observed for the manufacturing sector: in terms of employed population, it accounts for 34%, although the web channel is used only for 16% of published advertisements. The opposite is the case for the services sector: OJVs are crucial in recruiting personnel in this sector, representing 84% of all advertisements, while it accounts for 52% of the employed population. It should be clarified that the intention of this analysis is to capture macro evidence from the comparison of the available sources, keeping in mind both the diversity of their characteristics and also the different time periods compared (web data is updated to 2020, while the official data refers to 2019). In this sense, OJVs become a complementary tool for the analysis of data from official sources, with no expectation of a perfect match between the two types of data. Instead, the depth and freshness of data from OJVs can be exploited alongside the consistency of the official data.

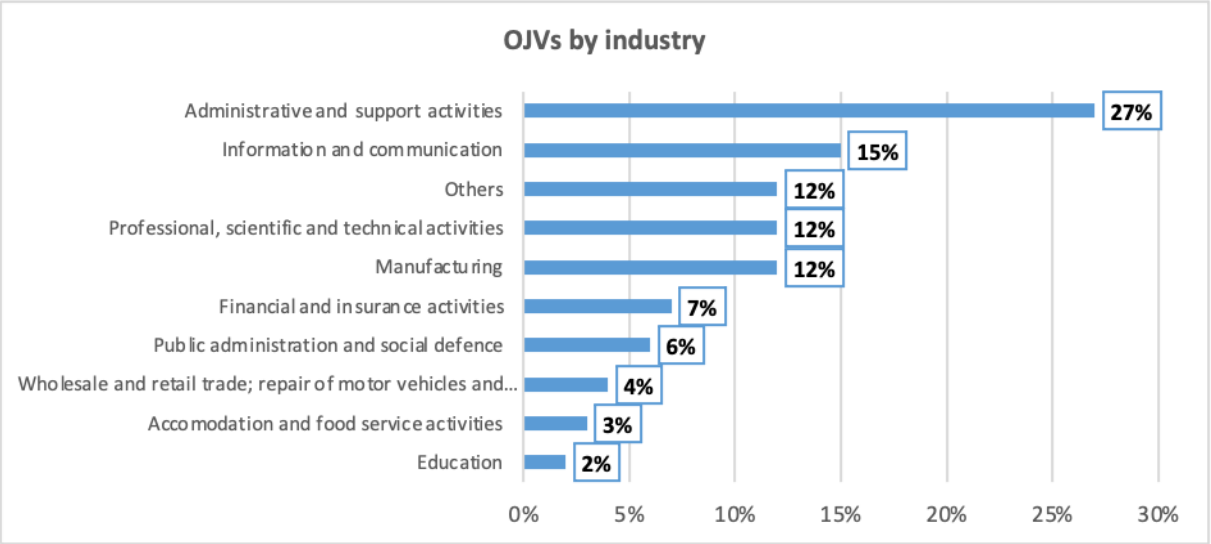
Figure 8.12. OJVs and employed population by industry



Analysis of the advertisements in the various sub-sectors allows us an even better understanding of what was previously observed in terms of under- or over-estimation of data from the web compared to official employment statistics.

On the web, the largest share of advertisements are for jobs in the administrative and support service activities sector, with 27% of the total advertisements, followed by the information and communication sector with 15%, the professional, scientific and technical activities sector and manufacturing, with 12% each, and financial and insurance activities with 7%. It can be observed that precisely because of the distinctive character of the web channel, there is little recruitment of staff for the public sector (only 6% of advertisements), which typically seeks personnel through public selection calls; the situation is similar for the education sector (2%). There is also little demand for accommodation and food service activities (3%), despite this sector having a very high turnover linked to seasonal factors; this suggests that OJVs are not the preferred channel for recruiting personnel in the sector, but that more traditional channels such as word of mouth are favoured.

Figure 8.13. OJVs by industry

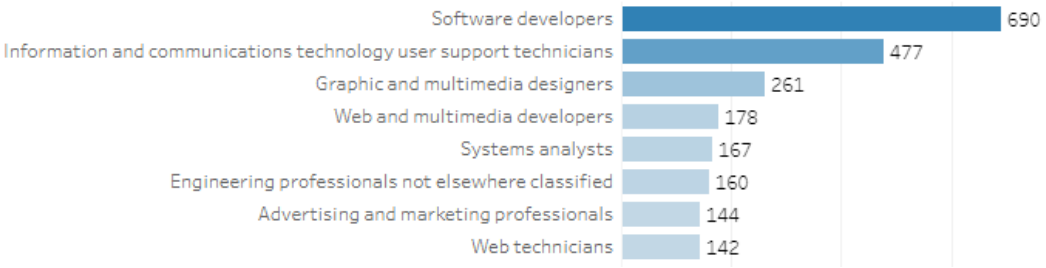


The sector with the largest number and share of advertisements (27%), administrative and support service activities, includes searches for the professions shown in Figure 8.14, which are consistent with the nature of the sector. In particular, accounting associate professionals is in the first position, with over 700 advertisements.

Figure 8.14. OJVs for the administrative and support service activities sector

In second position in terms of number of advertisements, with a 15% share of the total, is the information and communication sector. This confirms that the job market is in rapid transformation and is increasingly oriented towards the search for digital profiles, which are becoming increasingly strategic and in demand in all regions and businesses. With regard to the most in-demand profiles in this sector, in first position is software developer with about 700 announcements in the information and communication sector alone; in general, this is the most in-demand profession on the web, regardless of the sector analysed, with over 2 500 advertisements in the period observed, confirming that digital professions are also important in non-ICT sectors.

Figure 8.15. OJVs for the information and communication sector



Analysis of the distribution of employees in the various sub-sectors shows that the largest sector for employment in Tunisia is education, health and administration services, with 19%, in contrast to the situation for OJVs, where the education sector represents only 2% of the announcements, as explained above.

Figure 8.16. Employed population by industry, 2019

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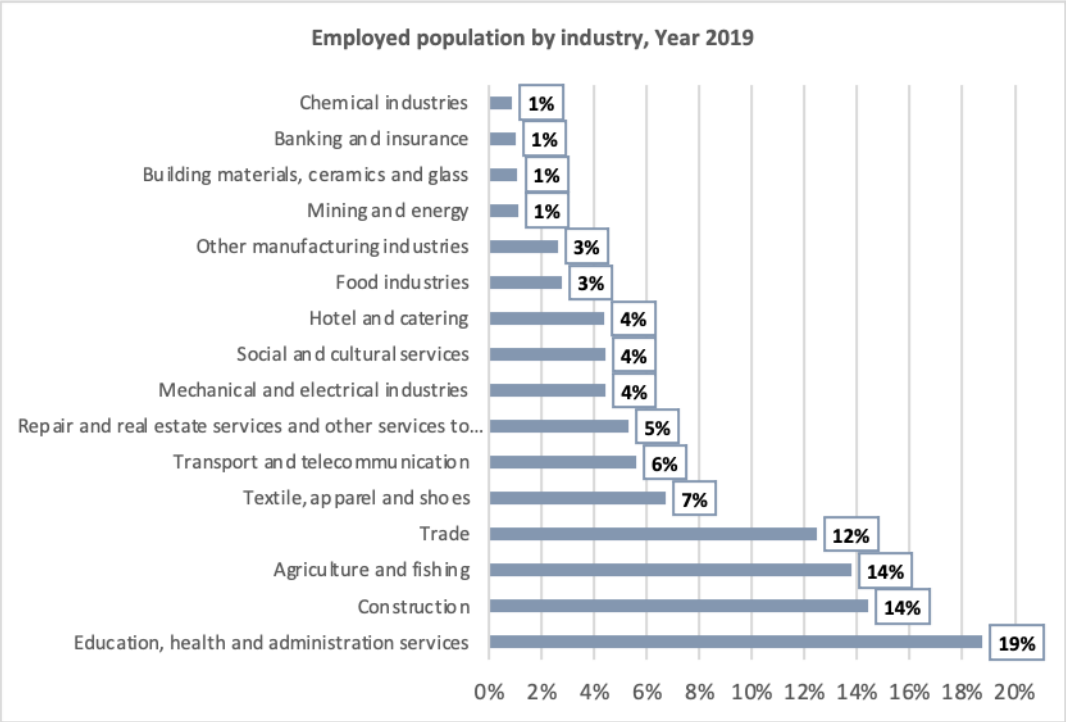


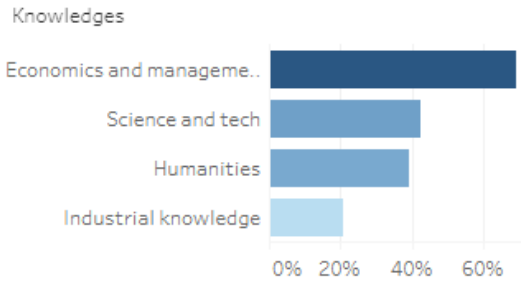
8.6 Skills

The skills required in advertisements can be considered as distinguishing: it's not common that an advertisement includes basic skills for a specific profession, those are implicit in the definition of the specific occupation required. This dimension is fundamental, as it allows the detection of market trends and any so-called 'emerging' professions, and the characteristics they have in terms of knowledge/skills, in order to allow adequate vocational programming starting from training courses, and thus to avoid the phenomenon of mismatching.

The importance of the information and communication sector in terms of job advertisements published on the web is confirmed by the ever-increasing demand for skills in the digital field. Digital skills are now a strategic factor for the competitiveness of the socioeconomic system, but awareness of their importance is still limited, as are the skills, among companies, public administrations and citizens. While technology lends itself to being a great support to increasingly complex decision-making processes, it is also necessary to work to strengthen those skills that can never be replaced, such as critical thinking and emotional intelligence. The challenge, therefore, is to make the educational and training offer consistent with changes in the knowledge society, accompanying the process of technological innovation without being engulfed by technologies, but by governing them.

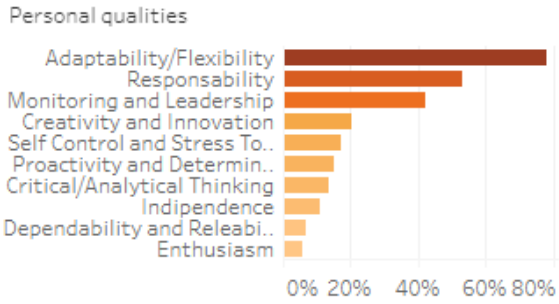
With regard to the knowledge and skills requirements in advertisements aimed at the Tunisian territory in the time frame concerned, 68.75% of advertisements are looking for applicants who have knowledge in the field of economics and management; knowledge relating to the science and technology sector is included in 42.14% of advertisements, humanities in 38.94% and, finally, industrial knowledge in 20.9%.

Figure 8.17. OJVs by knowledge requirements



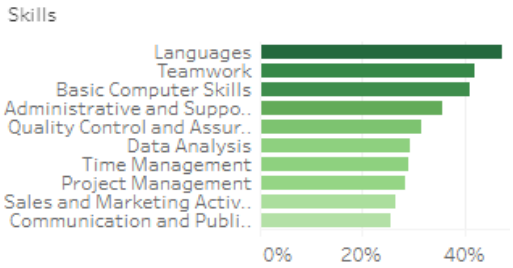
In terms of personal attitudes, in first place in terms of frequency of advertisements is adaptability/flexibility (required in 77.68% of the advertisements), followed by responsibility, requested in 52.83% of the announcements, and monitoring and leadership in 42.16% of cases. Lastly, and mentioned in only 5.89% of advertisements, is enthusiasm.

Figure 8.18. OJVs by personal qualities requirements



The most in-demand skill relates to languages, which is explicitly mentioned in 47.15% of advertisements, closely followed by teamwork (41.94%). Basic computer skills are mentioned in 40.98% of the advertisements.

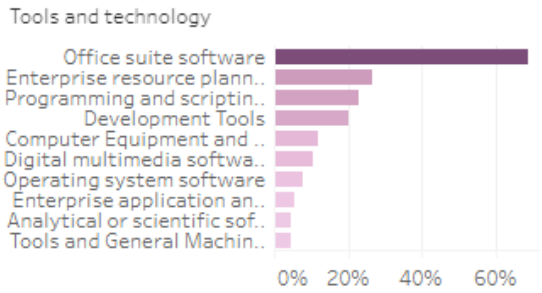
Figure 8.19. OJVs by skills requirements



Finally, with regard to tools and technology, in first position is Office suite software, which is required in 68.59% of advertisements; this confirms that digital skills are now also transversal to professions not strictly connected to the information and communication sector.

We also note the significant share of profiles mentioning programming and scripting languages, a requirement in 22.98% of advertisements.

Figure 8.20. OJVs by tools and technology requirements



The distribution of the skills/knowledge required is clearly linked to the required profession.

As previously mentioned, the profession in most demand in Tunisia during the observed period is software developer, with over 2 500 OJVs, and requests for knowledge/skills for this profession are reported in Figure 8.21. It is immediately evident that in terms of knowledge, science and tech ranks first (requested in 95.08% of the advertisements). In terms of personal skills, creativity and innovation appears to be valued, and is in second position here, compared with fourth position in the overall figure when it is not linked to the profession. Meanwhile, knowledge of languages is of little importance for software developers; instead, ICT development is in first place, appearing in 95.46% of advertisements. Finally, in tools and technology, first position goes programming and scripting languages, which is requested in 79.27% of the advertisements for software developers.

Figure 8.21. OJVs by skills/knowledge requested for software developers

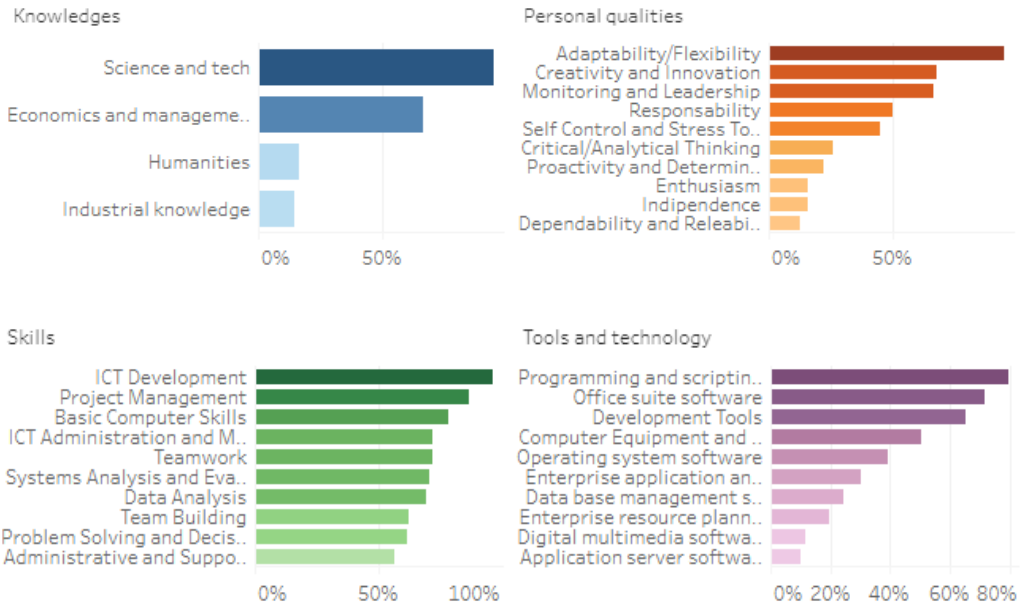
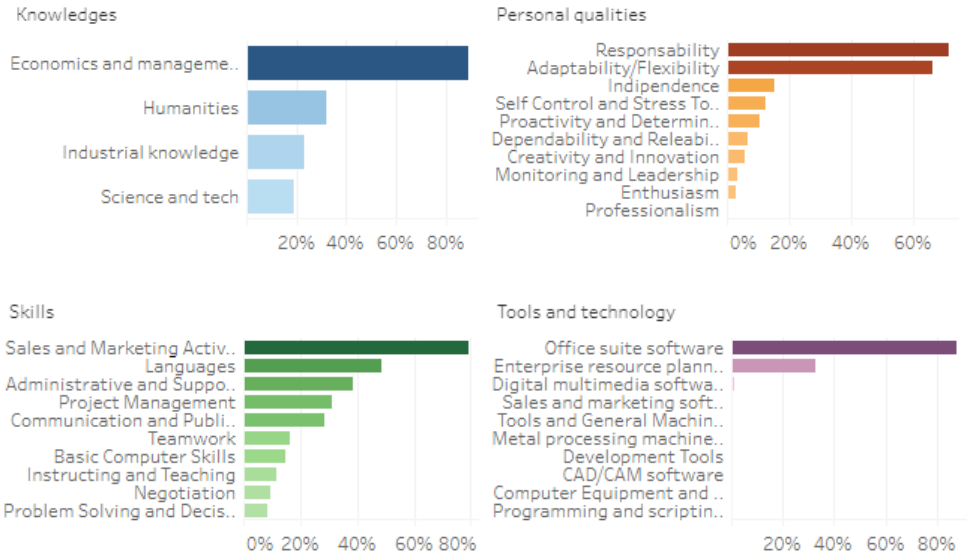


Figure 8.22 gives another example to further demonstrate how the demand for and importance of different skills/knowledge changes according to the profession selected; the high quality of the extracted and processed data is also evident from the excellent coherence between the skills/knowledge required and the profession.

The shop sales assistant profession had over 1 000 OJVs in the observed period. It is immediately evident that in terms of personal qualities, the most important characteristic is responsibility, which is

required in 70.93% of the relevant advertisements; in terms of fundamental skills, sales and marketing activities is in the top position and is required in 79% of the advertisements; finally, knowledge of Office suite software tools is important, and is required in 87.5% of cases, further confirmation of the key role of transversal digital skills to all sectors and profiles.

Figure 8.22. OJVs by skills/knowledge requested for shop sales assistants



8.7 Conclusions

Compared with traditional employment channels (such as employment services, recruitment agencies, mass media, friends and acquaintances), online job portals can provide a broader information base and more efficient ways to find a job, and give a better and more complete understanding of the situation on the labour market and the trends in its development. This can strengthen state policy in the field of employment and training, offer more effective tools for the work of the state employment service, provide better signals for the education system and additional education for adults, and facilitate the integration of socially vulnerable people into the full life of society.

Data from the OJVs allow the following conclusions to be drawn.

1. The number of advertisements on the web is growing, demonstrating that OJVs are increasingly used by companies to recruit employees for profiles that are difficult to fill and/or highly specialised, and not always reachable by standard recruitment channels.

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2. Companies looking for staff on the web use it to recruit employees for high- and medium-specialisation profiles, while they almost certainly use more ‘standard’ channels to search for low-specialisation profiles. Advertisements for professionals represent a 34% share of the total advertisements, followed by technicians and associate professionals with about 27%. In summary, with respect to the level of specialisation, high-level profiles represent 68.1% of the total advertisements, while low-level profiles account for only 5.4%.

3. In Tunisia the most in-demand profession is software developer, with over 2 500 advertisements, confirming that the job market is rapidly changing and is increasingly oriented towards digital profiles, which are becoming increasingly important strategically and are in demand in all regions and businesses. The information and communication sector is in second position in terms of the number of advertisements.

4. A significant number of job advertisements on the web relate to profiles with a master or equivalent qualification, the share being 25.75%; in contrast, profiles requiring primary education are not very significant, with share of less than 2%.

5. Services is the sector that looks for the most personnel on the web, with an 84% share of advertisements in the observed period, followed by the manufacturing sector with 16% and finally the agricultural sector with an insignificant share (0.2%). Compared with the official statistics, OJVs seem to underestimate the importance of the agricultural sector, which is very significant for Tunisia as it employs 14% of the workforce.

6. The skills required in advertisements can be considered as distinctive attributes: most common skills are not specified within OJVs, as they are considered implicit in the Occupation definition. The importance of the information and communication sector in terms of job advertisements published on the web is also confirmed by the ever-increasing demand for skills in the digital field. Digital skills are now a strategic factor for the competitiveness of the socioeconomic system.

7. Comparing required skills and the demanded profession in the advertisements, it's possible to identify a strong correlation: skills are strictly related to the specific occupation, confirming the quality of the analysed data.

ANNEX – WEBSITE CHARACTERISTICS

Rough position in the Google ranking: the rough position of the website in the Google ranking list resulting from the queries 'emploi + name of the country' and 'job + name of the country'. The value can be either first (second) page, which means the website appears in the first (second) page of the Google results, or 'other', to represent that the web page is listed from the third page onwards.

Type of job portal: defines whether the website is a primary job portal, a secondary job portal or a combination of job portal and secondary functions.

Type of operator: refers to the typology of the website, i.e. whether the website is related to a recruitment agency (e.g. GiGroup) or to a national newspaper (e.g. the Jobs section of the Guardian website), whether it is a specialised website (e.g. Monster), a public, sectoral or company website or a classified ads portal.

OJV volume (approximate number of OJVs)**:** the number of vacancies included on the website at the time of the analysis.

Geographical scope: defines whether the source is regional or national (e.g. the Czech portal), or whether it has an international dimension (e.g. Monster is almost worldwide).

Sectoral scope: defines whether the website refers to only one sector or to the whole labour market (defined as 'one industry' vs 'all industries').

Publication date of OJV: indicates whether or not the publication date of the vacancy is present.

Update frequency: indicates the frequency of update of the sources ('daily' or 'not daily').

OJV characteristics

Occupation: defines whether the vacancy title is structured or textual.

Type of contract: defines whether the type of contract in the vacancy description text is structured, textual or not available.

Working time: defines whether the working time in the vacancy description text is structured, textual or not available.

Sector: defines whether the sector in the vacancy description text is structured, textual or not available.

City: defines whether the city in the vacancy description text is structured, textual or not available.

District: defines whether the district in the vacancy description text is structured, textual or not available.

Region: defines whether the region in the vacancy description text is structured, textual or not available.

Qualification level: defines whether the qualification level in the vacancy description text is structured, textual or not available.

Wage: defines whether the wage in the vacancy description text is structured, textual or not available.

Language: lists the language used on the website (not included in values).

OJV Websites Tunisia included in the research

1. Keejob https://www.keejob.com/

Rough position in the Google ranking: First page

Type of job portal: Primary job portal

Type of operator: Job search portal

OJV volume: 1 521

Geographical scope: National

Sectoral scope: All industries

Publication date of OJV: Yes

Update frequency: Very frequent

Occupation: Textual

Type of contract: Structured

Working time: Structured

Sector: Structured

City: Structured

District: Structured

Region: Structured

Qualification level: Structured

Wage: Not available

Language: French

2. Tanitjobs https://www.tanitjobs.com/

Rough position in the Google ranking: First page

Type of job portal: Primary job portal

Type of operator: Job search portal

OJV volume: 3 369

Geographical scope: National

Sectoral scope: All industries

Publication date of OJV: Yes

Update frequency: Very frequent

Occupation: Textual

Type of contract: Structured

Working time: Textual

Sector: Structured

City: Not available

District: Structured

Region: Structured

Qualification level: Textual

Wage: Not available

Language: French

3. Tunisie Travail https://www.tunisietravail.net/

Rough position in the Google ranking: First page

Type of job portal: Primary job portal

Type of operator: Job search portal

OJV volume: 36 549

Geographical scope: National

Sectoral scope: All industries

Publication date of OJV: Yes

Update frequency: Very frequent

Occupation: Textual

Type of contract: Textual

Working time: Textual

Sector: Structured

City: Not available

District: Not available

Region: Structured

Qualification level: Textual

Wage: Not available

Language: French + Arabic

4. Tunisie-emploi https://www.tunisie-emploi.tn/

Rough position in the Google ranking: First page

Type of job portal: Primary job portal

Type of operator: Job search portal

OJV volume: 628

Geographical scope: National

Sectoral scope: All industries

Publication date of OJV: Yes

Update frequency: Very frequent

Occupation: Textual

Type of contract: Textual

Working time: Textual

Sector: Structured

City: Various

District: Various

Region: Various

Qualification level: Structured

Wage: Not available

Language: French + Arabic

5. ReKrute https://www.rekrute.com/

Rough position in the Google ranking: First page

Type of job portal: Primary job portal

Type of operator: Job search portal

OJV volume: 75

Geographical scope: International

Sectoral scope: All industries

Publication date of OJV: Yes

Update frequency: Less frequent

Occupation: Textual

Type of contract: Structured

Working time: Textual

Sector: Structured

City: Various

District: Structured

Region: Structured

Qualification level: Structured

Wage: Not available

Language: French

6. Farojob https://www.farojob.net/

Rough position in the Google ranking: First page

Type of job portal: Primary job portal

Type of operator: Job search portal

OJV volume: 11 061

Geographical scope: National

Sectoral scope: All industries

Publication date of OJV: Yes

Update frequency: Very frequent

Occupation: Textual

Type of contract: Textual

Working time: Textual

Sector: Structured

City: Not available

District: Not available

Region: Structured

Qualification level: Textual

Wage: Not available

Language: French

7. Jora https://tn.jora.com/

Rough position in the Google ranking: First page

Type of job portal: Secondary job portal

Type of operator: Job search portal

OJV volume: 10 036

Geographical scope: International

Sectoral scope: All industries

Publication date of OJV: Yes

Update frequency: Very frequent

Occupation: Textual

Type of contract: Textual

Working time: Various

Sector: Various

City: Various

District: Various

Region: Various

Qualification level: Textual

Wage: Not available

Language: French + English

8. Offre-emploi https://www.offre-emploi.tn/

Rough position in the Google ranking: Second page

Type of job portal: Primary job portal

Type of operator: Job search portal

OJV volume: 5 140

Geographical scope: National

Sectoral scope: All industries

Publication date of OJV: Yes

Update frequency: Very frequent

Occupation: Textual

Type of contract: Textual

Working time: Textual

Sector: Structured

City: Not available

District: Not available

Region: Structured

Qualification level: Textual

Wage: Textual

Language: French

9. Jobi https://www.jobi.tn/#!/

Rough position in the Google ranking: From third page on

Type of job portal: Primary job portal

Type of operator: Job search portal

OJV volume: 546

Geographical scope: National

Sectoral scope: All industries

Publication date of OJV: Yes

Update frequency: Very frequent

Occupation: Textual

Type of contract: Structured

Working time: Structured

Sector: Structured

City: Structured

District: Structured

Region: Structured

Qualification level: Structured

Wage: Structured

Language: French

10. Tunisie Annonce http://www.tunisie-annonce.com/

Rough position in the Google ranking: From third page on

Type of job portal: Combination of job portal and secondary functions

Type of operator: Classified ads portal

OJV volume: 3 143

Geographical scope: National

Sectoral scope: All industries

Publication date of OJV: Yes

Update frequency: Very frequent

Occupation: Textual

Type of contract: Textual

Working time: Textual

Sector: Structured

City: Structured

District: Structured

Region: Structured

Qualification level: Textual

Wage: Various

Language: French

11. emploi.nat http://emploi.nat.tn/fo/Fr/global.php

Rough position in the Google ranking: First page

Type of job portal: Primary job portal

Type of operator: Job search portal

OJV volume: 4 458

Geographical scope: National

Sectoral scope: All industries

Publication date of OJV: Yes

Update frequency: Very frequent

Occupation: Structured

Type of contract: Various

Working time: Not available

Sector: Structured

City: Not available

District: Not available

Region: Structured

Qualification level: Structured

Wage: Not available

Language: French

12. Bayt https://www.bayt.com/en/tunisia/

Rough position in the Google ranking: First page

Type of job portal: Primary job portal

Type of operator: Job search portal

OJV volume: 113

Geographical scope: International

Sectoral scope: All industries

Publication date of OJV: Yes

Update frequency: Less frequent

Occupation: Textual

Type of contract: Textual

Working time: Structured

Sector: Structured

City: Structured

District: Structured

Region: Structured

Qualification level: Textual

Wage: Not available

Language: French + English

13. Ballouchi https://www.ballouchi.com/annonces/emploi-services/

Rough position in the Google ranking: From third page on

Type of job portal: Combination of job portal and secondary functions

Type of operator: Classified ads portal

OJV volume: 4 114

Geographical scope: National

Sectoral scope: All industries

Publication date of OJV: Yes

Update frequency: Very frequent

Occupation: Textual

Type of contract: Structured

Working time: Textual

Sector: Not available

City: Structured

District: Structured

Region: Structured

Qualification level: Textual

Wage: Not available

Language: French

14. Opensooq https://tn.opensooq.com/ar

Rough position in the Google ranking: From third page on

Type of job portal: Combination of job portal and secondary functions

Type of operator: Classified ads portal

OJV volume: 33

Geographical scope: International

Sectoral scope: All industries

Publication date of OJV: Yes

Update frequency: Less frequent

Occupation: Textual

Type of contract: Structured

Working time: Not available

Sector: Not available

City: Not available

District: Not available

Region: Structured

Qualification level: Structured

Wage: Not available

Language: Arabic

15. Wzayef https://www.wzayef.com/en/jobs/tunisia

Rough position in the Google ranking: From third page on

Type of job portal: Primary job portal (jobs abroad)

Type of operator: Job search portal

OJV volume: 60

Geographical scope: International

Sectoral scope: All industries

Publication date of OJV: Yes

Update frequency: Less frequent

Occupation: Textual

Type of contract: Not available

Working time: Not available

Sector: Structured

City: Not available

District: Not available

Region: Structured

Qualification level: Not available

Wage: Structured

Language: Arabic + English

16. Tunisia Tanqeeb https://tunisia.tanqeeb.com/s/jobs/jobs-in-tunisia

Rough position in the Google ranking: From third page on

Type of job portal: Primary job portal

Type of operator: Job search portal

OJV volume: 650

Geographical scope: International

Sectoral scope: All industries

Publication date of OJV: Yes

Update frequency: Less frequent

Occupation: Textual

Type of contract: Not available

Working time: Structured

Sector: Structured

City: Not available

District: Not available

Region: Structured

Qualification level: Various

Wage: Not available

Language: Arabic + English + French

TABLE OF ABBREVIATIONS

AI	Artificial intelligence
ESCO	European Skills/Competences, qualifications and Occupations
ETL	Extraction, Transform and Loading
ICT	Information and communications technology
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
KDD	Knowledge discovery in databases
LMI	Labour market intelligence
MENA	Middle East and North Africa
OJV	Online job vacancy
TC	Text classification

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