# Tunisia Labor Market Field Experiment Paper

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# 1. Introduction

Around the world, finding a job is much harder for women than it is for men. Similarly, finding a good-quality job and fair remuneration for it is also very challenging for women. The gender gap in the labor market is pervasive across both developed and developing countries. Eliminating it remains a development priority not only because it is a core development objective on its own, but also because of its far-reaching impact on enhancing productivity and boosting economic prosperity (World Bank 2012). Many explanations have been put forward to explain this gender gap, but they have not all been studied equally, especially in different areas of the world. This study supplements the literature already carried out by examining gender-based discrimination in the Tunisian labor market.

In Tunisia, female students make up the majority (68 percent) of university graduates, and both female and male graduates join the labor market in comparable numbers. However, once in the labor market both groups do not have the same chances of finding a job. In 2014 the unemployment rate for university-educated women was 17 percentage points higher than that of their male counterparts.

This puzzling and substantially large gender gap in unemployment could be explained by, among other things, discrimination in the labor market. One hypothesis is that a larger share of women are unable to find employment because of the discrimination by employers in the hiring process. An additional hypothetical consequence of discrimination, whether at the point of hiring, in terms of salary offers, or in promotions, is that a large share of women may pursue majors or apply for jobs with lower employment potential than men. Employers may believe that women's capacities are inherently inferior to those of men, or that a woman's present or future household and child-caring responsibilities will result in lower productivity than that of a male employee.

## Study design

This study uses a mixed-methods approach to studying gender-based discrimination in Tunisia's (high-skilled) labor market. It begins by qualitatively documenting the perception of discrimination on the labor supply side, and then experimentally examines the presence and magnitude of discrimination on the employers' (demand) side . Documentation of the perception of discrimination was conducted via focus group discussions with male and female students in

their last year of tertiary-level studies. The students represented the four main universities in the country's capital, Tunis. Over 75 percent of the students indicated that gender discrimination is important when they are considering their choice of major and occupation.

Despite this perception, gender discrimination may not be as prevalent in the labor market. The presence and magnitude of discrimination by employers at the point of entry were examined by conducting a correspondence field experiment—the first of its kind in the Middle East and North Africa (MENA) region. The experiment entailed sending fictitious and substantially identical male and female resumes in response to job advertisements. Any differences in callback rates could then be attributed to gender and thus interpreted as gender discrimination.

For this study, 1,571 pairs of fictitious resumes for males and females were submitted to employers. To ensure that the fictitious resumes were representative of Tunisian job seekers, the actual resumes of Tunisian university students were collected to construct a database of credible "productive characteristics" such as educational degrees, language proficiency, computer skills, internships, certifications, awards, and community life, as well as "nonproductive characteristics" such as hobbies. These characteristics were randomly assigned to each resume, ensuring that, on average, resumes were balanced across genders. Fictitious identities were then created and assigned to the resumes. These identities consisted of a common first and last Tunisian name, a cellphone number, an email address, a home address, and a photo (which customarily is included in Tunisian resumes).

Between May and September 2019, a pair of resumes was submitted in response to job advertisements in four fields—engineering, finance/economics, information technology (IT), and marketing—spanning 14 occupations through the two largest online job platforms in Tunisia, Tanit Jobs and Option Carrière. Together, the four selected fields captured around 95 percent of advertised vacancies and represented 47 percent of the selected fields of study of students enrolled in higher education in the country (table A.1).

### Measuring responses

The main outcome of interest was whether the employer called or emailed with the possibility of hiring (to ask for an interview or for additional information) or did not call back or called to reject the candidate. Two secondary outcome indicators were also examined: the type of positive

employer response—indicates willingness to hire immediately, requests an interview over the phone on the spot, requests an in-person interview at a later date, or requests additional information—and the average response time from the time of the application.

## Study findings

The study finds that, on average, there is positive discrimination in favor of women by employers at the point of entry—that is, for the overall sample female candidates are about 2.4 percentage points more likely than male candidates to receive a callback from an employer. In other words, at this point female candidates have an approximately 10 percent advantage over male applicants.

However, this average effect hides substantial heterogeneity across fields. Depending on the field, the results reveal discrimination in favor of women, discrimination against women, or no discrimination. In the IT field, females and males with similar credentials do not have an equal chance of employment. Just at the point of entry, females are 15 percentage points less likely to receive a callback from an employer, and web design and web development are the two specific IT occupations in which discrimination is the most prevalent. This finding may explain why the unemployment rate for female graduates is 36 percentage points higher than that of their male peers in the Tunisian IT sector. By contrast, females benefit from positive discrimination in the marketing field. Males are 22 and 27 percentage points less likely than females to receive a callback for assistant marketing and marketing specialist occupations, respectively. Similarly, although substantially smaller, the study finds positive discrimination in the finance and economics fields, where females are 3.5 percentage points more likely than males to receive a callback. Finally, the study finds no discrimination against females in male-dominated engineering occupations, even as the actual unemployment gap in this field reached 48 percentage points in 2014.

The study also suggests that women can suffer from discrimination based on their physical appearance, which is likely related to the strength of their religious beliefs and practices. Specifically, veiled women are, on average, 8.5 percentage points (30 percent) less likely to receive a callback than nonveiled women.

The findings do not rule out that women may also face discrimination at the interview stage. They are more likely by 9 percentage points to be asked for an in-person interview at a later stage,

whereas men are more likely by 10 percentage points to receive an interview on the spot over the phone.

Beyond hiring, women face wage discrimination in employment. Use of the Blinder-Oaxaca decomposition method reveals that the observed wage gap is not explained by higher human capital endowments and is mostly due to higher premiums or higher returns that men receive on their endowments compared with women. Wage discrimination is particularly pronounced in higher-paying jobs.

The results of the study suggest that discrimination is an important factor in why female graduates fall behind their male peers in the labor market, particularly in certain occupations. Moreover, even in those occupations in which positive discrimination or no discrimination exists, other binding constraints to female employment still exist.

### Roadmap of this report

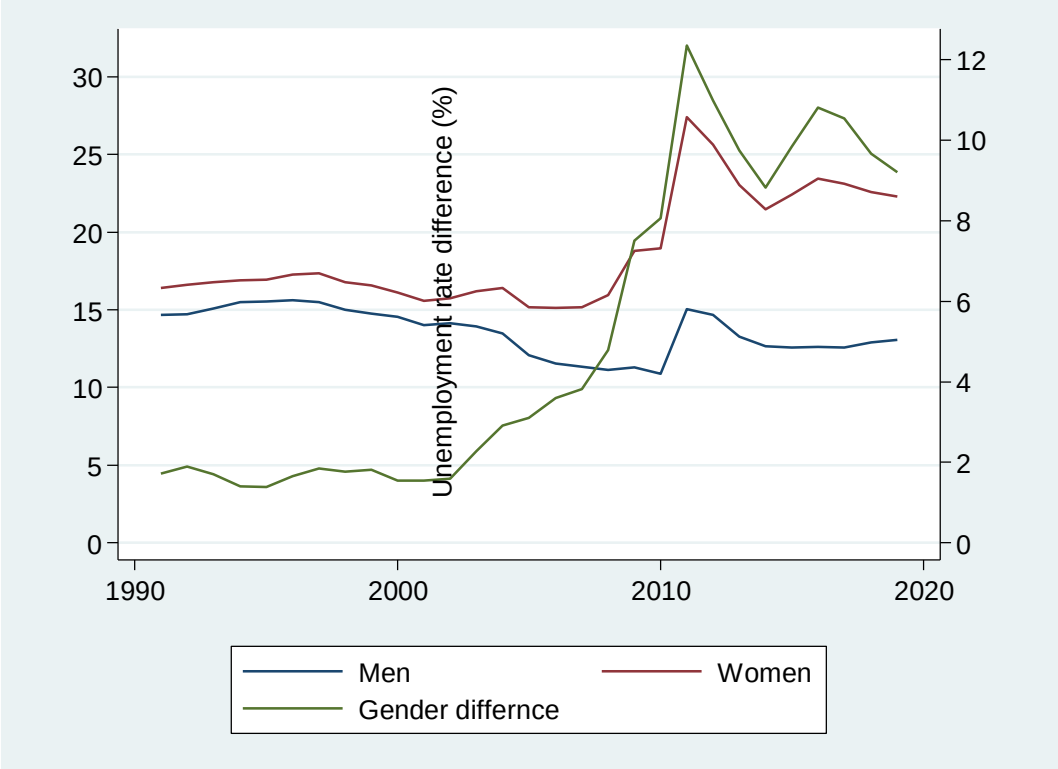
This report is structured as follows. The description of the Tunisian labor market in section 2 is followed in section3 by an examination of the constraints to employment among educated women in Tunisia. Section 4 then focuses on gender discrimination as an explanatory factor in high female unemployment in Tunisia and presents original qualitative data on the perception of discrimination among Tunisian university students. Section 5 describes the experimental design of this study, and section 6 presents the main empirical strategies and results on gender discrimination in the labor market. Section 7 further analyzes the extent to which additional features can influence such discrimination. Section 8 then looks at gender discrimination beyond the point of hiring. Study limitations and potential avenues for future research are examined in section 9, which is followed by a summary of the study results and their policy implications in section 10.

## 2. Context: The Tunisian labor market and the gender gap

The Tunisian labor market is characterized by a significant gap in outcomes between males and females. Over the last two decades, the labor force participation rate of males averaged 75 percent, whereas the rate for females averaged 25 percent. Although in Tunisia the rate for females is higher than the MENA average of 20 percent, it remains significantly lower than the world average of 48 percent.

Furthermore, among those participating in the labor market females are disproportionately more likely to be unemployed than males (figure 1). Much of the unemployment gender gap began shortly after 2001 and peaked at the end of the decade. The advent of the Arab Spring in 2011 put significant downward pressure on both males and females, but between 2015 and 2020 the gap stabilized to between 10 and 11 percentage points.

**Figure 1 Unemployment rates by gender: Tunisia, 1990–2019**

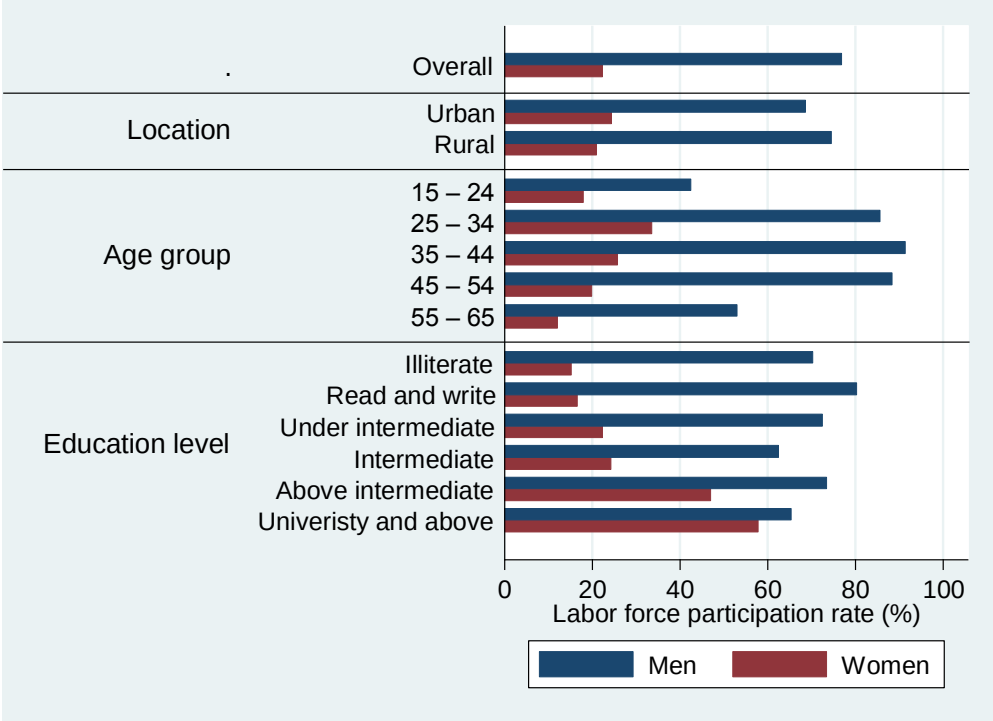



*Sources*: Modeled estimates, International Labour Organization (ILO); World Bank, World Development Indicators (WDI), 2019, https://databank.worldbank.org/source/world-development-indicators.

Aggregated averages often mask important and substantial variations. Features such as age, education, and location can provide a more nuanced picture of the key characteristics of men and women that are likely to influence their decision to enter the labor market and subsequently find employment. For example, women in urban areas are more likely than women in rural areas to participate in the labor market. In addition, women in the 25–33 age group have the highest labor force participation rate (34 percent) of all age groups. However, this rate drops beyond this age group, possibly following marriage. By contrast, men's labor force participation rates remain high across age groups and only drop for the 55–65 age group (figure 2).

In addition to age and location, education plays a strong role in influencing women's labor market participation. Although a larger share of men than women at every level of education participate in the labor market, the "labor force participation–education nexus" is stronger for women than for men (figure 2). In other words, as their level of education rises, female participation in the labor market increases substantially (from 24 percent for those with intermediate education to 58 percent for those with university degrees). By contrast, there is no discernible trend for men.

**Figure 2 Labor force participation rate by gender, location, age, and education: Tunisia, 2014**




*Source*: Tunisian Labor Market Panel Survey (TLMPS), 2014, http://www.erfdataportal.com/index.php/catalog/105.

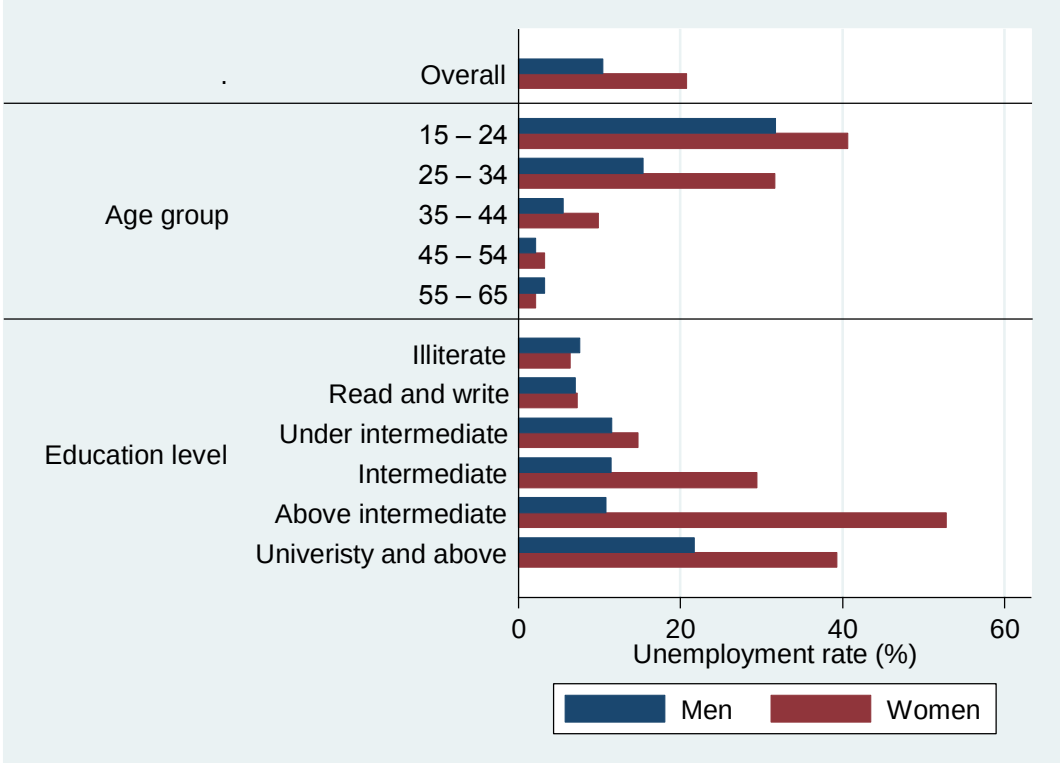
The labor force participation–education nexus for women is important because in recent decades Tunisia has achieved major gains in educational attainment for women. For example, between 2003 and 2017 the gross tertiary enrollment for girls increased from 30 percent to 42 percent, whereas for men the gross tertiary enrollment remained constant at 23–24 percent during the same period.[1] In the 2018 academic year, of the 272,261 students enrolled in public and private universities in Tunisia, 63 percent were women.

[1] World Bank, World Development Indicators (WDI), 2019, https://databank.worldbank.org/source/world-development-indicators.

Many Tunisian women who finish their tertiary education join the labor market. As noted, the labor force participation rate for this group of women was 58 percent in 2014. Tertiary-educated men joined in comparable numbers, albeit at a higher rate of 65 percent.

However, even for those entering the labor market there is a substantial gender gap, which is the focus of this study. Once in the labor market, both groups do not have equal job opportunities. For example, in 2014 the unemployment rate for university-educated women reached 39 percent, whereas it was 22 percent for their male counterparts. The discrepancy is even starker when looking at female unemployment in rural areas and by age in 2014: 32 percent of active women between the ages of 25 and 34 are unemployed versus 15 percent of men in that age group. In rural areas, 21 percent of women are unemployed, compared with 10 percent of men. According to data from the National Institute of Statistics (Institut National de la Statistique), women accounted for around 25 percent of employment in 2013, down from 26.5 percent in 2005 (Mouelhi and Goaied 2017). Therefore, although unemployment among the young and university-educated is stubbornly high—and remains higher than that for other groups such as older workers and those with lower education—women remain more disadvantaged than men (figure 3).

**Figure 3 Unemployment rate by gender, age, and education: Tunisia, 2014**



*Source*: Tunisian Labor Market Panel Survey (TLMPS), 2014, http://www.erfdataportal.com/index.php/catalog/105.

The gap in labor market outcomes between men and women extends beyond just employment versus unemployment; it is also apparent in the sector of employment and job quality. Specifically, women are more likely to segregate in particular fields. In 2014 the majority of women worked in the services sector—for example, 30 percent of all employed women worked in education, public administration, and human, health, and social services, versus18 percent of all employed men. Women are also more concentrated in manufacturing activities (26 percent) than men (13 percent). Employed women are, however, overrepresented in public wage work. In 2014 the share of women employed in the public sector was 30 percent, and the corresponding share working in the formal private sector was 28 percent. On the other hand, the share of male employment in the public and formal private sectors is lower than that of women, at 25 and 21 percent, respectively.

Women are employed to the same extent as men in the informal sector (14 percent). A greater proportion of males are employers or self-employed (24 percent), or more than double the proportion of women (11 percent). This finding indicates more men than women tend to own a business with employees. By contrast, a larger proportion of women (11 percent) than men (3 percent) are unpaid family workers, which is one of the vulnerable employment categories.

As for the occupations of employed women, most are not represented in positions of responsibility and leadership and are more concentrated in low-skilled jobs. In 2014 only 16 percent of employed women held a position of leadership and management, mainly in the education sector (Mouelhi and Goaied 2017). The majority of women (55 percent) were in blue-collar occupations mostly concentrated in the manufacturing and agriculture sectors.

## 3. Constraints to employment among educated women in Tunisia

This study focuses on the barriers faced by highly educated women in the Tunisian labor market. This is an important and puzzling group because, as described earlier, although female and male Tunisian university graduates exhibit similar labor participation rates, female unemployment is persistently higher than male unemployment in this highly educated cohort. But any further discussion of the role of gender-based discrimination in producing this gap must be prefaced by a brief description of the other important constraints and challenges facing educated women in the labor market.

In recent years, the Tunisian labor market has been characterized by two trends: an increasing supply of highly skilled labor and yet a stagnant economy that has been unable to increase its demand for labor at the same rate as the increase in supply.

From 1994 to 2004, the number of university graduates from public institutions in Tunisia grew at an annual rate of 12 percent—a rate five times higher than the growth rate of the working-age population (Assaad, Ghazouani, and Krafft 2017). This dramatic shift in the educational composition of new labor market entrants in Tunisia was coupled with the continued growth of the youth and young adult population. The shape of Tunisia's demography in 1994 was characterized by the clear signs of a youth bulge, as depicted by the largest share of the population ages 5–9 and 10–14.[2] In the intervening 20 years, and thanks in large part to a decline in fertility rates, this bulge transitioned to the 25–29 and 30–34 age groups (Assaad, Ghazouani, and Krafft 2017).

The pressure created by this new labor supply was not matched by an increase in the number of formal jobs that matched the qualifications and expectations of educated workers. Weak economic growth limited job creation in the formal private sector, which in turn was too low to absorb new entrants to the labor market. Because of the delays in implementing reforms after the 2011 revolution, as well as security-related incidents, social unrest, and regional instability (including in neighboring Libya), economic growth has averaged only 1.4 percent since the revolution (compared with 4.4 percent during the five previous years). The entry rate for the small firms that create formal sector jobs has been low, and, of those firms created, only a few have been able to survive and grow (World Bank 2017). As a result, a majority of those who do work are in low-productivity and low-quality jobs. Indeed, as much as 77 percent of Tunisia's workforce is employed in low-productivity sectors,[3] while high-productivity service sectors have absorbed only 7.7 percent of total employment.

Important for this study is that the pressure on the labor supply is particularly acute for women, whose ranks among graduates have been growing at a faster rate than those of men. In 2013 women made up 67 percent of higher education graduates, and that share persisted at 65 percent in 2017.

[2] A youth bulge is a common phenomenon in many developing countries and is typically the outcome of a reduction in infant mortality and a stability in fertility rates.

[3] *Low-productivity sector* refers to those with below-average productivity such as agriculture, textile, construction, public infrastructure, commerce, and manufacturing (see World Bank 2015a).

Assaad et al. (2018) argue that the lack of increase in opportunities in the formal private sector has disadvantaged women more than men. This is especially true for educated women for whom informal or nonwage employment is not a viable option. Women's higher reservation wages[4] mean they are more able and likely to remain unemployed until they can locate good-quality jobs that match their expectations (Assaad and Krafft 2016).

In 2014 the majority of educated women in Tunisia were from wealthier households, whereas only 15 percent of women who had a university degree belonged to households in the low wealth quintiles (Hanmer, Tebaldo, and Verner 2017). Tunisian educated women, especially married ones, report strong preferences for working in the public sector, where workdays are shorter, jobs are more secure, and maternity benefits are more generous. However, a decline in recruitment in the public sector most likely has resulted in a lack of job opportunities for educated women (Mouelhi and Goaied 2017). Women's preferences for public sector employment also likely stem from the skills mismatch between their major area of study and what is demanded by employers in the private sector. Data on enrollment by major at universities in Tunisia (see appendix A) show a gender divide in which a larger share of women are concentrated in fields that tend to have lower employment and wage potential. In 2018, for example, 85 percent of students studying education were female, and 71 percent of students enrolled in the social services major were female. By contrast, only 39 percent of engineering students were female.

The lack of job opportunities is severer in Tunisia's lagging regions than in its leading regions.[5] There, young women are often more geographically constrained than young men and are not able to relocate as easily to take advantage of economic opportunities. Assaad, Ghazouani, and Krafft (2017) argue that educated young women are more likely to be "trapped" by the opportunities available in their local labor markets, which may not correspond to their educational qualifications. These challenges are evident in the very high unemployment rates experienced by educated young women in rural areas and lagging regions. In 2014 more than one in three women were unemployed compared with approximately one in seven men in these lagging regions. In addition, rural females

[4] A reservation wage is the lowest wage rate at which a worker would be willing to undertake a particular kind of job.

[5] Tunisia is organized into 24 governorates that can be aggregated into seven administrative regions; Greater Tunis, North East, and Centre East are considered leading regions and North West, Centre West, South East, and South West are considered lagging regions On average, lagging regions have higher poverty rates, lower consumption rates, and fewer economic opportunities than leading regions (World Bank 2015b).

with a short-cycle university education[6] have an unemployment rate of close to 80 percent. The rate for long-cycle rural female university graduates is only slightly lower at almost 60 percent (Assaad, Ghazouani, and Krafft 2017).

Economic opportunities in the lagging regions are mostly concentrated in the low-productivity agriculture sector. Self-employment and unpaid family work alone provide more than a quarter of employment. Over half of employed women state that working as unpaid workers on family farms is their primary occupation (Hanmer, Tebaldo, and Verner 2017). Limited efforts are currently under way to increase productivity in agricultural value chains and to expand job opportunities in those regions, particularly for educated women.

Other barriers that could explain the discrepancy in labor market outcomes are gender-based time constraints. In particular, women face time constraints due to domestic work and childcare responsibilities, which in turn are an important driver explaining women's strong preference for public sector jobs. For example, Hanmer, Tebaldo, and Verner (2017) and Assaad, Ghazouani, and Krafft (2017) find that being married increases the probability of being employed for men but decreases it for women. Hanmer, Tebaldo, and Verner (2017) also show that in the leading regions, two-thirds of women do not participate in the labor market because of household responsibilities. In the lagging regions, women spend over 20 hours a week on household work, regardless of whether they are employed or out of the labor force. By contrast, men only dedicate a small fraction of their time to household work.[7]

Finally, other constraints, such as financial ones, can also differentially affect women. Even though women in Tunisia have equal ownership rights to property, in practice few women own land or other material assets, and most assets are registered in the husband's or father's name. These property issues make access to finance more difficult for new ventures (World Bank 2017). This situation is important because, given the lack of wage opportunities, entrepreneurship could be considered one viable option for educated workers. However, a recent assessment found that entrepreneurship education offered to university students led to only a temporary increase in business ideas but no sustained impact on self-employment or employment outcomes four years

[6] In Tunisia, since the 2006/07 school year higher education is structured as follows. The first diploma *(license)* is obtained after two to three years of higher education (short cycle). Students who continue their higher education studies for another two years (long cycle) obtain a master's diploma (Assaad and Boughzala 2018).

[7] Hanmer, Tebaldo, and Verner (2017) estimate that women who spend more than 40 hours a week doing household work are about 5 percent less likely to be employed than those who devote fewer hours to household work.

after graduation. In fact, a large share of graduates report financial constraints as the most prevailing barrier to entrepreneurship (Alaref, Broadmann, and Premand 2020), thereby demonstrating how even entrepreneurship is not a viable option for most educated women.

## 4. Employer discrimination in the labor market

The previous section outlined several structural and systemic challenges faced by educated women trying to enter the Tunisian labor market—challenges that are likely explanations for why female unemployment is persistently higher than male unemployment among university graduates. This section addresses a fundamental and prominent additional explanation: gender-based discrimination in the labor market. Discrimination by employers in certain fields or sectors could translate into higher female unemployment. It could also result in segregation in low-skilled and low-productivity sectors. Discrimination may also deter young female students from pursuing male-dominated majors of study at the tertiary level and instead pursue majors with limited absorptive capacity, thereby reinforcing the gender gap.

### Theories on gender-based employer discrimination

But why would employers discriminate on the basis of gender? Before moving to the empirical analysis, a brief look at the extant theories and recent evidence surrounding gender-based employer discrimination would help to answer this question.

On the theoretical front, two canonical economic theories of discrimination seek to address this question. First, taste-based models, advanced by Gary Becker (1957), argue that discrimination reflects the prejudice, or "taste," of members of the majority or dominant group—such as men—against those from a minority group—such as women. Some employers simply have a distaste for hiring women, or if they do hire them, they show such distaste by paying them less than male employees with the same level of skills. However, taste models predict that, under some conditions of market competition, discriminating employers will be phased out of the market, and so the gender wage gap will be eliminated. However, the persistence of discrimination, and wage gaps for that matter, implies that taste-based models cannot fully explain employer-based discrimination.

A second prominent economic theory is statistical discrimination. It asserts that employers lack information about job applicants when hiring, and one way to address this issue is to use observable characteristics, such as gender, to proxy for unobservable ones, such as skills or turnover propensity—see, for example, Arrow (1973) and Phelps (1972). For this to occur, employers have to believe that, say, female applicants are, on average, less productive than male applicants. Although these beliefs, or "stereotypes," may be held only on average, they would result in applicants from one group being treated differently than applicants from the other group, *even though* they possess the same skills and potential productivity. Furthermore, these models, along with research in social psychology, claim that these beliefs and stereotypes may be self-confirming—that is, when certain groups are stereotyped as less productive, these groups will become less productive because the payoff from investing in skills may depend on employers' beliefs that likely—and arbitrarily—disregard such investments.

Finally, recent research in psychology suggests that the underlying source of prejudice is rooted in social identity. When a group is part of the social identity, in-group members may be favored, and out-group members can suffer from negative evaluations, even if these groups are completely arbitrary ones. Similar research suggests the existence of unconscious and unintentional biases triggered by exposure to out-group members. In all these arguments, socialization and social norms are the ultimate drivers of discrimination.

Although these theories attempt to offer explanations as to why one might see employer-based discrimination, compiling empirical proof that such discrimination exists is no easy task (see Bertrand and Duflo 2016). For example, earlier studies of discrimination simply regressed different individual-level outcomes on a "minority group" indicator and a host of other covariates as controls. It is now well known that interpreting the estimate of the "group" variable as discrimination is vulnerable to omitted variable bias, among other concerns, which would lead to biased estimates of the variables of interest. To address these limitations, two experimental methodologies have been used: audit and correspondence studies.

In *audit studies*, pairs of individuals, often called auditors or testers, are matched—and trained—so that all relevant characteristics other than the one being investigated (such as gender) do not vary. The pair then applies for the job, and the entire job search experience, which contains a wealth of qualitative information, is carefully documented and analyzed. A study by Neumark,

Bank, and Van Nort (1996) is the canonical example. Comparably matched pairs of men and women applied for jobs as waiters and waitresses at 65 restaurants in Philadelphia. The study found discrimination against female applicants in high-priced restaurants, but also discrimination in favor of female applicants in low-priced restaurants. Papers with audit-style research designs have found similar mixed results. Goldin and Rouse (2000) studied gender discrimination in hiring musicians for orchestras by exploiting the introduction of screens (or similar devices) that would hide the auditioning musician from the jury. Their findings suggested that gender-blind auditions increase the relative probability that women will advance from the preliminary round or will ultimately be hired in the final round by more than 50 percent, although such auditions also reduce the relative probability of women advancing from a semifinal round in auditions that include a semifinal.

Audit studies do, however, have certain limitations (see Heckman 1998). For one thing, the requirement that two (real) individuals are identical in all dimensions relevant for an employer with the exception of gender is arguably far-fetched. Moreover, because these individuals are not blind to the research process, the design is also subject to demand effects. To address these issues, researchers have turned to *correspondence studies*. Instead of relying on real applicants, correspondence studies leverage fictitious applicants. For example, in response to job advertisements researchers send pairs of resumes, while having full control of the applicants' characteristics as well as the information given to employers. This control is able to generate strict comparability in everything but the group variable of interest, gender. In addition, because of the relatively low marginal cost, researchers can send out a large number of applications to a wide range of employers.

By studying different industries as well as different sets of skills, these studies have questioned the validity of certain theories, such as taste-based models, while also discovering heterogeneous effects that could be interpreted using both statistical discrimination and stereotyping arguments. For example, Riach and Rich (2006) have studied gender discrimination in the English labor market for entry-level jobs. They focused on the so-called type of occupation: male occupations (such as engineer), female occupations (such as secretary), and mixed occupations (such as trainee accountants and computer analysts).

Their results reveal that female candidates are more likely to receive a callback for occupations that are more female-dominated, which could be attributed to employers holding gender stereotype

beliefs. Booth and Leigh (2010) had similar results. After studying a sample of over 3,000 applicants in Australia and focusing on female-dominated professions (wait staff, data entry, customer service, and sales jobs), they estimated a callback of 1.28 in favor of women. A similar yet weaker result was found in the Swedish labor market. Also using a large sample (3,228), Carlsson (2011) found a female-to-male callback ratio of 1.07, with a higher rate in female-dominated occupations and no statistical difference in male-dominated occupations. More recently, Darolia et al. (2016) found no strong evidence of gender-based discrimination when studying almost 9,000 applications across different occupation categories in the United States.

Overall, correspondence studies examining gender-based discrimination show mixed findings. Further research is therefore needed for two reasons. First, the number of studies is small. And, second, the literature suffers from a developed country bias in the sense that research conducted in the developing world is extremely scarce—a problematic situation because women in developing countries exhibit overall worse labor market conditions.

### Students' perceptions of employer-based discrimination in Tunisia: Qualitative evidence

This study was motivated by qualitative focus group discussions conducted with 57 female and male students in their last year of tertiary studies at the four main universities in Tunis.[8] A questionnaire was administered as well.

The findings validate the presence of perceived discrimination in Tunisia's labor market. When asked how important various attributes were when considering a job, an overwhelming 75 percent of students noted that the issue of gender discrimination (or arguably lack thereof) was important when they were considering various occupations. This finding may in turn spill over into the choice of major, and almost 60 percent noted that the matter of gender discrimination crossed their mind when selecting into their current major. In particular, when asked whether "there is a lot of gender discrimination" in their preferred top three occupations, some 30 percent agreed or strongly agreed. However, this may be a conservative downward estimate because perceptions about gender

[8] The 57 students were selected from four universities roughly corresponding to the majors targeted by the correspondence study: Ecole nationale des ingénieurs de Tunis (ENIT), Ecole supérieure des sciences economiques et commerciales de Tunis (ESSEC), Institut des sciences sociales et humaines de Tunis (ISSHT), and Ecole nationale supérieure de l'informatique de Tunis (ENSIT). Students were not sampled at random, but were selected using 'convenience sampling'.

discrimination are endogenous, and, as such, they may have already influenced students' preferences about their top occupations.

As for the hiring process itself, when compared with men, women reported a lower probability of being invited for an interview after sending in a job application (a difference of 25 percent). In focus group discussions, students also noted that discrimination may appear in the initial salary offered and the progression of increases in salary. In citing other forms of discrimination specific to the hiring process, some students suggested that the barriers generally erected by employers stemmed from their concerns about marriage, child-bearing, family responsibilities, and maternity leave. As a result, employers may choose male applicants who are willing to work overtime and at night, unlike women who cannot go out alone at night. One female undergraduate engineering student illustrated this point by saying, "In fact, one favors a man over a woman for the following reasons. People say that a woman has a family and has children, she should make sacrifices to the detriment of her career, and so she cannot take responsibility. The employer takes this point into account."

Although almost all participants agreed that discrimination exists, they also noted that the degree depends on the nature of work. Moreover, in some cases the employer is influenced by culture, traditions, and social norms. Participants noted that some occupations are best filled by women instead of men, especially those that require communication or contact with customers, such as an assistant, a secretary, or a receptionist. However, women are less preferred for occupations that require physical effort such as a police officer, taxi driver, soldier, and football team coach. Similarly, participants claimed that in these occupations workers would not accept a female boss. Thus for decision-making positions such as manager, the priority is always given to men, who are perceived to be authority figures, unlike women, who are perceived to be weak and emotional. This point was expressed by a male engineering student: *"*Maybe some occupations require physical endurance. This automatically plays in favor of the man and creates discrimination[9]."

[9] In industries that may require a higher degree of physical endurance, male employment is indeed higher than female employment. For example, in construction and mining, the share of male employees is over 95 percent (Tunisia Labor Market Panel Survey, 2014).

# 5. Experimental design

To examine empirically gender-based discrimination by employers in the Tunisian labor market and to quantify its magnitude, the study team conducted a field experiment based on the correspondence method used by Bertrand and Mullainathan (2004) in their groundbreaking study. The experimental design consisted of sending fictitious and substantially identical male and female resumes in response to job advertisements. Any differences in callback rates could then be attributed to gender, and thus could be interpreted as gender discrimination. To the study team's best knowledge, this is the first study of its kind conducted in the MENA region.

## Selecting economic fields of focus

The sample of economic fields was based on feasibility. The field experiment relied on identification of an outlet in which a large sample of job postings for a given economic field were advertised publicly and transparently. Aside from personal networks, online job platforms appeared to be by far the most popular channel for both employers and applicants to post and seek jobs. Thus the sample was restricted to economic fields that are advertised through Tanit Jobs and Option Carrière, the two largest online job platforms in Tunisia.

Within this sample, the field experiment focused on four economic fields or majors—engineering, finance/economics, IT, and marketing and within those four fields on 14 occupations.

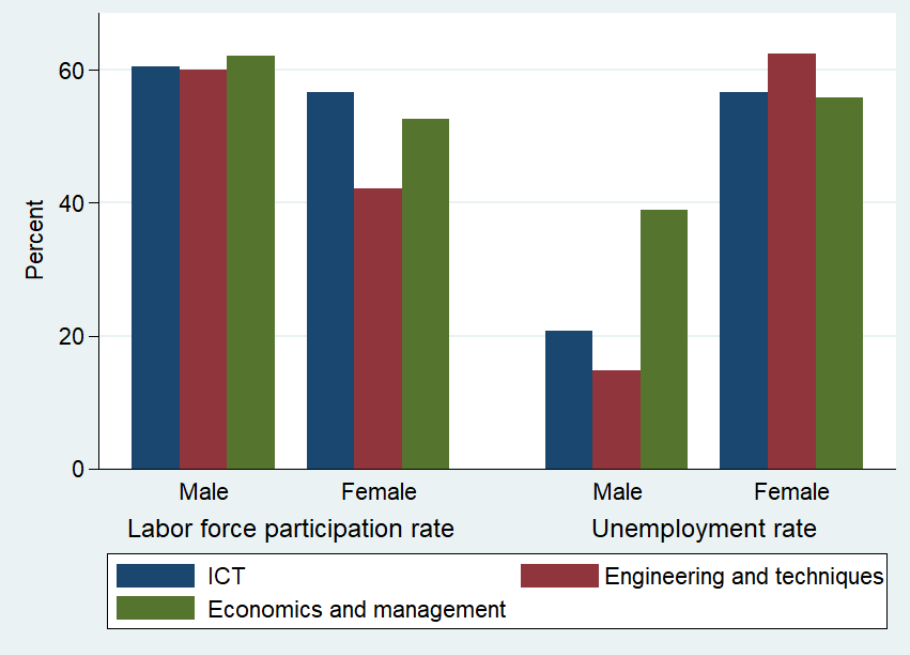
This selection was driven by several reasons. First, these fields are relevant to both students and employers. For students, these four majors represent roughly half of all enrollment in higher education.[10] For employers, these majors represent around 95 percent of advertised vacancies in the online job platforms selected for the experiment.

Second, these majors exhibit variation in gender balances as well as gender stereotypes. The IT major has roughly the same number of female (16,994) and male (16,359) students; the engineering major is male-dominated (25,485 male students versus 16,462 female students); and the economics and marketing majors are female-dominated (29,947 female students versus 15,965 male students).

[10] In the 2016–17 academic year, these four fields captured 45 percent of enrollment in higher education in the country. By gender, these majors capture 36 percent of enrolled female students and 41 percent of enrolled male students.

Finally, these majors also exhibit important differences in labor market outcomes by gender, which in turn provides a compelling rationale for testing discrimination by employers at the point of entry (figure 4). For men across the four majors, around 60 percent of graduates join the labor force. Male and female graduates who study IT join the labor market in comparable numbers at 57 percent. However, for the other majors the labor force participation rate is lower for women than for men, especially in engineering. Nevertheless, the stark discrepancy between male and female graduates is in finding a job once they enter the labor market to look for one. In engineering, 15 percent of male graduates are unemployed, compared with 63 percent of female graduates. Similarly, for IT 21 percent of men are unemployed, compared with 57 percent of females. Together, these numbers highlight that the four majors chosen for the field experiment display a spectrum of discrepancy in the chances of male and female graduates finding employment.

**Figure 4 Labor market outcomes by gender and major: Tunisia, 2014**




*Source*: Tunisian Labor Market Panel Survey (TLMPS), 2014, http://www.erfdataportal.com/index.php/catalog/105.
*Note*: In the survey, the marketing major is classified under the economics and management major. ICT = information and communications technology

## Creating a bank of resumes

After selecting the four fields of focus, the next challenge was to produce a set of realistic and representative artificial resumes. For that, the study team used the resumes of actual job seekers—collected during the qualitative data collection—as the basis for the artificial ones.

For each of the four majors or fields, a database of productive and nonproductive characteristics was constructed. Productive characteristics influence employers' hiring decisions. They are languages; certifications; awards; computer skills; high school name, degree, graduation date; bachelor's university name, degree, graduation date; master's degree, institution, graduation date; completed internships; completed projects; and community life. Because of the highly specialized nature of the majors and occupation, the input for some of those productive characteristics was developed at the level of an occupation and not within a major. For example, internships filled differ for electrical and mechanical engineers. To ensure the full credibility of the resumes, the input for the resume characteristics for each major and occupation was obtained through multiple interviews and discussions with students and university professors in Tunis.

Nonproductive characteristics are club membership and hobbies. In terms of applicants' personal characteristics, the sample was restricted to recent and young graduates with no to a limited employment history because of the difficulty faced in constructing a credible employment history. As a result, age variation across resumes could not be applied to test where gender discrimination may differ among younger versus older applicants. In addition, real-life Tunisian resumes do not specify marital status or number of children, and thus this information was not inserted in the resumes. Finally, the experiment was directed at job seekers residing in Greater Tunis (Tunis, Ariana, Ben Arous, and Mannouba).

### Creating identities and contact information for fictitious resumes

Fifteen unique female identities and 15 unique male identities were created for the job applications. Each one was assigned a name, photo, phone number, email address, and home address. The 15 names for each gender were chosen based on the most common Tunisian first and last names. Thirty phone numbers (15 per gender) were also acquired and two operators (one male and one female) were hired and trained to answer calls to those numbers and record the conversations. Because Tunisians do not commonly use voicemail, the 30 phones were activated at all times, with the operators constantly on standby to answer them. The male operator answered the 15 phones associated with male identities, and the female operator answered the 15 phones associated with female identities. Gmail addresses associated with each of the 30 names were set up as well.

Photos were added as is customary in Tunisian resumes. As for the images themselves, a Tunisian photographer hired for the experiment first took several photos of real Tunisian students who matched the profile of the applicants (that is, university graduates within the desired age range), and then digitally altered them to create 15 fictitious female photos and 15 fictitious male photos.[11] The original photos ensured that all subjects looked professional and as standardized as possible to avoid introducing any confounders related to attire or facial features. In terms of skin color (darker-skinned versus lighter-skinned) and veil (for female candidates), the photos mirrored to the extent possible the actual distribution of both in Tunisia.[12]

Finally, fictitious home addresses were constructed following the usual practice: street number, street name, locality, delegation, governorate, and postal code. It was important to ensure that the distribution of governorates in the database of applicants corresponded to the actual distribution of job seekers in Greater Tunis. Therefore, the majority of applicants were assigned Tunis, followed by Ben Arous, Ariana, and Mannouba. The list of delegations, localities, and street names were then selected, relying on Google Maps to construct plausible home addresses. Finally, street numbers were constructed and added.

### Randomization routine

The 1,571 pairs of female and male resumes (3,142 in total) were created by randomly assigning to each the comprehensive set of characteristics devised by the study team and ensuring that, on average, resumes were balanced across genders. The randomization routine was as follows:

- For the applicants' identities, names (along with the phone number and email address corresponding to each name) and photos were randomly assigned to resumes by gender. Home addresses were also randomly assigned across both male and female resumes (that is, they were cross-randomized).
- Nonproductive characteristics, such as hobbies and club memberships, were randomly assigned across both male and female resumes.

[11] Even though their actual photos were not used, students were asked to sign a consent form and were given a small financial compensation.
[12] The team relied on local knowledge and consultations to come up with approximate estimates for the distribution of women who wear the veil and the distribution of darker- versus lighter-skinned people in Tunisia.

- Productive characteristics, such as certifications and awards, were randomly assigned at the major level across male and female resumes. Other productive characteristics, such as projects, internships, and community life, were randomly assigned at the occupation level across male and female resumes. All inputs were qualitatively similar to one another for the pair of male and female resumes but not identical. This was necessary to avoid the risk of detection.
- The same education degree and institution at the secondary and tertiary level were applied to the pair of male and female resumes at the occupation level. The name of the institution was also identical to ensure that results were not confounded by the signal that a particular institution name might send to the employer.
- The same computer and language skills were also applied to the pair of male and female resumes at the occupation level, always fulfilling the requirements of the job. Cosmetic changes in the order of the skills listed for the pair were made in order to avoid raising the suspicion of the employer.
- The final resumes were formatted in randomly chosen fonts, layouts, and cover letter styles.
- As a final check during the application stage, minor changes were sometimes made to the resumes to ensure they fully satisfied all the requirements listed in the job advertisement. In these cases, the changes were always made to the pair of male and female resumes in an identical manner.

Table B.1 in appendix B presents the characteristics of applicants by appearance (skin color and use of veil) and by city of residence. The differences in the averages between female and male applicants are balanced and statistically not significant, reflecting the successful randomization of regional information across applicants for both genders. Table B.2 in appendix B presents a detailed snapshot of the applicants in terms of education, internships, projects, skills, and other productive characteristics. Because of the randomization routine just described, no statistical differences in the average distribution of productive characteristics between male and female resumes are observed. Appendix C contains examples of the male and female resumes.

### Implementation: Responding to ads

A pair of resumes (one male and one female) was submitted for each job advertisement in the two online job platforms that met the following criteria:

- The job falls within one of the four economic fields of focus.
- The job is located in Greater Tunis (because most jobs are concentrated in coastal areas, and interior regions have a low demand for labor).
- The job is an entry-level one that requires less than two years of work experience.
- The job advertisement states the employer's name so that any callback can be easily traced. As such, ads with anonymous employer names were excluded.

The four fields were targeted in roughly equal numbers (table 1) in order to establish enough statistical power to test the heterogeneity of estimates by different majors. This is theoretically relevant because some occupations (such as marketing specialists) may require interactions with customers, whereas others (such as mechanical engineers) are more traditionally male-dominated and may require some degree of physical effort.

The 3,142 applications were submitted between May and September 2019 through Tanit Jobs and Option Carrière.

When applications were submitted, the name and contact information for each employer were logged, along with information on the position advertised and the specific requirements (such as education, experience, computer skills, or other soft skills). Any employer characteristics listed were also recorded. Additional data on employer characteristics were collected through phone interviews and other search methods. Overall, whenever possible firm type (local/international), firm size, percentage of women working in the firm, whether the firm had any mandated gender quotas, and whether the firm offered any childcare services to its female employees were retrieved.[13] Table 1 lists some characteristics of the jobs that received the fictitious applications.

**Table 1 Characteristics of jobs receiving applications**

| | Number of application-pairs submitted for advertised jobs | Percent of total |
|---|---|---|
| *Major* | | |

[13] Among the sample of companies that replied to one or both candidates, other characteristics were collected through follow-up phone calls to better understand their profiles. Of those, 68.51 percent of companies had less than 50 workers, and 16.16 percent had between 50 and 100 workers. In general, in 78.73 percent of companies women made up less than 50 percent of all workers, and in 65.58 percent of companies with more than 50 workers, women made up less than a quarter of the workforce. Finally, it is remarkable that 97.88 percent of these companies do not offer childcare services, and 96.99 percent do not have female quotas. Unfortunately, collecting the same set of information from companies that did not reply to either candidate proved to be challenging. Thus the study team was unable to conclusively examine whether gender callback estimates potentially vary across firms with those characteristics.

| | | |
|---|---|---|
| Engineering | 393 | 25 |
| Finance/economics | 339 | 22 |
| Information technology (IT) | | |
| Marketing | 437 | 28 |
| *Occupation* | | |
| Engineering: civil engineer | 68 | 4 |
| Engineering: computer engineer | 186 | 12 |
| Engineering: electrical engineer | 60 | 4 |
| Engineering: industrial engineer | 45 | 3 |
| Engineering: mechanical engineer | 34 | 2 |
| Finance/economics: accountant | 163 | 10 |
| Finance/economics: economist | 16 | 1 |
| Finance/economics: financial officer | 160 | 10 |
| IT: IT specialist | 189 | 12 |
| IT: web designer | 96 | 6 |
| IT: web developer | 117 | 7 |
| Marketing: marketing assistant | 129 | 8 |
| Marketing: marketing specialist | 173 | 11 |
| Marketing: web marketing specialist | 135 | 9 |
| *Firm origin* | | |
| International | 314 | 20 |
| Local | 475 | 30 |
| Subsidiary | 189 | 12 |
| Not available | 593 | 38 |
| *Job ad location* | | |
| Ariana | 410 | 13 |
| Ben Arous | 300 | 10 |
| Mannouba | 80 | 3 |
| Tunis | 2,352 | 75 |

## Measuring responses and outcomes

For each phone or email response by the employer, the content of the phone call or the email was matched with the corresponding application.

Whether a given resume elicited a callback from the employer was first coded. Then, the content of the phone call by the employer was grouped into the following categories: application rejected, employer willing to hire immediately, request for an interview over the phone on the spot, request for an interview in person at a later day, request for additional information, and other.

The main outcome indicator, *Employer Callback*, was constructed as follows: (1) a value of 1 if the employer called with the possibility of hiring (whether to ask for an interview or additional

information) or (2) a value of 0 if the employer did not call back or called to reject the candidate. Two secondary outcome indicators were also measured: (1) a categorical variable on the type of employer answer and (2) the average time required for an employer to respond from the time of application.

## 6. Empirical strategy and main results

### Average differences in callback rates: (Positive) gender discrimination

Overall, 67 percent of employers advertising jobs did not respond to either applicant within the pair, whereas 15 percent responded to both applicants. Of the employers who responded to one applicant but not the other, 11 percent responded only to the female applicant and 8 percent responded only to the male applicant. At face value, then, it seems that female applicants (25 percent) were, on average, more likely than male applicants (23 percent) to receive a callback.

To more systematically analyze the extent to which differences in the callback rates are due to gender, the study team relied on the econometric specification

$$Employer\ Callback_i = \alpha + \beta Female_i + \varepsilon_i\ , \qquad (1)$$

where the outcome of interest for a given applicant *i* is the binary indicator for receiving a callback from the employer with the possibility of hiring, and the key variable of interest is $Female_i$, an indicator of whether applicant *i* is female. Here, the main estimate of interest is $\beta$, which represents the average treatment effect of being female on the employer callback rate—that is, the difference in the callback rates for men and women solely due to their gender.

Additional models included either *Major* specific fixed effects ($\sum_{j=1}^{n} \gamma_j Major_{ij}$), or *Occupation* specific fixed effects ($\sum_{j=1}^{n} \gamma_j Occupation_{ij}$). In more saturated models (not shown), controls for firm-level characteristics were also included. In all cases, the results remained the same. To follow best practices, equation (1) was estimated using a linear probability model (Angrist and Pischke 2008), but the results were substantially identical if parametric estimations had been used. Similarly, as is standard, standard errors at the unique job ad level were clustered, thereby allowing errors to be arbitrarily correlated within each job advertisement.

Table 2 shows the results. On average, female applicants had a higher callback rate than male applicants. The difference—around 2.5 percentage points—is not substantially trivial because it represents more than a 10 percent increase over the average male callback rate. Indeed, this result is robust and is precisely and identically estimated across different econometric specifications.

**Table 2 Overall estimates by major and occupation**

| | Employer callback | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Female applicant ($\beta$) | 0.025** | 0.025** | 0.025** |
| | (0.011) | (0.011) | (0.011) |
| Observations | 3,142 | 3,142 | 3,142 |
| Clusters | 1,571 | 1,571 | 1,571 |
| R-squared | 0.00 | 0.04 | 0.75 |
| Outcome control mean | 0.23 | 0.23 | 0.23 |
| Major fixed effects | No | Yes | Yes |
| Occupation fixed effects | No | No | Yes |

*Note:* Clustered standard errors by job advertisement appear in parentheses.

* $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$.

At face value, this average result represents an encouraging finding when thinking about the potential role of discrimination against women in the labor market because it reveals instead slight positive discrimination in favor of women. However, to further understand this finding the study team examined the conditional effects of gender by field and occupation, as discussed in the next section.

## Gender discrimination across economic fields

Although the results of this study suggests positive discrimination in favor of women, there are many reasons to believe that such an effect masks important and substantial heterogeneity. The

evidence discussed in previous sections has suggested that industries exhibit different gender biases, mainly through different stereotypes regarding the employment of women. For that reason, the first way to further examine the presence of gender discrimination in the labor market is through the lens of the four majors represented in the study sample—engineering, finance/economics, IT, and marketing—and then, in more detail, through the lens of occupations within them.

The raw data support the notion that the gender effect is likely conditional on the field of employment. Table 3 describes the different types of callback rates (equal treatment, male-favored, and female-favored) across the four majors. At face value, the differences between IT and marketing are striking. In IT, women seem to  incur discrimination; in marketing, they seem to enjoy positive discrimination. Women also seem to be slightly favored in the finance/economics field, whereas no clear difference appears in engineering.

**Table 3 Distribution of callbacks from employers by major**

| | Engineering | Finance/economics | IT | Marketing |
|---|---|---|---|---|
| Equal treatment: | | | | |
| % of job ads in which both resumes in one pair did not receive an employer callback | 76 (299 obs.) | 82 (277 obs.) | 60 (242 obs.) | 52 (229 obs.) |
| % of job ads in which both resumes in one pair did receive an employer callback | 14 (54 obs.) | 6 (21 obs.) | 15 (62 obs.) | 22 (96 obs.) |
| Male-favored: | | | | |
| % of job ads in which the male resume in one pair received a callback | 5 (18 obs.) | 4 (14 obs.) | 20 (79 obs.) | 3 (15 obs.) |
| Female-favored: | | | | |
| % of job ads in which the female resume in one pair received a callback | 6 (22 obs.) | 8 (27 obs.) | 5 (19 obs.) | 22 (97 obs.) |

*Note:* The number of observations associated with each percentage appears in parentheses.

A more rigorous and systematic examination of the heterogeneous effect of gender by economic field (occupation) relies on the econometric specification

$$Employer\ Callback_{ij} = \sum_{j=1}^{n} \delta_{ij} Female_i \times Major_{ij} + \sum_{j=1}^{n} \gamma_j Major_{ij} + \varepsilon_i \ , \qquad (2)$$

where the estimate of interest is $\delta_{ij}$, which measures the difference in callback rates by gender for applicants in major $j$. For example, when $j$ identifies the IT major, then $\delta_{ij}$ represents the difference in the callback rates between men and women who applied for jobs in the IT sector. To ease the exposition of results, this specification uses an exclusive and exhaustive partition of economic fields (occupations), thereby removing the constant.

Table 4 summarizes the results. The results for majors confirm that women have a higher predicted probability of receiving a callback in marketing by about 19 percentage points (74 percent), as well as in finance by about 4 percentage points (37 percent), whereas men have a higher predicted probability of receiving a callback in IT by about 15 percentage points (43 percent). Furthermore, no evidence of discrimination is found in engineering. Table 4 disaggregates the results at the occupation level, replicating the previous findings.

**Table 4 Heterogeneity of estimates by economic field and occupation**

| Differences in callback rates between female and male applicants by | Coefficient | Standard error | P-value | [ 95% confidence interval] | |
|---|---|---|---|---|---|
| *Major* | | | | | |
| Engineering | 0.010 | 0.016 | 0.53 | -0.021 | 0.042 |
| Finance/economics | 0.038** | 0.019 | 0.04 | 0.001 | 0.075 |
| IT | –0.149*** | 0.024 | 0.00 | -0.195 | -0.103 |
| Marketing | 0.188*** | 0.023 | 0.00 | 0.143 | 0.232 |
| *Occupation* | | | | | |
| Civil engineer | –0.044 | 0.039 | 0.26 | -0.120 | 0.032 |
| Computer engineer | 0.032 | 0.026 | 0.22 | -0.019 | 0.084 |
| Electrical engineer | –0.033 | 0.033 | 0.32 | -0.098 | 0.032 |
| Industrial engineer | 0.000 | 0.032 | 1.00 | -0.062 | 0.062 |
| Mechanical engineer | 0.088* | 0.049 | 0.07 | -0.008 | 0.184 |
| Accountant | 0.018 | 0.028 | 0.51 | -0.037 | 0.074 |
| Economist | 0.063 | 0.061 | 0.30 | -0.057 | 0.182 |
| Financial officer | 0.056** | 0.027 | 0.04 | 0.003 | 0.109 |
| IT specialist | –0.048 | 0.034 | 0.16 | -0.114 | 0.019 |
| Web designer | –0.219*** | 0.050 | 0.00 | -0.316 | -0.122 |
| Web developer | –0.256*** | 0.041 | 0.00 | -0.336 | -0.177 |
| Marketing assistant | 0.217*** | 0.044 | 0.00 | 0.131 | 0.303 |
| Marketing specialist | 0.266*** | 0.038 | 0.00 | 0.191 | 0.341 |
| Web marketing specialist | 0.059* | 0.031 | 0.06 | -0.002 | 0.120 |

*Note*: The table reports the estimations of equation (2). The panel on majors regresses the callback dummy on interaction terms between the female dummy and each of the four major dummies. The panel on occupations regresses the callback dummy on interaction terms between the female dummy and each of the 14 occupation dummies. Only the interaction terms between the female dummy and each major/occupation dummy are reported ($\delta_{ij}$).

$^{*}$ $p < 0.10$ $^{**}$ $p < 0.05$ $^{***}$ $p < 0.01$.

## Additional outcomes: Callback types and times

Beyond the differences in the callback rates, this study examines (1) the type of call and (2) the time that lapsed before the employer called the applicant.

### *Distribution of employers' callbacks by gender*

Employers' callbacks were documented, specifying whether the call was to request an interview over the phone on the spot, request an interview at a later date, request additional information, or for other purposes. To determine whether the distribution of callback types was affected by gender, a goodness of fit test was carried out by using both the Pearson chi-squared test and Fischer's exact test.

Table 5 presents the distribution of employers' callback responses by gender. Women are more likely to be invited for an in-person interview for a later date by 9 percentage points, whereas men are more likely to interviewed on the spot over the phone by 10 percentage points. This finding may signal that employers would prefer to screen female candidates in person and may also indicate that more scrutiny or discrimination is exercised at the interview stage.

**Table 5 Distribution of employers' responses in callbacks by gender**

| Employer response | Number of male observations | Number of female observations | Total |
|---|---|---|---|
| Invite to an interview | 269 | 339 | 608 |
| | (77%) | (86%) | (82%) |
| Require further information | 13 | 10 | 23 |
| | (4%) | (3%) | (3%) |
| Interview on the spot | 58 | 26 | 84 |
| | (17%) | (7%) | (11%) |
| Other | 9 | 17 | 26 |
| | (3%) | (4%) | (4%) |

| | |
|---|---|
| Pearson chi-squared test | 0.00 |
| Fisher's exact test | 0.00 |

*Note*: The last two rows report the p-value for a test of proportion testing the null hypothesis that the distribution of employers' responses is equal across both genders.

### *Differences between female and male applicants in response time*

In attempting to determine whether the length of time taken by employers to contact applicants was affected by gender, the study team performed mean comparison tests for each major and occupation. The tests were evaluated under t-tests that presume large samples and Wilcoxon tests that provide a nonparametric perspective, thereby increasing the confidence in the robustness of the results.

Table 6 reveals that there are no gender differences in the time taken by employers to respond to applications. Across all resumes, employers took an average of 21 days to respond to women from the time of the application submission and an average of 23 days to respond to men. However, this difference is not statistically significant. No differences were found by major or occupation, with the exception of computer engineering, where employers took an average of 14 days to respond to females and an average of 24 days to respond to males.

**Table 6 Gender differences in the average number of days employers take to respond**

| | Time to respond (days) | | | P-values | |
|---|---|---|---|---|---|
| | Male | Female | Ratio | Wilcoxon test | T-test |
| *Major* | | | | | |
| Engineering | 23.56 | 19.16 | 1.23 | 0.14 | 0.26 |
| Finance/economics | 7.50 | 16.15 | 0.46 | 0.23 | 0.06 |
| IT | 25.81 | 19.56 | 1.32 | 0.28 | 0.17 |
| Marketing | 25.50 | 26.06 | 0.98 | 0.39 | 0.91 |
| *Occupation* | | | | | |
| Civil engineer | 17.83 | 21.56 | 0.83 | 0.67 | 0.69 |
| Computer engineer | 23.68 | 14.25 | 1.66 | 0.03 | 0.03 |
| Electrical engineer | 26.24 | 24.07 | 1.09 | 0.73 | 0.83 |
| Industrial engineer | 29.50 | 49.50 | 0.60 | 1.00 | 0.74 |
| Mechanical engineer | 30.00 | 36.25 | 0.83 | 1.00 | – |
| Accountant | 8.35 | 19.08 | 0.44 | 0.25 | 0.10 |

| | | | | | |
|---|---|---|---|---|---|
| Economist | 2.00 | 3.50 | 0.57 | 1.00 | – |
| Financial officer | 5.17 | 11.92 | 0.43 | 0.51 | 0.18 |
| IT specialist | 29.96 | 22.43 | 1.34 | 0.70 | 0.32 |
| Web designer | 25.92 | 20.71 | 1.25 | 0.37 | 0.59 |
| Web developer | 20.77 | 10.47 | 1.98 | 0.43 | 0.07 |
| Marketing assistant | 33.23 | 28.21 | 1.18 | 0.88 | 0.59 |
| Marketing specialist | 22.47 | 32.95 | 0.68 | 0.20 | 0.20 |
| Web marketing specialist | 20.34 | 15.83 | 1.28 | 0.83 | 0.50 |
| Total | 23.48 | 21.48 | 1.09 | 0.71 | 0.40 |

*Note:* The table shows by major and occupation the number of days taken by employers to contact both male and female applicants after the application submission date, as well as the ratio. The last column also reports the p-value for a test of proportion testing the null hypothesis that the callback rates are equal across both genders. Due to the reduced number of observations, it was not possible to calculate the t-test for mechanical engineers and economists.

# 7. Additional determinants of gender discrimination in the labor market

The findings so far shed light on the extent and magnitude of gender discrimination in the Tunisian labor market. Meanwhile, the experimental research design allows further analysis of the extent to which additional factors shape the presence of discrimination against or in favor of women. To do so, the analysis focused on three factors: (1) the characteristics of the applicant, (2) the characteristics of the employer, and (3) the characteristics of the job posting itself.

## Characteristics of the applicant

Certain characteristics of applicants can affect his or her eligibility, and these traits can have gender differential effects. This experimental study was designed to investigate the potential moderating role of key individual characteristics related to race, ethnicity, and religion: (1) skin color (that is, whether darker or lighter ), (2) whether women are shown wearing a veil, and (3) the region of residence—Ariana, Ben Arous, Mannouba, or Tunis)—of the applicant.

The applicants' characteristics were consistent across both men and women as well as for the different job advertisements (that is, within each major all applications had the same level of education, skills, years of experience, age, and so forth). Only the applicant's region of residence, appearance (veiled or unveiled for women), and skin color were cross-randomized, which allowed interpretation of the effects in a causal way.

To rigorously estimate these conditional effects, the econometric estimation for veiled or nonveiled and region of residence follows the same approach as in equations (1) and (2), respectively. For skin color, the following specification was used:

$$Employer\ Callback_{ij} = \eta + \alpha Female_i + \sum_{j=1}^{n-1} \beta_{ij} Female_i \times lighterskinned_{ij} + \sum_{j=1}^{n-1} \gamma_j lighter\ skinned_{ij} + \varepsilon_i \quad (3)$$

For this specification,

- $\alpha$ captures gender differences in callback rates for darker-skinned applicants
- $\alpha + \beta_j$ is the gender differences in callback rates when the applicant is lighter-skinned
- $\beta_j$ is the marginal increase in the difference of the gender callback rates for lighter-skinned applicants versus darker-skinned ones.

Table 7 presents the results. It indicates that there are no differences in callback rates between females and males by the applicant's skin color or region of residence. However, women who are veiled are less likely than nonveiled women to receive a callback. This causal effect is substantially large, at about 8.5 percentage points (30 percent).

**Table 7 Effects of applicant characteristics on gender differences in callback rates**

| | Coefficient | Standard error | P-value | [95% confidence interval] | |
|---|---|---|---|---|---|
| *Skin color* | | | | | |
| Difference in gender callback rates when applicants are lighter-skinned | 0.022 | 0.030 | 0.46 | -0.037 | 0.082 |
| *Veiled or nonveiled* | | | | | |
| Difference in callback rate between veiled and nonveiled women | -0.085*** | 0.022 | 0.000 | -0.128 | -0.041 |
| *Region of residence* | | | | | |
| Difference in callback rates for male and female applicants from Ariana | 0.022 | 0.031 | 0.47 | -0.038 | 0.083 |
| Difference in callback rates for male and female applicants from Ben Arous | 0.015 | 0.029 | 0.60 | -0.042 | 0.073 |
| Difference in callback rates for male and female applicants from Mennouba | 0.055 | 0.040 | 0.17 | -0.023 | 0.133 |

| | | | | | |
|---|---|---|---|---|---|
| Difference in callback rates for male and female applicants from Tunis | 0.021 | 0.022 | 0.35 | -0.022 | 0.064 |

*Note*: The panel on skin color reports the results from equation (3), where the callback dummy was regressed on the full interaction between the female dummy and the lighter-skinned applicant dummy. Only the coefficient on the interaction term between the female dummy and the lighter-skinned applicant dummy is reported in the table ($\beta_{ij}$). In the panel on veiled or nonveiled, the callback dummy was regressed on a veiled female dummy and the four major dummies and solely for the subset of female applicants, following the approach in equation (1). Only the coefficient on the veiled female dummy is reported in the table ($\beta_i$). In the panel on region of residence, the callback dummy was regressed on the interaction terms between the female dummy and each of the four region dummies, following the approach in equation (2). Only the coefficient on the interaction term between the female dummy and the region dummy is reported in the table ($\delta_{ij}$).

$^{*}\ p < 0.10$ $^{**}\ p < 0.05$ $^{***}\ p < 0.01$.

## Characteristics of the employer

Some characteristics of employers can also have an impact on the gender of the applicants selected for callbacks. The data available allowed study of the potential discrimination sources that emerged from the type of firm (international, local, or subsidiary), and the location of the firm (Ariana, Ben Arous, Mannouba, or Tunis).

Table 8 replicates the approach used in equation (2) to examine the extent to which differences in callback rates between men and women vary by the type of firm and the location of jobs. Overall, no differences emerge in gender callback rates, with the exception of job ads located in Tunis, where women seem more likely than men to receive a callback. However, this finding may not be surprising because Tunis is home to about three-fourths of the sample, reflecting an average effect similar to that in the baseline results.

**Table 8 Effects of employer characteristics on gender differences in callback rates**

| Difference in callback rates for male and female applicants for jobs in | Coefficient | Standard error | P-value | [95% confidence interval] | |
|---|---|---|---|---|---|
| Ariana | -0.020 | 0.031 | 0.53 | -0.080 | 0.041 |
| Ben Arous | 0.040 | 0.028 | 0.16 | -0.015 | 0.095 |
| Mannouba | -0.050 | 0.061 | 0.41 | -0.169 | 0.069 |
| Tunis | 0.033** | 0.013 | 0.01 | 0.008 | 0.058 |
| International firms | 0.006 | 0.026 | 0.81 | -0.044 | 0.057 |
| Local firms | 0.015 | 0.019 | 0.45 | -0.023 | 0.053 |

| | | | | | |
|---|---|---|---|---|---|
| Subsidiary firms | 0.032 | 0.027 | 0.24 | -0.021 | 0.085 |

*Note*: The table reports the results from equation (2). The callback dummy was regressed on the interaction terms between the female dummy and each of the dummies that represent the employer's characteristics. Only the coefficient on the interaction term between the female dummy and the employer's characteristic dummy is reported in the table ($\delta_{ij}$).

$^{*}$ $p < 0.10$ $^{**}$ $p < 0.05$ $^{***}$ $p < 0.01$.

### Characteristics of the job posting

Job advertisements are not homogeneous; vacancies have specific requirements often associated with stereotypes of the skills associated with men and women. It was therefore critical and meaningful to explore whether features of the job advertisement itself can moderate the effect of gender on the hiring process.

To do so, the study team followed the specification in equation (3) and leveraged three types of variables: (1) language ability (for jobs that require French, English, or other languages); (2) computer skills (for jobs that require word or data processing skills, such as those needed for Microsoft Office); and (3) soft skills (for jobs that require teamwork or organizational skills).

For descriptive purposes, 52 percent of jobs in the study database required French, 32 percent English, and 2 percent other languages. For computer skills, 63 percent required knowledge of Microsoft Office, and 25 percent required other computer skills. For soft skills, 10 percent required strong teamwork skills, and 8 percent strongly emphasized organizational skills.

Table 9 summarizes the results. Overall, women appear more likely to receive a callback for job postings requiring French language skills when compared with jobs that do not require these skills. Women also are more likely to receive a callback for jobs that require knowledge of Microsoft Office. By contrast, men are more likely than women to receive a callback for jobs that require other computer skills. That said, interpretation of these results should take into account the potential confounders of some of these characteristics. For example, French is overwhelmingly required in marketing positions (about 75 percent) but not in the other fields, where it is required about 40 percent of the time. Similarly, other computer skills are required in IT over 90 percent of the time compared with 19 percent in finance, 27 percent in marketing, and 59 percent in engineering. In summary, these findings are in line with earlier evidence about heterogeneity of gender discrimination by field.

**Table 9 Effects of gender on differences in callback rates by job requirement**

| Marginal increase in gender callback gap due to skill requirement: | Percent of jobs requiring skill | Coefficient | Standard error | P-value | [95% confidence interval] | |
|---|---|---|---|---|---|---|
| French | 52 | 0.064*** | 0.023 | 0.01 | 0.018 | 0.110 |
| English | 32 | -0.055** | 0.028 | 0.05 | -0.109 | -0.001 |
| Other languages | 2 | 0.070 | 0.062 | 0.26 | -0.053 | 0.192 |
| Microsoft Office | 63 | 0.089*** | 0.028 | 0.01 | 0.035 | 0.144 |
| Other computer skills | 25 | -0.145*** | 0.021 | 0.00 | -0.187 | -0.104 |
| Teamwork | 10 | -0.017 | 0.029 | 0.55 | -0.074 | 0.039 |
| Organizational skills | 8 | 0.029 | 0.033 | 0.37 | -0.035 | 0.094 |

*Note*: The table reports the results from ordinary least squares regressions in which the callback dummy was regressed on an interaction term between the female dummy and the required group of skill dummies, following the approach in equation (3). Only the coefficient on the interaction term between the female dummy and the skill requirement dummy is reported in the table ($\beta_{ij}$).

* $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$.

## 8. Discrimination beyond the point of hiring: Evidence from survey data

These experimental results are informative about gender discrimination in the job application process. However, discrimination in the labor market is not restricted to the hiring stage; a large share of discrimination occurs during employment, whereby the labor of men and women is valued differently by the market. To further examine gender differential beyond the point of hiring, this study examined the monthly wage differentials between men and women using the 2014 Tunisian Labor Market Panel Survey (TLMPS).[14]

Table 10 presents the average differences in monthly wages between men and women at different disaggregation levels. It suggests a systematic tendency to value the labor of men over that of women and pay men higher wages than women. Indeed, the median wage for men is higher than the median wage for women in both urban and rural areas. Moreover, the raw gender gap in median

[14] This section broadly complements the field experiment and substantiates the prevalence of gender wage differentials for workers at all education levels. It is not limited to the target group of the field experiment because the TLMPS is not sufficiently broad to allow a wage decomposition analysis for tertiary-educated workers only. Future research will help reveal the magnitude of the gender wage differential among those workers.

wages persists at all age levels and for all education levels. In terms of sector of employment, the median wage for women is slightly higher than that of men in government jobs, a result consistent with the findings that the public sector tends to have favorable conditions for women's employment. However, the median wage for men is higher in the private sector and in semipublic enterprises.

**Table 10 Raw wage differentials by area, education level, age, and sector of employment**

*Tunisian dinars*

| | Raw wage differential (monthly) | | |
|---|---|---|---|
| | Median, men | Median, women | P-value continuity (median equality) |
| *Overall* | 444 | 325 | 0.00 |
| *Area* | | | |
| Urban | 500 | 359 | 0.00 |
| Rural | 400 | 300 | 0.00 |
| *Education level* | | | |
| Illiterate | 315 | 260 | 0.00 |
| Read and write | 400 | 300 | 0.01 |
| Under intermediate | 418 | 300 | 0.00 |
| Intermediate | 620 | 425 | 0.14 |
| Above intermediate | 712 | 658 | 0.41 |
| University and above | 950 | 855 | 0.00 |
| *Age group* | | | |
| 15–24 | 347 | 265 | 0.00 |
| 25–34 | 421 | 350 | 0.02 |
| 35–44 | 478 | 412 | 0.31 |
| 45–54 | 450 | 378 | 0.00 |
| 55–65 | 460 | 260 | 0.14 |
| *Sector of employment* | | | |
| Government | 600 | 653 | 0.20 |
| Public enterprise | 435 | 375 | 0.85 |
| Private | 400 | 300 | 0.00 |

Raw wage differences provide a gross description of the ways in which the labor market takes into consideration gender to remunerate labor. However, based on the previous analysis it is difficult

to determine whether these differences occur because men are better endowed than women for jobs or because, conditional on similar levels of endowments, the market assigns more value to men than to women (discrimination).

To distinguish between the two, the Blinder-Oaxaca methodology is adapted to estimate the explained portion of the wage gap due to observed human capital endowments (endowment effect) and the unexplained portion that may be due to discrimination (coefficient effect). The first stage consists of identifying the coefficients of the linear regression suggested by equations (4) and (5):

$$\ln(\text{Wage})^g = \beta_0^g + \beta_1^g age + \beta_2^g age^2 + \beta_3^g experience + \beta_4^g experience^2 + \beta_5 locality + \sum_{i \in Governorate} \eta_i^g \mathbb{I}_i + \sum_{i \in Education\ Level} \delta_i^g \mathbb{I}_i + \varepsilon^g \quad (4)$$

$$\ln(\text{Wage})^g = \sum_{j \in Industry} \left( \beta_{0,j}^g \mathbb{I}_j + \beta_{1,j}^g age \mathbb{I}_j + \beta_{2,j}^g age^2 \mathbb{I}_j + \beta_{3,j}^g experience \mathbb{I}_j + \beta_{4,j}^g experience^2 \mathbb{I}_j + \beta_5 locality \mathbb{I}_j + \sum_{i \in Governorate} \eta_i^g \mathbb{I}_i \mathbb{I}_j + \sum_{i \in Education\ Level} \delta_{i,j}^g \mathbb{I}_i \mathbb{I}_j \right) + \varepsilon^g . \quad (5)$$

In the previous equations, $ln(Wage)$ represents the logarithm of the monthly wage;[15] $age$ is the age in years of the individual; $experience$ is the working experience of the person calculated following Hara (2018); *locality* is a binary variable that takes the value of 1 if the individual is from an urban area; $\mathbb{I}$ is an indicator function used to represent dummy variables of *education level* and *governorate* where the individual resides; and $g$ stands for gender because the coefficients are calculated independently for male and female.

Applying the Blinder-Oaxaca decomposition to equation (4) produces the endowment-coefficients decomposition across industries. By contrast, applying the Blinder-Oaxaca decomposition to equation (5) produces the endowment-coefficients decomposition within industries. This difference may reveal whether discrimination occurs across industries or within industries.

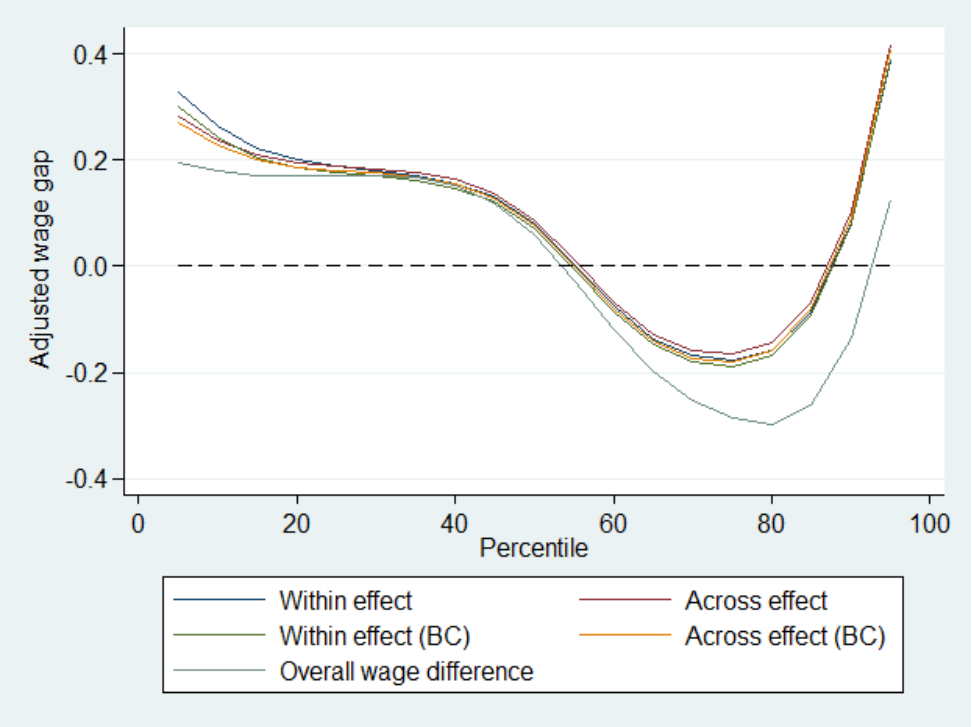
[15] While the TLMPS includes information on number of hours worked, converting monthly wages to hourly wages adds more noise to the data. Therefore, the results are presented using monthly wage data.

Complementing the previous methodology, recent studies such as Ahmed and McGillivray (2015) suggest that the calibration of equations (4) and (5) may contain an implicit selection bias. The fact that individuals are employed reveals that they have some special unobservable attributes that allow them to be hired. To correct for this bias, a Heckman correction model was implemented in which the first stage estimates the probability of being employed conditional on (1) the covariates used in equation (4), (2) being head of household, and (3) dummies for marital status. The predicted score is used to calculate the inverse Mills ratio, and this variable is added as an additional covariate to equations (4) and (5). This model, called bias-corrected (BC), adjusts the Blinder-Oaxaca decomposition to incorporate those unobservable skills that guarantee the employment of the individuals in the sample.

Finally, based on Hara (2018) a recentered influence function (RIF) regression method was used as proposed by Firpo, Fortin, and Lemieux (2018).[16] This technique allowed re-creation of the Blinder-Oaxaca decomposition at different wage levels. Figures 5 and 6 summarize the results graphically.

**Figure 5 Coefficient effect of gender wage gap by industry**

[16] The results of the RIF regressions were calculated for every five percentiles between 2 and 95. To avoid noise from specific outliers, the results presented take those calculations and filter them using a locally weighted regression. By doing so, the trends displayed are more robust to variations in individual values.



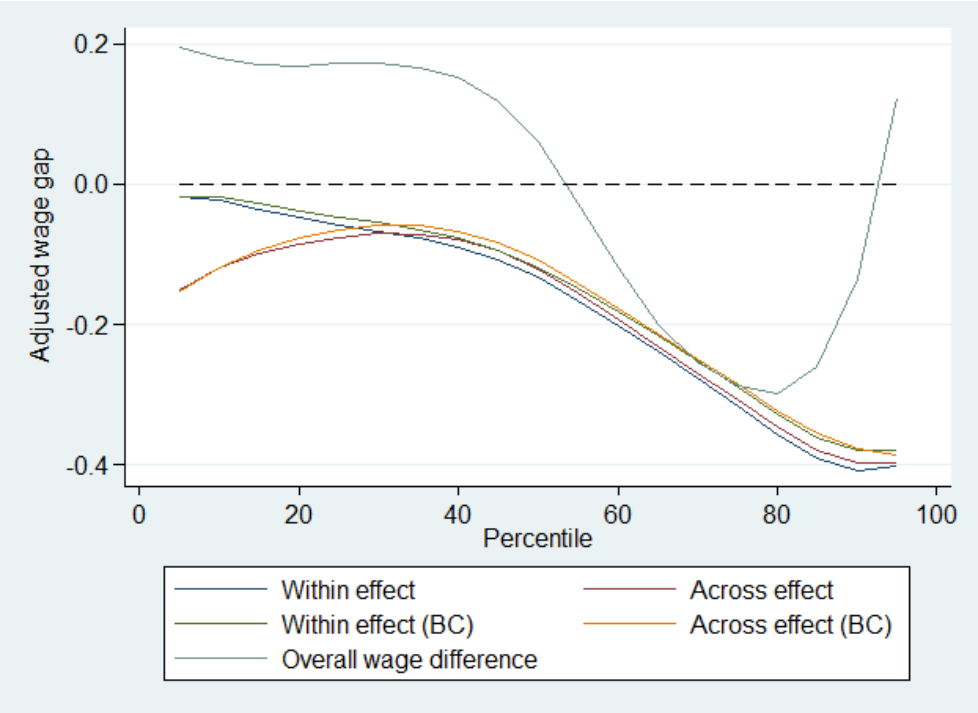

*Note:* BC = selection bias-corrected.

Figure 5 presents the raw wage differential at each percentile of the wage distribution and then captures the coefficient effect of the wage gap for every wage percentile. This means that for each wage percentile the analysis compares (in a standardized framework) the average wage difference of a man and a woman that have the same level of endowments. The figure suggests that for individuals whose wage is below the 60th percentile and above percentile 85, the market provides men with higher remuneration than women. This finding confirms that men receive higher returns than women on their endowments because of discrimination. To be more specific, for the fifth percentile, the coefficient effect ranges from 0.27 to 0.33 standardized wage units; for the first quarter from 0.18 to 0.19; for the median from 0.07 to 0.09; for the third quarter from –0.19 to –0.17; and for the 95 percentile from 0.39 to 0.42. This indicates that the highest level of discrimination is observed in both the highest and the lowest wage percentiles.

However, between the 60th and 85th percentiles the evidence suggests that women are remunerated more than men in equivalent jobs. Nevertheless, this gap is considerably smaller than the gap that favors men in other scenarios. Figure 5 also shows that the four types of regressions are overlaying each other, which suggests that wage discrimination happens in the same way across and within industries.

Figure 6 presents the raw wage differential at each percentile of the wage distribution and then captures the endowment effect of the wage gap for each wage percentile. This means that for each wage percentile, the analysis compares (in a standardized framework) the wage difference between a man and a woman if her endowments were remunerated by the market at the same price as those of her male counterpart. The range of the graph is negative, and, independent of the analysis, the wage grows negatively larger at higher wage percentiles. In particular, for the fifth percentile the endowment effect ranges from –0.15 to –0.02 standardized wage units; for the first quarter from –0.08 to –0.05, for the median from –0.13 to –0.11; for the third quarter from –0.32 to –0.29; and for the 95th percentile from –0.40 to –0.38.

**Figure 6 Endowment effects of gender wage gap by industry**




These results indicate that none of the observed gender wage gaps is due to the higher endowments of men and that women need to be systematically better prepared than men for a given wage. The endowment effect is low at low wages because these jobs usually require basic skills. Thus the level of endowments is in general low. Yet once a job position requires a wider sets of skills (proxied by larger wages), a woman must be overprepared to get the same wage for a given position as a man. Meanwhile, in contrast to figure 5, in the endowment effect the cross-industry effect

separates itself from the within-industry effect for the largest half of the wages, suggesting that the difference in endowments is mostly concentrated in specific industries.

Although figures 5 and 6 account for industry of employment in calculating wage discrimination, female segregation into certain occupations may also play a role in influencing the gender wage gap, particularly if women self-select into lower-productivity occupations. To account for that, figures 7 and 8 present the coefficient and endowment estimates within and across occupations. The results are consistent with the earlier findings by industry and confirm that the unexplained portion of the wage gap grows by almost four times from the lowest wage quantiles to the highest wage quantiles.

**Figure 7 Coefficient effects of gender wage gap by occupation**

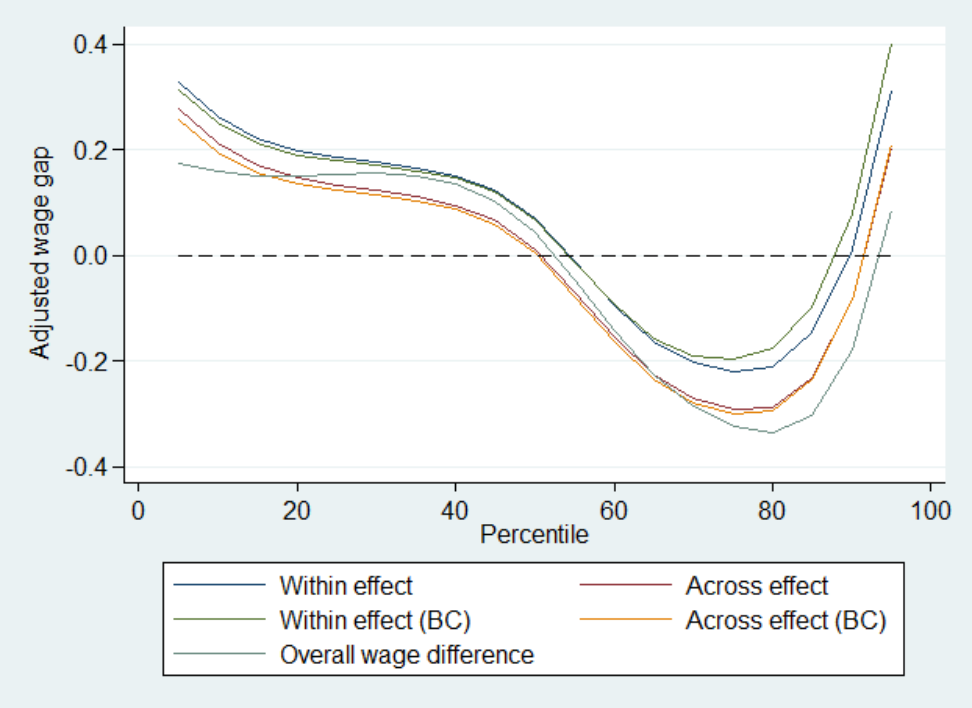
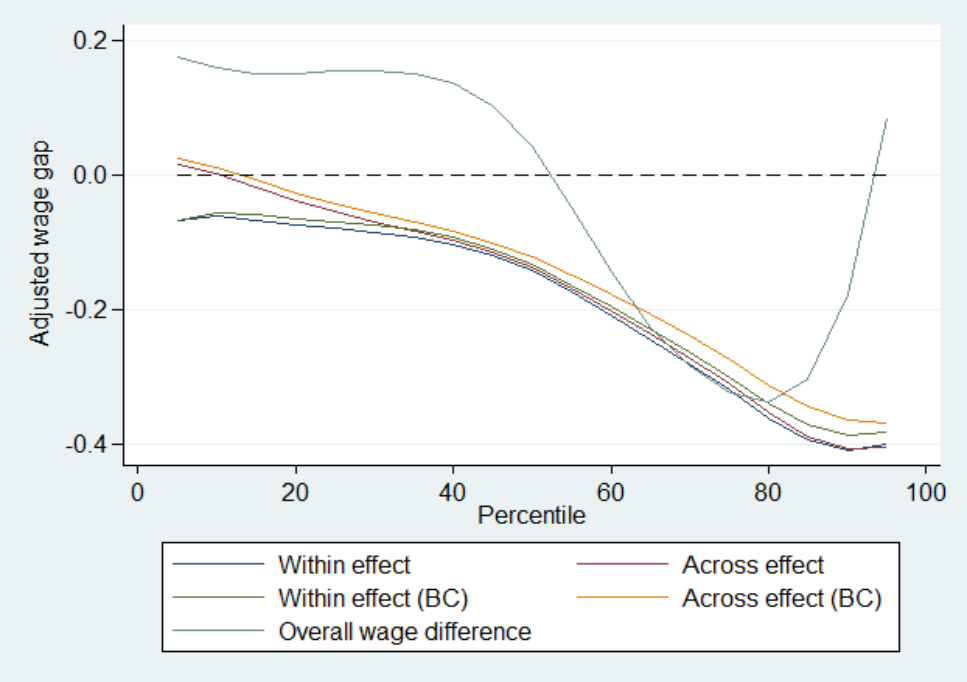



**Figure 8 Endowment effects of gender wage gap by occupation**




## 9. Limitations of the study and areas for future research

Despite the methodological advances provided by correspondence studies, a number of caveats remain and should be considered when interpreting the results of this study. First, as for external validity, the results cannot be generalized to all employers and job seekers in Tunisia. On the employer side, the experiment is limited in scope to four specific fields of study, and thus the results are not generalizable to other fields of study. Even within these four fields of study, the results may not be generalizable at the level of each field because the jobs advertised through the two platforms used may not be fully representative of all jobs in each field. Moreover, the experiment is designed to test discrimination at point-of-entry and for entry-level jobs in Greater Tunis, meaning the results are not necessarily generalizable to other skilled positions requiring longer work experience or to vacancies outside Greater Tunis. On the job seeker side, the four chosen majors capture 47 percent of tertiary-educated students in Tunisia.

Other limitations mostly pertain to the information included in resumes in Tunisia. Applicants' number of children and marital status are typically not included in Tunisian resumes, which limits analysis of the typically assumed bias against women who enter the "marriage market" (Assaad, Ghazouani, and Krafft 2017).

Second, the scope of the experiment sheds light on whether discrimination takes place at the top tier of educational attainment, but it cannot formally answer *why* any discrimination revealed takes place.

Third, this study answers questions about average callback rate differences assuming constant, nonadaptive job applicant behavior in their search for jobs. In other words, the experiment does not account for modifications in an application strategy after an applicant receives a certain number of rejections or for modifications that account for specific job seeker requirements (Fix and Struyk 1993).

Fourth, the fact that the dependent variable is callback rates (and not wage offers) establishes a nonlinear relationship that could throw results into doubt if employers believe there is potential heterogeneity in the unobserved variance of productive characteristics between males and females (Heckman and Siegelman 1993; Neumark 2012). This experiment, like all correspondence studies, attempts to balance productive characteristics between two similar population groups (high achieving and recent male and female graduates), but it cannot control for employers' beliefs or the variance in unobserved qualities. If employers indeed believe there is more variance in males, they are more likely to lean toward hiring males even if there are no *average* differences between observed and unobserved characteristics.

Finally, it is important to note the ethical considerations typically brought up in relation to correspondence studies, the most important of which is the assumption that the benefits gained from the study outweigh employers' lack of consent to the study and thus an unintended waste of their time. In addition, there could be potentially harmful impacts if a job offer is extended and declined by the applicant (which often happens in audit studies) and the employer falsely begins to formulate an opinion based on the characteristics conveyed by the resume.

# 10. Summary of study findings and policy implications

## Study findings

The average gap in the unemployment rate in Tunisia between tertiary-educated men and women reached 17 percentage points in 2014. To what extent is this gap a result of gender discrimination? This study attempts to answer that question. On the one hand, the study finds that, on average,

there is positive discrimination in favor of women because they are more likely to be contacted by an employer. On the other hand, subgroup analyses reveal that discrimination both in favor of and against women exists, and the magnitudes are substantial.

The fact that discrimination against women is more pronounced in certain occupations than in others is in line with the stereotypes that result in female applicants being treated differently than male applicants, *even* when they have the same skills and potential productivity. In the IT sector—where there is gender parity in enrollment at the higher education level—women are 15 percentage points (43 percent) less likely to receive a callback from an employer. This finding may explain in part why the unemployment rate of female graduates is 36 percentage points higher than that of their male peers in the Tunisian IT sector.

On the other hand, no discrimination was found against women in male-dominated engineering occupations, even as the actual unemployment gap in this field reached a staggering 48 percentage points in 2014. Positive discrimination toward women was strongly observed in the marketing field, and somewhat weakly in the finance/economics field. Specifically, the results confirm that in marketing a female applicant had a higher probability—by about 19 percentage points (74 percent)—of receiving a callback. Even with positive discrimination, women who graduate with a marketing degree are still less likely than men to find employment, as indicated by an unemployment gap of 19 percentage points.

Meanwhile, this study finds that women are discriminated against based on physical appearance. Veiled women are 8.5 percentage points less likely to receive a callback than nonveiled women. Potentially, this finding goes beyond physical appearance and relates to the strength of religious beliefs and practices.

Some explanations could reconcile the positive discrimination in favor of women, on average and in some fields, with the widening gaps in unemployment between men and women in the Tunisian labor market. First, this study measures discrimination at the screening stage and does not rule out that women face discrimination at the interview stage and beyond. Conditional on receiving a callback from the employer, women are more likely to be asked, by 9 percentage points, to schedule an interview in person for a later date, whereas men are more likely, by 10 percentage points, to be interviewed on the spot over the phone. One could argue that this finding suggests that more scrutiny or potential discrimination could be exercised at the interview stage.

Beyond hiring, women face wage discrimination in employment. In Tunisia, the median wage for men is higher than the median wage for women at all age levels and for all education levels. It is also higher in the private sector and in semipublic enterprises. None of the wage gaps is explained by higher human capital endowments, and it is mostly due to higher premiums that men receive on their endowments compared with women—that is, a woman must be overprepared to gain the same wage for a given job as a man. From the lowest wage quantiles to the highest quantiles, this premium grows by almost four times, showing the magnitude of the glass ceiling faced by Tunisian women. In fact, wage discrimination against Tunisian women is no different from that in the rest of the world. Much like the conclusions reached by Arulampalam, Booth, and Bryan (2007), Pendakur and Woodcock (2010), and Zucco (2019), among others, Tunisia exhibits a high glass ceiling for women because they are required to be vastly more qualified than their male counterparts, especially for high-earning positions.

Second, this experiment creates an artificial supply of applicants, whereas in reality the rate at which females apply for jobs may differ from that of male job seekers. For example, in the engineering field it is plausible that female engineers submit fewer applications for actual engineering jobs and more for less demanding jobs in which the supply of female job seekers exceeds the demand for labor because of the inability of women to compete with men in view of their long working hours or other childcare and household responsibilities.[17]

Third, the higher concentration of female graduates than male graduates in some majors, such as marketing and finance, could mean there is an oversupply of female graduates for the number of jobs available in those fields, translating into higher unemployment rates among female graduates, even when there is positive discrimination is favor of women.

Fourth, the positive discrimination in favor of women could be related to how the profile of advertised jobs in some fields may fit certain gender stereotype beliefs held by employers. For example, many of the jobs advertised on the online portal for the finance field were for assistants, and a higher share of marketing jobs required knowledge of Microsoft Office and less advanced computer skills, as well as languages. This finding is in line with evidence found elsewhere.

[17] Unfortunately, no data are available to further verify this hypothesis. Implementing panel surveys in the future to carefully track the choices of graduates over time would be a good first step.

According to the World Economic Forum (2016), the IT industry has a significant gender gap in female hirees, whereas women are more highly represented in sectors related to services.

Finally, other constraints from the supply side related to higher reservation wages could explain the high unemployment rate for female job seekers. It is influenced by high opportunity costs, especially because of preferences for public sector employment, the working conditions in the private (informal) sectors, and other explanations presented in section 3 of this report.

Female unemployment in Tunisia is thus a complex challenge and cannot be fully explained by one factor alone. Closing the gender gap in employment requires a comprehensive, multisectoral approach aimed at tackling binding constraints from both the demand side and the supply side.

### Policy implications: Addressing discrimination in the Tunisian labor market

In the IT sector, where discrimination is widespread, it is important to undertake prevention measures. Enacting laws that prohibit any form of discrimination in employment is an important first step. Tunisia currently scores 75 on the World Bank's Women, Business, and Law index,[18] indicating that the country's economy gives women only three-quarters of the legal rights of men. Although this average is significantly higher than the MENA average of 47.37, there is room for improvement.

Currently, Tunisia's laws do not mandate equal remuneration for work of equal value, and women are not allowed to work in the same industries and same night hours as men.[19] In addition, because this study finds that veiled women are 8.5 percentage points less likely than nonveiled women to receive a callback from employers, it is important to gradually influence the customs around inserting photos in applicants' resumes. More also needs to be done to ensure that women are not discriminated against at the interview stage or throughout their career progression based on their appearances, religious views, and family circumstances.

In instances in which discrimination in the workplace appears to be the result of statistical discrimination (for example, employers believe that female applicants are still, on average, less qualified or less productive than male applicants), Tunisia's National Employment Agency

[18] https://wbl.worldbank.org/.
[19] World Bank, Women, Business and the Law database, 2019, https://wbl.worldbank.org/.

(Agence nationale pour l'emploi et le travail indépendent) could strengthen its labor market programs and job intermediation services between employers and job seekers, especially in workplaces where most workers are men. Offering internships and on-the-job training can serve as a credible signal for employers and challenge some of their perceptions about women's productivity. In the IT sector, programs that promote skills training for women seeking to enter IT-related fields could be linked to the educational/vocational programs currently in Tunisia. Programs such as public information campaigns and career guidance services may also be needed to correct misperceptions about gender discrimination among students and their families and to encourage them to enroll in studies that tend to be male-dominated, such as engineering.

Moreover, it is important to implement targeted strategies to change (male) behavior in the workplace. Studies from the Organisation for Economic Co-operation and Development (OECD) found that in private enterprises, targeted strategies that champion leadership on gender issues from the top help to create opportunities for women through sponsorship, robust talent management, and a targeted search for female candidates for senior executive positions, who will, in turn, serve as positive role models for future generations of girls (Elborgh-Woytek et al. 2013). For example, in Norway, Kunze and Miller (2017) find narrower gender gaps in promotions for workers with female bosses, suggesting that policies that increase female representation in corporate leadership can have spillover benefits to women in the lower ranks.

# Appendix A

# Enrollment of Tunisian universities

**Table A.1 Total number of students enrolled in Tunisian universities by major and gender, 2018**

| Major | Number of students enrolled (all universities, public and private) for the academic year 2018 | Number of female enrolled students | Number of male enrolled students |
|---|---|---|---|
| Training of trainers and education sciences | 5,947 | 5,049 | 898 |
| Arts | 10,370 | 7,566 | 2,804 |
| Letters | 28,359 | 21,854 | 6,505 |
| Business and administrative studies | 45,912 | 29,947 | 15,965 |
| Law | 15,764 | 11,693 | 4,071 |
| Journalism and information sciences | 1,446 | 1,069 | 377 |
| Social sciences and science of behavior | 17,358 | 12,398 | 4,960 |
| Mathematics and statistics | 2,841 | 1,649 | 1,192 |
| Computer science and multimedia | 33,353 | 16,994 | 16,359 |
| Life sciences | 7,093 | 6,189 | 904 |
| Physical science | 9,847 | 7,471 | 2,376 |
| Industry of transformation | 3,447 | 2,794 | 653 |
| Architecture and building | 9,148 | 3,585 | 5,563 |
| Engineering and related techniques | 41,920 | 16,462 | 25,458 |
| Veterinary science | 283 | 204 | 79 |
| Agriculture silviculture and halieutic | 3,931 | 2,910 | 1,021 |
| Health | 25,851 | 18,651 | 7,200 |
| Social services | 867 | 748 | 119 |
| Protection of the environment | 1,232 | 1,013 | 219 |
| Transportation services | 1,630 | 1,113 | 517 |
| Services to individuals | 5,662 | 2,228 | 3,434 |
| Total | 272,261 | 171,587 | 10,0674 |

# Appendix B

# Characteristics of study job applicants

**Table B.1 General characteristics of study job applicants**

| | Number of male applicants | Number of female applicants | Fraction of male applicants | Fraction of female applicants | P-value of fraction differences |
|---|---|---|---|---|---|
| ***Applicant's appearance*** | | | | | |
| Lighter-skinned (*base category*: darker-skinned) | 776 | 752 | 0.50 | 0.48 | 0.37 |
| Veiled women (*base category*: nonveiled women) | N/A | 431 | N/A | 0.27 | N/A |
| ***Applicant's** region **of residence*** | | | | | |
| Ariana | 330 | 352 | | | |
| Ben Arous | 405 | 367 | | | |
| Mannouba | 231 | 225 | | | |
| Tunis | 605 | 627 | | | |
| P-value of statistical differences in distribution of regions between men and women | 0.38 | | | | |

## Table B.2 Detailed characteristics of study job applicants

| | Number of male applicants | Number of female applicants |
|---|---|---|
| **University major** | | |
| ***Engineering*** | | |
| Certificat du cycle préparatoire aux études d'ingénieur en physique-chimie | 130 | 129 |
| Certificat du cycle préparatoire aux études d'ingénieur en physique-techniques | 115 | 109 |
| Certificat du cycle préparatoire aux études d'ingénieur en mathématiques-physique | 106 | 111 |
| Certificat du cycle préparatoire aux études d'ingénieur en mathématiques-physique (mention : très bien) | 53 | 43 |
| Certificat du cycle préparatoire aux études d'ingénieur en physique-techniques (mention : très bien) | 44 | 46 |
| ***Marketing*** | | |
| Licence appliquée en marketing (techniques de vente et de distribution) (mention : bien) | 25 | 32 |
| Licence appliquée en marketing (techniques de vente et de distribution) (mention : très bien) | 43 | 52 |
| Licence appliquée en marketing et communication (mention : bien) | 33 | 30 |
| Licence appliquée en marketing et communication (mention : très bien) | 73 | 77 |
| Licence appliquée en gestion (spécialité : Web-marketing) (mention : très bien) | 32 | 40 |
| Licence fondamentale en gestion (spécialité : marketing) (mention : bien) | 31 | 37 |
| Licence fondamentale en gestion (spécialité : marketing) (mention : très bien) | 166 | 142 |
| Licence appliquée en technologie de l'information (mention : très bien) | 34 | 27 |
| ***Economics/finance*** | | |
| Licence appliquée en ingénierie financière et marchés (mention : très bien) | 42 | 45 |
| Licence appliquée en ingénierie économique et financière (mention : très bien) | 46 | 37 |
| Licence appliquée en comptabilité (mention : très bien) | 92 | 84 |
| Licence fondamentale en comptabilité (mention : très bien) | 71 | 79 |
| Licence fondamentale en gestion (Finance) (mention : très bien) | 72 | 78 |
| Licence appliquée en économie et méthodes quantitatives (mention : très bien) | 2 | 6 |
| Licence appliquée en économie quantitative (mention : très bien) | 11 | 7 |
| Licence fondamentale en économie et finance internationale (mention : très bien) | 3 | 3 |
| ***IT*** | | |
| Licence appliquée en systèmes informatiques et logiciels | 42 | 44 |
| Licence appliquée en systèmes informatiques et logiciels (mention : très bien) | 71 | 76 |
| Licence fondamentale en informatique système et multimédia (mention : très bien) | 29 | 23 |
| Licence fondamentale en informatique (mention : très bien) | 130 | 136 |
| Licence fondamentale en informatique et multimédia (mention : très bien) | 47 | 57 |
| Licence appliquée en communication multimédia (mention : très bien) | 28 | 21 |
| ***$\chi^2$ goodness of fit test for distribution equality (P-value)*** | ***0.793*** | |
| **Language** | | |
| German | 1,571 | 1,571 |

| | | | |
|---|---|---|---|
| English | 1,571 | 1,571 | |
| Arabic | 1,571 | 1,571 | |
| Spanish | 1,571 | 1,571 | |
| French | 1,571 | 1,571 | |
| Italian | 1,571 | 1,571 | |
| **University** | | | |
| Ecole préparatoire aux études d'ingénieurs d'El Manar | | 104 | 122 |
| Ecole supérieure des sciences économiques et commerciales de Tunis (ESSECT) | | 160 | 154 |
| Ecole supérieure privée d'ingénierie et de technologie | | 11 | 19 |
| Institut préparatoire aux études scientifiques et techniques | | 33 | 27 |
| Ecole supérieure de commerce (ESC Manouba) | | 133 | 169 |
| Faculté des sciences de Tunis | | 14 | 14 |
| Institut des hautes études commerciales de Carthage (IHEC) | | 246 | 225 |
| Institut préparatoire aux études d'ingénieurs de Tunis | | 140 | 128 |
| Institut préparatoire aux études scientifiques et techniques | | 146 | 128 |
| Institut supérieur d'informatique | | 176 | 180 |
| Institut supérieur d'informatique de Tunis | | 42 | 44 |
| Institut supérieur d'informatique et de multimédia | | 54 | 55 |
| Institut supérieur de comptabilité et d'administration des entreprises (ISCAE Manouba) | | 40 | 33 |
| Institut supérieur de gestion (ISG Tunis) | | 197 | 195 |
| Institut supérieur des arts multimédia de Manouba | | 75 | 78 |
| ***$\chi^2$ goodness of fit test for distribution equality (P-value)*** | ***0.649*** | | |
| **Certification** | | | |
| INJAZ Leadership Training | | 141 | 138 |
| 4C Communication professionnelle et marketing digitale | | 146 | 137 |
| 4C Habilités managériales et entrepreneuriales | | 161 | 152 |
| Certification « 4C TIC bureautique » | | 130 | 148 |
| Certification « Créa-Image » optimisation pour le web | | 98 | 89 |
| Certification “ECOSTIG” Graphic Design & Illustration using Adobe Illustrator | | 111 | 101 |
| Certification “ECOSTIG” Print & Digital Media Publication using Adobe InDesign | | 98 | 94 |
| Certification « FormaGraph Design » illustration avec Photoshop | | 95 | 118 |
| Formation certifiée « Certificate in investment » au sein de l'association tunisienne des intermédiaires en bourse | | 41 | 39 |
| Formation certifiée sur « La méthodologie de la recherche économique » | | 4 | 4 |
| Formation certifiée sur « Les méthodes d'implantation de l'économie sociale et solidaire » | | 1 | 7 |
| Formation certifiée sur « Les outils d'analyse de données économiques » | | 5 | 3 |
| Formation certifiée sur la manipulation du logiciel « SPSS 25.0 » | | 6 | 2 |
| Formation certifiée sur le logiciel « Ciel Comptabilité » | | 38 | 39 |
| Formation certifiée sur le logiciel « EBP Comptabilité » | | 46 | 40 |
| Formation certifiée sur le logiciel « SAGE Commercial » | | 33 | 43 |
| Formation certifiée sur le logiciel « SAGE Paie » | | 46 | 41 |
| Formation professionnelle certifiée de « Brevet de déclarant en douane » au « Centre 2000 » | | 38 | 40 |
| Formation professionnelle certifiée sur « Les méthodes d'élaboration de politiques financières » au sein du colloque « Journées de l'économie et finance appliquée 2018 » | | 35 | 44 |
| INJAZ Innovation and Entrepreneurship | | 121 | 139 |
| INJAZ Steer your Career | | 131 | 116 |
| Participation certifiée avec un document de conférence aux « Journées de l'économie et finance appliquée 2017 » | | 46 | 37 |
| ***$\chi^2$ goodness of fit test for distribution equality (P-value)*** | ***0.617*** | | |
| **Award** | | | |
| Deuxième place au « Tunisian Collegiate Graphic Design Contest » | | 48 | 63 |
| Deuxième place au « INJAZ DESIGN CAMP SIMULATION » | | 50 | 50 |
| Deuxième place à la compétition « Prix Orange du designer » | | 53 | 59 |
| Deuxième place à la compétition estudiantine nationale « INJAZ IDEAS CAMP SIMULATION'18 » | | 105 | 86 |

| | | |
|---|---|---|
| Deuxième prix du 'meilleur site web de l'année 2017' dans le cadre du Junior Achievement's Company program (INJAZ Tunisia) | 50 | 57 |
| Deuxième prix à la compétition « GRAPHIC DESIGN HACKATHON 2018 » | 74 | 67 |
| Finaliste au « Concours national de l'innovation » | 81 | 66 |
| Finaliste au « Concours national de l'innovation industrielle » | 69 | 90 |
| Finaliste au « Huawei ICT Competition » | 86 | 77 |
| Finaliste à « LEADERS ON THE STAGE 2018 » (compétition estudiantine nationale) | 33 | 49 |
| Finaliste à « Finance Innovation ENACTUS 2017 » (compétition estudiantine nationale) | 37 | 37 |
| Finaliste à « INJAZ IDEAS CAMP SIMULATION'18 » (compétition estudiantine nationale) | 3 | 7 |
| Finaliste à la compétition estudiantine nationale : « Business Planner'17 » | 36 | 35 |
| Finaliste à la compétition estudiantine nationale « Open Start'up Tunisia 2017 » | 37 | 40 |
| Finaliste à la compétition nationale « RIYEDA'17 » pour le projet de Start'up le plus prometteur | 3 | 3 |
| Finaliste à la compétition « Prix Orange de l'Ingénieur » | 77 | 85 |
| Finaliste à la compétition « Student's Eco-Design » | 139 | 124 |
| Finaliste à la compétition estudiantine nationale « BUSINESS PLAN OF THE YEAR'18 » | 53 | 30 |
| Finaliste à la compétition estudiantine nationale : « Lead&Rise ENACTUS 2017 » | 40 | 44 |
| Finaliste à la compétition estudiantine nationale : « Analytical Finance Debates'17 » | 41 | 50 |
| Finaliste à la compétition estudiantine nationale : « BUSINESS MODEL OF THE YEAR'17 » | 7 | 4 |
| Finaliste à la compétition estudiantine régionale « FinTech Spirit 2018 » | 46 | 38 |
| Finaliste à la compétition estudiantine régionale « Projet de l'économie sociale et solidaire » | 3 | 2 |
| Finaliste à la compétition nationale « Tunisia Web Awards » | 68 | 57 |
| Sélectionné parmi les finalistes de la compétition nationale « RIYEDA'17 » pour le projet de Start'up le plus prometteur | 76 | 87 |
| Sélectionné parmi les trois finalistes à la compétition estudiantine nationale « Lead&Rise ENACTUS 2017 » | 171 | 173 |
| Troisième prix de la compétition estudiantine nationale « LEADERS ON THE STAGE 2018 » | 85 | 91 |
| **$\chi^2$ goodness of fit test for distribution equality (P-value)** | **0.404** | |
| **Graduation project** | | |
| Administration réseau avec SNMP V1, V2, et administration sécurisée avec SNMP, V3 | 23 | 30 |
| Administration à distance avec SSH, Telnet, Ftp, Scp | 23 | 16 |
| Assistant marketing stagiaire chez ARTEM Studios, chargé de coordonner les études de marchés marketing avec le bureau de consulting, assurer des études comparatives, proposer des plans d'actions liés aux techniques de vente et de Communication | 31 | 33 |
| Commande à but didactique de convertisseurs par microcontrôleur : Hacheur, onduleur à résonance, Onduleur monophasé et triphasé | 14 | 6 |
| Création d'un site web permettant la création et la gestion des groupes dans l'université (php, Html5, CSS3, MySQL, Jquery) | 27 | 29 |
| Création d'un système d'ordonnancement préemptif et non préemptif sous Linux | 21 | 23 |
| Data Mining and Text Mining : Utiliser les techniques d'analyse de données dans un sujet d'actualité | 6 | 6 |
| Développement d'un réseau social de géolocalisation et de proximité sous Android et en mode web avec intégration du réseau social Facebook pour le compte de la société Sotetel | 14 | 6 |
| Développement d'un site web vitrine d'une agence immobilière (Java EE, MySQL) | 14 | 8 |
| Développement d'une application mobile de gestion des ventes et d'allocation des voitures | 29 | 23 |
| Développement d'une application web de messagerie (Html5/CSS, php4, MySQL, JavaScript) | 13 | 19 |
| Développement d'une application web de partage de fichiers entre communautés (Html5/CSS, php4, MySQL, JavaScript, Bootstrap) | 12 | 14 |
| Développement d'une application web permettant à l'université de gérer et chercher des stages | 9 | 13 |
| Développement d'une application M-Banking (Mobile Banking) sous Android qui permet aux utilisateurs de faciliter les transactions bancaires pour le compte de la société Sotetel | 13 | 14 |
| Développement multi-canal web et mobile d'une application de géolocalisation par points d'intérêt : Application de guide et recherche d'itinéraire avec push de notifications en | 20 | 13 |

| | | |
|---|---|---|
| temps réel jusqu'à l'arrivée au point d'intérêt, adapté à l'évolution des comportements, exposée sur deux canaux web classiques et web mobile, avec une offre d'administration. | | |
| Machine Learning and Deep Learning : utiliser les algorithmes de Machine Learning et de Deep Learning en applications réelles | 8 | 4 |
| Machine Learning : Prédiction des prix des actions par la méthode de régression et la méthode SVM (Support Vector Machine) | 5 | 4 |
| Mechanical Design Project : Pompe centrifuge, cisaille hydraulique, table élévatrice à ciseaux | 10 | 6 |
| Mise en place et test d'un système de détection des intrusions (Snort) | 21 | 29 |
| Participation au projet de mise en place du plan d'action Marketing-Produit visant au Re-branding de la marque de Hamadi Abid « HA » et au monitoring du projet durant trois mois | 44 | 51 |
| Participation à la conception et développement d'un portail pédagogique personnel pour étudiants dans le cadre du projet national SALIMA (Système d'Administration de Licences et Masters) | 22 | 22 |
| Projet CMM : Conception et design graphique d'un site web pour le centre d'appel CMM pour promouvoir ses services en offrant un portail d'administration (php7, Bootstrap, Jquery, MySQL) | 25 | 24 |
| Projet CMM : Conception et développement d'un site web pour le centre d'appel CMM pour promouvoir ses services en offrant un portail d'administration (php7, Bootstrap, Jquery, MySQL) | 17 | 12 |
| Projet LAMSIN : étude et simulation numérique des modèles stochastiques dans une population dynamique et leur comparaison avec les modèles déterministes | 6 | 6 |
| Projet Robotique : Conception d'un robot Sumo qui fait face à un autre, détection de la ligne limite et calcul de la distance | 9 | 4 |
| Projet Visual Identity : Création d'une identité visuelle d'une enseigne de grande distribution | 13 | 10 |
| Projet conception et réalisation d'une application « e-commerce » servant à l'achat en ligne des produits de beauté et pouvant être développée sur Androïd, Mac OS BlackBerry, etc. | 18 | 11 |
| Projet d'application Desktop : Développement d'une application de détection de plagiat sur des programmes C (C++) | 21 | 15 |
| Projet d'application Desktop : Tableau de bord de suivi des employés, application permettant le suivi et l'évaluation des employés (JavaSE, JavaFX) | 26 | 20 |
| Projet d'application mobile Evento : Conception et développement d'une application de gestion des événements au sein des universités (Android, php, MySQL, UML) | 16 | 23 |
| Projet d'automatique et design systems : mise en oeuvre d'un système numérique de contrôle de la température de l'air soufflé dans un canal aérothermique | 11 | 16 |
| Projet d'exploitation et exportation de l'énergie solaire dans des centrales solaires | 11 | 16 |
| Projet d'étude de conception d'une coque de bateau inspirée de la forme de l'orque : développement d'un modèle CAD de la coque, identification par simulation numérique sur le logiciel ANSYS des propriétés hydrodynamiques et hydrodynamiques du nouveau design | 6 | 9 |
| Projet d'étude de dimensionnement et calcul de structures d'un site de maintenance et de remisage (sous-sol partiel, des niveaux rez-de-chaussée, hall de maintenance) | 23 | 16 |
| Projet d'étude des descripteurs audio du rythme des sons percussifs : Développement de scripts Python pour le pré-traitement, la classification (KNN) et le clustering (K-means) d'une base de données sonores | 5 | 7 |
| Projet d'étude intégré (siège de la douane de Tunis) : étude de l'ossature d'un bâtiment à plusieurs étages, étude acoustique et thermique de la salle de conférence | 14 | 14 |
| Projet de Gravity Light : Projet d'entreprise générant de l'énergie à partir de la gravité, | 3 | 4 |
| Projet de Monitoring d'énergie : Programmation d'un système de monitoring énergie via the BeagleBone Card | 19 | 20 |
| Projet de conception et développement d'un site web d'e-commerce permettant l'achat et la gestion d'articles commerciaux (JEE, JSP/Servlet, MySQL) | 30 | 33 |
| Projet de réalisation d'un site web de recrutement pour le compte de la Banque de l'Habitat | 14 | 17 |

| | | |
|---|---|---|
| Projet de standardisation et infrastructure de qualité : application aux systèmes solaires thermiques : modélisation des systèmes de panneaux solaires à l'aide du programme T *sol | 10 | 11 |
| Projet design pour la création d'application mobile Evento pour la gestion des événements au sein des universités | 13 | 12 |
| Projet design pour la création d'une application web de partage de fichiers entre communautés | 13 | 22 |
| Projet optimisation : développement d'un script MatLab pour déterminer la position du minimum d'énergie potentielle d'une chaîne composée de plusieurs barres | 3 | 10 |
| Réalisation d'un algorithme pour un simulateur de quatre types d'ordonnanceurs (C, SE Fedora UNIX) | 23 | 26 |
| Réalisation d'un outil de lecture pour les non-voyants : un support pour lire du texte à partir d'une image et la transformer en parole en développant un algorithme de traitement d'image contenant un texte et la technique de concaténation de segments de parole à partir d'un texte en utilisant Phyton, OpenCv and OCR | 16 | 18 |
| Réalisation d'un site web pour une agence de location de voitures en ligne (JEE, Bootstrap, Jquery, MySQL) | 16 | 27 |
| Réalisation d'un site web servant de guide touristique de la Tunisie (Android Studio, Java) | 26 | 34 |
| Stage Doz.com, chargé de la participation dans les stratégies de communications digitales ainsi que le monitoring des exécutions, création de l'identité digitale des marques sur les réseaux sociaux et référencement des sites web de trois clients | 37 | 32 |
| Stage chez SOTUFAB : Participation à la mise en œuvre d'une étude stratégique de segmentation du marché et de ciblage de la future clientèle sur des segments non encore exploités par l'entreprise | 42 | 31 |
| Stage chez VATOTICKET : Mise en place du plan d'action Marketing de la plateforme de ticketing pour augmenter l'efficacité des campagnes de promotion et de fidélisation | 44 | 43 |
| Stage chez l'agence de Web marketing A2WM, chargé de la participation dans la mise en œuvre des techniques de référencement, positionnement et audit web, la gestion des campagnes adwords, e-mailing, la rédaction des contenus thématiques | 34 | 36 |
| Stage chez l'agence de Web marketing CapSeo, chargé de la participation dans la rédaction web, le référencement naturel et payant des sites web clients, l'audit technique et sémantique des sites web et le SMO (Référencement social) | 27 | 37 |
| Stage chez l'agence de marketing Got2be Event en tant que chef d'équipe de marketing direct chargé de coordonner l'équipe, superviser les opérations, assurer la logistique, faire le reporting journalier et final | 29 | 25 |
| Stage chez l'Arab Tunisian Bank ATB : Participation à la mise en œuvre d'une étude de Benchmarking et de positionnement concurrentiel de la banque dans son secteur d'activité | 43 | 48 |
| Stagiaire chez Electro-Diesel Tunisies, chargé d'assister le directeur marketing dans l'élaboration d'une base de données clients et gestion de portefeuille, animation des réseaux de distribution et suivi des plans d'actions et de fidélisation | 33 | 41 |
| Stagiaire chez Media-System, chargé d'assister le chef de projet dans la gestion des relations clients, le suivi des objectifs (qualité, délais, coût), la gestion des demandes de qualité en accord avec les exigences du chef de produit | 36 | 30 |
| Stagiaire chez Web2Reach, responsable d'intégrer et de mettre à jour le contenu sur le site web d'un client, établir la stratégie SEO/SEA du site, rédaction de contenu, animation des réseaux sociaux et conception des outils de communication digitale | 37 | 30 |
| Système de supervision des salles serveur (Carte Raspberry, pi 2B, Framework Django) | 24 | 25 |
| Étude et mise en place d'un PBX-IP ASTERISK | 32 | 18 |
| Etude expérimentale et numérique d'un canal ouvert : reproduire les écoulements en surface libre avec un canal hydraulique à pente variable, modélisation de surface libre avec CFD Software, comparaison des résultats expérimentaux avec les numériques | 20 | 22 |
| Etude numérique des méthodes de prédiction de la météo et résolution PDE en utilisant Scilab | 8 | 8 |
| ***$\chi^2$ goodness of fit test for distribution equality (P-value)*** | ***0.781*** | |
| **Internship** | | |

| | | |
|---|---|---|
| Projet d'exploitation et exportation de l'énergie solaire dans des centrales solaires | 15 | 12 |
| Stage chez Alpha-Engineering & technologies : développement d'une application MatLab étudiant la faisabilité de la modélisation de la probabilité d'amitié sur un réseau social en utilisant un modèle linéaire | 6 | 3 |
| Stage chez Christian Albrechts Universität zu Kiel, Allemagne : Optimisation des systèmes réels, application d'un système Batch pour générer les distributions et étudier l'incertitude | 10 | 6 |
| Stage chez Compitechnology : conception sur SolidWorks de prototypes de produits innovants destinés au marché japonais et fabrication de prototypes par impression 3D | 9 | 5 |
| Stage chez Crunch Analytics Ghent : techniques et algorithmes avancés d'analyse de données, Modélisation et collecte pour un client en industrie pharmaceutique | 4 | 2 |
| Stage chez EBC-European business center en tant que responsable d'étude stagiaire participant dans la préparation logistique, la mise en œuvre et la rédaction de recommandations et de rapports liés aux études économiques et stratégiques | 7 | 9 |
| Stage chez EPPM : étudier et simplifier le processus de sélection de programmes pour les conduites sous pression en l'automatisant à l'aide du code VBA | 9 | 11 |
| Stage chez Fuba : systèmes embarqués et technologies avancées. Conception et réalisation d'un système de commande et dialogue homme-machine dédié à la commande d'une couveuse | 18 | 11 |
| Stage chez GTEC Consulting : conception et développement d'une solution BI permettant l'analyse et la prise de décisions à travers des tableaux de bord en utilisant les outils de Microsoft BI | 79 | 66 |
| Stage chez Institut für Mechanik-Montanuniversität Leoben : effet des précipitations de carbure sur la croissance des grains d'un acier de tube X80 microallié grâce à la simulation du mouvement à triple jonction et de la distribution granulométrique | 9 | 8 |
| Stage chez Integration Objects : mise en place d'un process monitoring basé sur une approche Data Driven, définition et calcul de KPI's qui ont été intégrés dans la plateforme KnowledgeNet Analytics | 9 | 6 |
| Stage chez Inventy Labs-Tunisie : développement d'indicateurs clés de performance intégrés dans les produits d'Inventy, développement de scripts Phyton pour automatiser la modification des fichiers XML relatifs aux 'calculation views' | 1 | 14 |
| Stage chez ListerAct assurant la responsabilité de réalisation de calculs de structures internes pour vérification des ouvrages de génie civil dans le cadre de la participation au visa calculs et contrôle de plans d'exécution des travaux | 20 | 13 |
| Stage chez Manipal University Jaipur, Inde : utilisation des algorithmes de Machine Learning pour l'analyse des données et leur application sur un ensemble de données MOA pour des systèmes en temps réel | 7 | 6 |
| Stage chez Manipal University, Jaipur, Inde : caractérisation nanocomposite par simulation moléculaire dynamique. orientation aléatoire de medins incurvés de fibres incurvées utilisant LAMMPS Software | 7 | 10 |
| Stage chez SAFOZI Tunisie : mise en place d'un guide d'utilisateur en ligne et réalisation de jeux de test et de tutoriels pour le service Cloud offert par l'entreprise | 61 | 69 |
| Stage chez SNCFT : réalisation d'un planificateur de routes en se basant sur le projet 'TEMPUS' | 35 | 24 |
| Stage chez STEG Tunisie au bureau central de conduite : conception d'une alimentation stabilisée et recherche sur le supercondensateur | 23 | 19 |
| Stage chez STMicroelectronics : automatisation de la validation du Bootloader via l'interface SPI | 43 | 46 |
| Stage chez STS : projet de recherche sur les outils de gestion des systèmes de transport et les moyens de leur optimisation | 24 | 32 |
| Stage chez Scoop Informatique : administration des sites, gestion des compagnes e-mailing, maintenance sites web dynamiques, design web et ergonomie | 18 | 12 |
| Stage chez TALAN Tunisie : équipe support pour le client AXA-IM France : Gestion des applications communication/client Groupe (Salesforce, Adobe Campaign) | 69 | 62 |
| Stage chez TECHLAB TN : réalisation d'une application desktop de gestion des ICO avec électronJS et ReactJS | 30 | 37 |

| | | |
|---|---|---|
| Stage chez TSC Tunisie : mise en œuvre de la migration d'une application de l'Android vers l'IOS et ajout d'interfaces avec Windev Mobile 20 | 36 | 32 |
| Stage chez Tunis Re : développement d'un modèle stochastique décrivant l'évolution du prix des actifs, évaluation des paramètres, estimation du risque de marché | 1 | 4 |
| Stage chez l'institut national de météorologie : analyse et modélisation des données de la météo | 7 | 4 |
| Stage chez AB Consulting : création de l'identité visuelle, d'un client, Logo, carte visite, Affiche publicitaire, Flyer | 10 | 18 |
| Stage chez SOTETEL : développement d'un réseau social de géolocalisation et de proximité sous Android et en mode web avec intégration du réseau social Facebook | 26 | 37 |
| Stage chez la Banque Internationale Arabe de Tunisie (BIAT) permettant de participer dans l'analyse financière, l'appréciation du risque de crédit dans le département politique et stratégie des risques et conseil client | 81 | 79 |
| Stage chez la société Great Deal : conception des supports de multimédia | 13 | 12 |
| Stage en tant que développeur web chez « webticart » : conception et développement d'un site web marchand sous le système de gestion de contenu « zencart » | 29 | 25 |
| Stage en tant que web designer chez My Solution Dev | 20 | 15 |
| Stage professionnel Webmaster chez WEBTICOS : Administration des sites, gestion des compagnes e-mailing, maintenance sites web dynamiques, design web et ergonomie | 14 | 19 |
| Stage à l'Agence Nationale de Sécurité Informatique (ANSI) : étude et développement d'un outil graphique d'un Web application Firewall open source (ModSecurity) | 60 | 62 |
| Stagiaire chez CMS (Chaudronnerie métallerie du Sahel) responsable de l'assistance aux activités du Transit (import, export et déclaration douane), de comptabilité générale, de suivi des comptes, déclarations fiscales et sociales | 77 | 86 |
| Stagiaire chez IDEA Consult en tant que responsable d'étude tenu d'assister les opérations d'élaboration d'études stratégiques, d'études de faisabilité économique et commerciale de nouveaux projets, d'études économiques et financières | 9 | 7 |
| Stagiaire chez Igrec Ingénierie, chargé de la mise en évidence des évolutions de la Gestion Technique du Bâtiment (GTB) et de l'intéropérabilité entre les systèmes. | 9 | 14 |
| Stagiaire chez OmniBa, chargé des missions de conducteur de travaux sur chantier tel que la mise en œuvre des moyens nécessaires à l'exécution du chantier dans le respect des conditions de délais, de coûts, de qualité et de sécurité, suivi QSE (suivi des détails techniques, de leur bonne mise en œuvre, contrôle des ouvrages exécutés), etc. | 12 | 29 |
| Stagiaire chez OmniCréa en tant que Full Stack designer assistant chargé d'améliorer les supports visuels (Print design, Site internet), générer de manière proactive de nouveaux « Leads » au travers des outils de communication digital | 21 | 20 |
| Stagiaire chez SoTuLub (Société Tunisienne de Lubrifiants) responsable de la saisie comptable, rapprochement bancaire, déclarations mensuelles, CNSS, et de l'assistance dans le calcul et la réalisation des déclarations fiscales mensuelles | 86 | 77 |
| Stagiaire chez UBCI, participant dans le traitement des dossiers de crédit, identification et analyse des risques de crédit, élaboration des états financiers analytiques et prise en charge des clients | 79 | 81 |
| Stagiaire chez Vinci Energie, chargé d'assister à l'établissement des bilans de puissances, du choix de la distribution, du dimensionnement des équipements principaux, de l'implantation du matériel, des spécifications concernant les énergies renouvelables (éoliennes et panneaux photovoltaïques) | 10 | 16 |
| Etude expérimentale et numérique d'un canal ouvert : reproduire les écoulements en surface libre avec un canal hydraulique à pente variable, modélisation de surface libre avec CFD Software, comparaison des résultats expérimentaux avec ceux numérique | 21 | 14 |
| ***$\chi^2$ goodness of fit test for distribution equality (P-Value)*** | ***0.211*** | |
| **Hobby** | | |
| Camping | 1,571 | 1,571 |
| Cinema | 1,571 | 1,571 |
| Painting | 1,571 | 1,571 |
| Fitness | 1,571 | 1,571 |
| Judo | 1,571 | 1,571 |

| | | |
|---|---|---|
| Lecture | 1,571 | 1,571 |
| Music | 1,571 | 1,571 |
| Swimming | 1,571 | 1,571 |
| Nature | 1,571 | 1,571 |
| Theater | 1,571 | 1,571 |
| Traveling | 1,571 | 1,571 |
| Cycling | 1,571 | 1,571 |
| **Club memberships** | | |
| Membre de l'ATUGE (Association des Tunisiens des grandes écoles) | 89 | 77 |
| Membre de l'Association tunisienne de développement et formation | 84 | 75 |
| Membre de l'association Jeunes Dynamiques | 93 | 82 |
| Membre de l'association Méditerrannée Action Nature | 93 | 91 |
| Membre de l'association Youth and Sciences Tunisia | 77 | 80 |
| Membre de l'organisation Human Appeal International | 80 | 86 |
| Membre de l'organisation Scouts Tunisiens | 89 | 76 |
| Membre de la Tunisian Federation of Amateur Filmmakers | 73 | 77 |
| Membre de la plateforme CEED Tunisie pour l'accompagnement des Start'Up | 89 | 93 |
| Membre de la plateforme Wajjahni Tunisie pour l'entreprenariat et l'employabilité | 162 | 174 |
| Membre du Gate Exchange Program (Programme d'échange culturel entre étudiants allemands et tunisiens) | 89 | 82 |
| Membre du Tunisian International Model United Nations (TIMUN) | 77 | 86 |
| Membre du Rotaract Club Tunisie | 167 | 169 |
| Membre du comité d'organisation du festival de Carthage | 82 | 73 |
| Participant in the International project SIGHT (Special Interest Group for Humanitarian Projects) | 69 | 80 |
| Représentant des étudiants au conseil scientifique | 80 | 74 |
| Volontaire au Croissant Rouge Tunisien | 78 | 96 |
| ***$\chi^2$ goodness of fit test for distribution equality (P-value)*** | ***0.969*** | |

# Appendix C

## Examples of resumes of male and female job seekers

AMIRA BEN ABDALLAH

ÉDUCATION

**Ecole Polytechnique de Tunis** 6/29/2018

Diplôme de Mastère de recherche en Systèmes électriques de puissance

**Ecole Polytechnique de Tunis** 6/27/2018

Diplôme national d'études d'ingénieur en génie électrique, option automatique et design systèmes

**Ecole supérieure privée d'ingénierie et de technologie** 7/3/2015

Certificat du cycle préparatoire aux études d'ingénieur en Physique-Techniques

**Lycée Technique 9 avril 1938 de Tunis** 7/6/2013

Diplôme national du Baccalauréat de spécialité sciences expérimentales (mention: Bien)

DETAILS PERSONNELS

amira.benabdallah99@gmail.com

97903124

Residecne Ezzouhour, Boumhel El Bassatine, 2097, Ben Arous

EXPÉRIENCES

Programmation d'un compteur, diviseur, décodeur et afficheur en VHDL

Stage chez "Fuba": systèmes embarqués et technologies avancées. Conception et réalisation d'un système de commande et dialogue homme-machine dédié à la commande d'une couveuse

COMPÉTENCES EN PROGRAMMATION

Altuim Designer, CodeBlocks, MPLab, Isis, Psim, Eagle, MatLab SimuLink, Tsol, Arduino, Keil, LabView, IAR, PSPice, MPLab, ModelSim, Atollic, COOCOX, QT

COMPÉTENCES EN INFORMATIQUE

Python, C/C++

LANGUAGES

Arabe (Langue maternelle), Français (Avancé), Anglais (Moyen), Espagnol (Débutant)

CERTIFICATIONS

MATLAB

INTÉRÊTS

Théatre

ACTIVITÉS EXTRASCOLAIRES

Membre du club "Bright Minds"

Membre de l'organisation "Human Appeal International"

Gagnant de la compétition Robotique Carthage

# Yassine Ben Ayed

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55602511

Cite El Haddad , Mohamadia, 1145, Ben Arous


## ÉDUCATION

**Ecole Polytechnique de Tunis** 6/29/2018

Diplôme de Mastère de recherche en Systèmes électriques de puissance

**Ecole Nationale d'ingénieurs de Tunis** 7/2/2018

Diplôme national d'études d'ingénieur en génie électrique, option automatique et design systèmes

**Institut préparatoire aux études scientifiques et téchniques** 7/3/2015

Certificat du cycle préparatoire aux études d'ingénieur en Physique-Techniques

**Lycée Pères Blancs d'el Menzah 9** 7/4/2013

Diplôme national du Baccalauréat de spécialité sciences expérimentales (mention: Très bien)

## EXPÉRIENCES

Projet d'automatique et design systems: mise en oeuvre d'un système numérique de contrôle de la température de l'air soufflé dans un canal aérothermique

Stage chez "STEG Tunisie" au bureau central de conduite: la conception d'une alimentation stabilisée et recherche sur le supercondensateur

## COMPÉTENCES EN PROGRAMMATION

C/C++, Python

## COMPÉTENCES EN INFORMATIQUE

CodeBlocks, Isis, Eagle, Tsol, Keil, IAR, MPLab, Atollic, QT, COOCOX, ModelSim, PSPice, LabView, Arduino, MatLab SimuLink, Psim, MPLab, Altuim Designer

## CERTIFICATIONS

INJAZ Leadership Training

## ACTIVITÉS EXTRASCOLAIRES

Participant au NASA App Challenge competition (ANTARES-WATT Project)

Membre du comité d'organisation du festival de Carthage

Finaliste à la compétition "Prix Orange de l'Ingénieur"

## INTÉRÊTS

Dessin/Peinture

## LANGUAGES

Arabe (Langue maternelle), Français (Avancé), Anglais (Avancé)

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