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### **Title**

The Youth Gender gap in North Africa:  
Income differentials and Informal Employment

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# The Youth Gender gap in North Africa: Income differentials and Informal Employment

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## Abstract

The paper takes advantage of the Sahwa data set carried out in 2015 among 7,816 youth aged 15-29 from Algeria, Egypt, Morocco and Tunisia. The research question addresses the determinants of youth gender inequalities in North Africa with respect to prominent informal employment. A binary logistic model first investigates the determinants of labour market participation in each country. Next, Mincer earnings functions and quantile regressions analyse gender distribution over the formal/informal employment divide with respect to the subsample of 1,941 employees vs. self-employed workers. Last, an Oaxaca-Ransom decomposition model gauges the gender income gap of employees vs. self-employed workers, whereby females face a penalty as entrepreneurs and wage earners.

**JEL:** E26, J46.

**Keywords:** decomposition model; earning functions; gender; household surveys; informal employment; logistic regressions; North Africa; quantile regressions; wage differentials.

## Introduction

One of the salient facts of the labour market is the importance of informal employment in developing economies (Jutting and Laiglesia, 2009). It accounts for about half (50.2%) of total non-agricultural employment in North African countries (Charmes, 2015), 43 per cent in Algeria, 53 per cent in Egypt, 45 per cent in Morocco and 50 per cent in Tunisia (ILO, 2017). Recent labour market changes in the region, with regard to rising informal work (Angel-Urdinola and Tanabe, 2012; Gatti et al, 2014), non-permanent employment and self-employment, would result in a widening gender gap with respect to employment.

Nearly two-thirds of North African women and one-third of men hold vulnerable jobs (ILO, 2017). In Algeria, the overall rate of informal female employment is 24 percent; in the private sector, it is close to 70 per cent compared with 63 per cent for men (Charmes, Remaoun, 2014; Gherbi, 2014; ONS, 2015; Adair, Bellache, 2018). In Egypt, more than a quarter of employed women work in the informal sector (World Bank, 2014; El-Haddad and Gadallah, 2018). Tunisia accounts for more than 27 per cent of women in the informal economy; they are very numerous in informal wage employment (76%) rather than in the informal sector (19%) (Charmes, 2016). In Morocco, 40 per cent of women work as family helps (HCP, 2017).

Statistics most often understate the contribution of women to the informal economy and the household, in terms of employment and output as well as income. If their activities are performed at home, they are not easily identifiable, neither counted, nor investigated and valued in their own right.

Women in North Africa currently average about 23 per cent of the urban labour force (ILO, 2016), which is considered to be one of the lowest rates worldwide (World Bank, 2019). Women still face structural barriers to accessing to and remaining in the labour market.

Taking advantage of data drawn from the *Sahwa* project (2016), our purpose is to focus on the main characteristics of youth labour market activity in four North African countries, Algeria, Morocco, Tunisia and Egypt, so as to investigate to what extent vulnerability, low earnings and discrimination are related to the limited access to formal employment for women.

Section 1 is devoted to the literature review as for definition(s) of informal employment according to household surveys guidelines from the ILO (2013), and measurements of the trends and distribution of informality as well as labour market segmentation in North Africa. Section 2 investigates the determinants of the young males and females' participation to

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employment, especially informal employment, applying a binary logistic estimation to the four distinct countries of the overall sample (7,816 individuals). Section 3 presents the Mincer earnings function as for gender over the formal/informal employment divide, analysing both average gains and quantile distribution with respect to the subsample of 1,941 employees and self-employed workers. Section 4 examines the results of an Oaxaca-Ransom decomposition model of wage differentials as regards employees and self-employed workers according to gender. Conclusion recapitulates main findings.

## **1. Literature review on informal employment in North Africa**

### **1.1. Definitions and measurements: The story so far**

The informal sector (ILO 1993) includes the unincorporated enterprises, a subset of the institutional household sector, gathering both own-account workers and employers. These economic units, which provide some legal market output, are not registered or their employees or their size stands below five permanent paid employees.

Informal employment (ILO 2003) encapsulates all jobs carried out in both informal as well as in formal enterprises by workers who are not subject to labour regulation, income taxation or social protection. This is due to the absence of declaration of the jobs or the employees, casual or short duration jobs, jobs with hours or wages below a specified threshold, work place outside the premises of the employer's business. The extensive definition is based on non-payment of social contribution rather than the absence of social protection, in as much as individuals may access to social protection thanks to the contribution of another family member (Charmes 2019, 18). Theoretically, the informal sector is included within informal employment like Russian dolls.

Informal employment or employment in the informal economy includes three components: (i) employment in the informal sector (the largest component), (ii) informal employment in the formal sector and (iii) informal employment in households (domestic workers and contributing family workers).

### **1.2. Informal employment, age and gender issues in North Africa: salient facts**

According to the expert benchmarking provided by Charmes (2019), North Africa is the region wherein which macroeconomic estimates of the informal economy are the most numerous since the 1970s. Taking stock, three stylised facts are worth mentioning.

A first stylised fact is that average (non-agricultural) employment in the informal economy throughout North Africa has been growing slightly over 50 per cent in the 2000s and declining slightly below 50 per cent since the early 2010s. This suggest that informal employment is a lasting or structural phenomenon (Charmes, 2019, p. 41).

A second stylised fact is that informal employment is countercyclical: on rise when economic growth slows down until the late 2000s, it contracts with upgraded economic growth, hence experiencing a reversal in trend in the early 2010s. However, this general pattern requires a thorough inspection with respect to the behaviour of the various components of informal employment in North Africa. Furthermore, the trends as well as the level may differ across countries, according to the impact of economic shocks (structural adjustment and crises) and the employment policies designed to absorb these (See Adair and Souag, 2019, as for Algeria).

A last stylised fact is that employment in the informal economy is negatively related to GDP per capita; in this respect, Morocco experiences the lowest GDP per capita among North African countries and the highest share of employment in the informal economy.

Turning to a restricted picture of informality, i.e. the informal sector subset, it is noteworthy that labour productivity in the informal sector is weak; its contribution to GDP is low, whether or not agriculture is included (Charmes, 2019, pp. 72 & 74).

Beyond these stylised facts, we address two features of informality, such as age and gender, which remain little documented in North Africa.

According to Charmes (2019), the level of informality is more likely to be higher among young people and older persons: three out of four are in informal employment worldwide. This inverted U-shaped distribution of age groups requires more investigation, especially as regards youth, which is our concern in this article.

Informal employment is a larger source of jobs for men than for women, whatever the classification of countries, be it developing or developed countries and for agricultural as well as non-agricultural informal employment. In contrast, as for low and lower-middle income countries, a higher proportion of women are in informal employment than men (Charmes, 2019). The gender divide regarding informal employment also deserves some additional investigations.

The share of self-employment in non-agricultural employment has been rising in all North African countries over the 1980s and the 1990s. According to gender distribution, the percentage of women became or remained dominant in all countries, respectively as of Algeria, Morocco and Tunisia, Egypt being excepted. See Table A1 in the Appendix.

In the late 1990s, the share of informal employment in non-agricultural employment varies across countries from the lowest in Algeria (43%) to the highest in Egypt (55%). With respect to the components of non-agricultural employment, self-employment is the main one, varying across countries from the lowest in Egypt (50%) to the highest in Algeria (67%). As for gender distribution, the ratio of women in self-employment is always higher than that of men. See Table A2 in the-Appendix-

### **1.3. Labour market segmentation theory**

The concept of a single labour market, a core assumption of human capital theory, is challenged by the theory of labour market segmentation: the “primary” sector opposing the “secondary” sector (Doeringer & Piore, 1971), i.e. the divide between the formal and the informal sector (Fields, 1975). The primary or formal sector proves attractive, because it provides better-paid jobs and enjoys social protection that are missing in the secondary or informal sector. Segmentation can also take place within the informal sector itself: the informal “lower tier” (or subsistence sector) wherein women operate provides easy access to low paid jobs, whereas the informal “upper tier” includes similar barriers to entry as in the formal sector (Fields, 1990). In as much as education and experience explain wage (or income) differentials, human capital theory fits quite well the formal sector but it fails to explain such wage (or income) differentials in the informal sector (Dickens & Lang, 1992).

Several papers document informality on the North African labour market (Angel-Urdinola, 2012; Gatti et al, 2014). The relationship between informality and wage inequality is seldom tackled (El-Haddad & Gadallah, 2018). To our best knowledge, no paper so far has addressed the major issue of youth gender inequalities in North Africa with respect to the formal/informal segmentation.

We did not tackle whether entering the informal economy is a matter of voluntary choice (or comparative advantage) vs. last resort strategy (Gunther and Launov, 2012), especially as regards gender. In this respect Merouani et al. (2018) apply a logistic model with interaction effects to a stratified small sample selected from the *Sahwa* dataset, 1,525 young workers aged below 30 from three Maghreb countries (Algeria, Morocco and Tunisia) in 2016. The average participation rate to social security in the three countries is only 32 per cent. As for country distribution, it is highest in Algeria (41%) and lowest in Morocco (21%), while Tunisia stands in between (30%). The paper suggests that most youth workforce is risk-taking and voluntarily chooses to evade social security coverage: the lowest share being in Algeria (56%), the highest in Morocco (77%) and Tunisia standing in between (70%), in contrast with

the minority of those adopting a last resort (i.e. involuntary) strategy. The impact of education proves positive both on the probability of enjoying social protection, but also on that of choosing informality, irrespective of gender, although females are less likely to choose informality. Self-employed are more likely to choose informality; this is due to the fact they are excluded from some benefits (accident at work and maternity leave). Unfortunately, the role of women within family income-seeking strategies in informal employment is not addressed

## 2. Determinants of youth employment in North Africa

Data come from *Sahwa*, a youth survey funded by the European Union that was conducted in 2015 upon several countries from Middle East and North Africa region. It uses a common in-depth questionnaire covering education, employment and integration, political participation, values and culture, gender issues, migration and international mobility. We selected four countries: Algeria, Tunisia, Morocco and Egypt. The sample presented in Table 1 includes 7,816 individuals aged 15-29, wherein 3,937 (50.4%) are females and 3,879 (49.6%) are males. The labour force comprises 3,027 individuals, i.e. 2,116 males (69.9%) and 911 females (30.1%), displaying a low activity ratio on average (38.7%). One quarter (783 individuals,) of the labour force is unemployed, which makes a high youth unemployment rate on average (25.86%).

**Table 1. Distribution of the *Sahwa* sample in four North African countries (2015)**

Sample	Algeria	Egypt	Morocco	Tunisia
<b>Overall sample</b>				
7,816 (100%)	2,000 (25.6%)	1,947 (24.9%)	1,862 (23.8%)	2,008 (25.7%)
<b>Inactive youth</b>				
4,789 (100%)	1,185	1,191	1,328	1,086
<b>Labour force</b>				
3,027 (100%)	815 (26.92%)	756 (24.97%)	534 (17.64%)	922 (30.45%)
<b>Participation rate</b>	40.75	38.82	28.67	45.9

Source: Authors from *Sahwa* (2016)

The sample is broken into three age groups: (15-19), (20-24) and (25-29) years old. The distribution of active youth is rising from 13 per cent (15-19), over one third (20-24) and up to one half (25-29).

Marital status takes the value of 1 for married individuals and 0 for singles. The sample comprises singles (83%) and married people (17%).

Educational attainment includes three levels: higher learning (24%), secondary (36%) and medium level at most including no education (40%).

Urban (57%) and rural areas (43%) account for the place of residence.

The "household standard of living" comprises three categories: poor (53.5%), average (22.5%) and rich households (24%).

### 2.1. Estimation of binary logistic regressions in four North African countries

In Table 2, the participation model estimates the probability of labour force participation, separately upon the four countries (Algeria, Tunisia, Morocco and Egypt), wherein the reference category is the inactive population; hence, the dependent variable is 1 if the individual participates in the labour market and 0 if he or she is inactive.

Hereafter, we design four estimates, one for each country, separately upon the overall sample, which includes 2,000 Algerians, 1,947 Egyptians, 1,862 Moroccans and 2,008 Tunisians. As for the average distribution of the sub-sample of inactive youth, two thirds are females; over one half enjoys secondary level of education. Almost half the females aged 25-29 enjoy primary level of education, whereas over one third of males aged 25 to 29 enjoys primary or medium level of education. On average, females enjoy higher educational attainment.

Variables related to gender, education and the household's standard of living display substantial differences.

**Table 2. A binary logistic estimation of the labour market participation in each North African country**

Country Variables	Algeria			Egypt			Morocco			Tunisia		
	Coeff.	Exp (B)	Prob.	Coeff.	Exp (B)	Prob.	Coeff.	Exp (B)	Prob.	Coeff.	Exp (B)	Prob
<b>Age</b> (ref.: [15-19])												
[20-24]	1.606***	4.984	0.00	1.259***	3.523	.000	0.780***	2.181	.000	1.701***	5.47	.000
[25-29]	2.545***	11.632	0.00	2.479***	11.927	.000	2.372***	10.72	.000	2.593***	13.3	.000
<b>Gender</b> (ref.:female)												
Male	1.536***	4.646	.000	2.687***	14.96	.000	1.377***	3.962	.000	0.919***	2.506	.000
<b>Marital status</b> (ref.: single)												
Married	-.515***	0.597	.004	-0.42***	0.657	.009	-0.46***	0.627	.0008	-1.03***	0.355	.000
<b>Educational attainment</b> (ref.: medium or below)												
Secondary	-.520***	0.595	.000	-0.316**	0.729	.0025	-0.55***	0.57	.000	<b>-0.64***</b>	0.523	.000
Tertiary	-.705***	0.494	.000	-0.73***	0.479	.000	-1.16***	0.313	.000	<b>-0.63***</b>	0.528	.000
<b>Standard of living</b> (ref.: poor)												
Medium	.127		0.722	0.126		0.722	0.019		0.891	1.094		0.2960
Rich	.402		0.526	-0.61***	0.541	0.003	0.019		0.891	<b>-0.347**</b>	0.707	.007
<b>Place of residence</b> (ref.: urban)												
Rural	.218		0.641	0.283**	1.327	0.020	0.267		0.605	3.696*		0.055
<b>Household size</b>	3.750*		0.053	1.184		0.277	<b>0.194***</b>	0.824	0.000	0.929		0.335
Constant	-2.33***		.000	-2.84***		.000	-1.66***		.000	-1.50***	0.221	.000
<b>Log likelihood-2</b>	<b>2141.594</b>			<b>1832.485</b>			<b>1737.163<sup>c</sup></b>			<b>2253.25.</b>		
<b>Cox &amp; Snell R-2</b>	<b>.245</b>			<b>.326</b>			<b>.233</b>			<b>.227</b>		
<b>Nagelkerke Pseudo R-2</b>	<b>.331</b>			<b>.443</b>			<b>.334</b>			<b>.303</b>		
<b>N (7,816observations)</b>	<b>2,000</b>			<b>1,946</b>			<b>1,862</b>			<b>2,008</b>		

Note: \*\*\* p<0.01, \*\* p<0.05 and \* p<0.1.

Source: Authors

Age is very significant for both age groups and in the four countries at 1 per cent threshold. The access of youth to the labour market increases with age.

As for gender, males are twice as likely as females to be active in all four countries. Being a male increases by 14 percentage points his chances of participating in the labour market in Egypt, 4.6 percentage points in Algeria, 3.9 percentage points in Morocco and 2.5 percentage points in Tunisia. This outcome seems consistent with national statistics regarding female participation rate in these countries, whereby Tunisia ranks in the first place. See Table A3 in Appendix.

Educational attainment is negatively correlated with the participation of youth in the labour market of the four countries. Actually, education seems to be a deterrent to an early inclusion of young people into the labour market. The probability of participation in the labour market is decreasing from secondary level to higher learning level in all countries. A university degree no longer guarantees a formal job.

Educational attainment is negatively correlated with the participation of youth in the labour market of the four countries. Although this puzzling result may look counterintuitive, it is consistent with similar findings as for two surveys upon representative samples in Algeria: at national level using time series analysis (Adair and Souag, 2019), and at the regional level using longitudinal analysis (Adair and Bellache, 2018). The rationale could be the following: On the supply side, with respect to policies, various assistance mechanisms to employment promote precarious jobs for youth without necessarily providing social protection; hereby fostering informal employment. On the demand side, with respect to unemployed young graduates, getting a paid job makes them better off than remaining unemployed with no social benefit.

The marital status variable is significant and negative in the four countries with respect to bachelors. Married individuals are less likely to participate than singles. This unsurprising

result is tightly correlated to the 29 years old ceiling of the sample, which over four out of five individuals that are single.

Variables related to the family environment are non-determinant as for access to employment. Being born in a "rich" household decreases the chances of participation in the labour market by 0.7 percentage in Tunisia and by 0.54 percentage point in Egypt. The richer the household the less it needs a complementary income from youth members. The size of the household impacts positively upon the inclusion of youth into the labour market. The larger the size of the household, the working age youth must contribute to household income: by 3.7 percentage points in large households in Algeria and by 0.8 percentage point in Morocco. As for rural areas, individuals are more likely to be active in Egypt and Tunisia; a large workforce operates in agriculture in these two countries, whereas the variable is not significant in Algeria and Morocco.

## 2.2. Robustness of the estimations

The robustness test controls for grouping at the country level, when the number of observations in the groups is too heterogeneous and likely to affect the error term in the regressions. We performed a robustness test to the logistic regressions to ensure the quality of our results, which show there is no major difference with and without any given country, especially when removing Morocco, whose data did undergo (re)calibration (See Table A4a and Table A4b in Appendix).

## 3. Determinants of youth earnings: the Mincer model

An earnings function stemming from a model of optimal accumulation of human capital (Mincer, 1974; Polachek, 1981) identifies the determinants of earnings of the individuals participating in the labour market (See Box 1).

The evaluation of education returns consists in the regression of the logarithm of nominal wages (in Purchasing Power Parity \$) perceived by an individual on a set of characteristics. The basic Mincer model includes the number of years of schooling and work experience as explanatory variables. Other explanatory variables (gender, industry, work contract, occupational status, etc.) can be added in an 'augmented' Mincer model.

### Box 1. The Mincer earnings function

$$\ln W_{it} = \ln W_{i0} + r_{is} + \sum_{t=s}^{t-1} r_{it} k_{it} + U_{it} \quad [1]$$

$W_{it}$ : wages of individual  $i$  at time  $t$

$\ln W_{it}$ : logarithm of nominal wages

$S_i$ : number of years of schooling (within the education system) by individual  $i$

$r_s S_i$ : return on schooling

$U_{it}$ : set of random elements involved in the determination of wages

The contribution of schooling to the increase in the individual's earnings ( $r_{is}$ ) expresses how much, on average, one year of schooling increases wages in percentage.

The introduction of the second component of human capital, the professional experience of individual (learning acquired during working life) leads to the following earnings function:

$$\ln W_{it} = W_0 + r_s S_i + r_e EXP_{it} + U_{it} \quad [2]$$

$r_e EXP_{it}$ : the return on the professional experience of individual  $i$  at time  $t$

The contribution of professional experience to the rise in the individual's earnings expresses how much, on average, one year of experience increases wages in percentage.

The hypothesis of declining marginal productivity of professional experience, alongside with age, leads to the introduction of a quadratic variable in the earnings function.

$$\ln W_{it} = W_0 + r_s S_i + r_e EXP_{it} + r_e^e (EXP)^2 + U_{it} \quad [3]$$

Source: Authors

### 3.1. Estimation of an earnings function with correction for endogeneity

According to Wooldridge (2001, Chapter 5), one well-known limitation of OLS is that it provides a biased estimator. Estimation should be corrected for endogeneity with two-stage least squares (2SLS) using an instrumental variable (IV). The instrumental variable applied here is educational attainment of the father and of the mother. Educational attainment of the parents explain to a large extent the duration of schooling of their child(ren). Hence, it is relevant a variable (Boumahdi and Plassard, 1992; Block, 2010). Social capital theory implies that educated parents are better socially included, thus facilitating their children's access to the labour market.

Hereafter, we focus on the subsample of the 1,941 workers outside agriculture in four countries (Tunisia, Morocco, Algeria and Egypt). The predictors of earnings of the individuals tested are the following variables: human capital (years of schooling and work experience), industry (manufacturing, building, trade, health, education, services and public administration) and work contract (Indefinite duration, Fixed term, Employment assistance and absence of contract).

**Table 3. Estimation of the earnings function with correction for endogeneity**

<b>Explanatory variables</b>	<b>Coefficient</b>	<b>P-value</b>
<i>Experience</i>	0.014	0.415
<i>Experience –square</i>	0.002*	0.237
<b>Gender</b> (ref.: <i>female</i> )		
<i>Male</i>	0.255***	0.000
<b>Duration of schooling</b>	0.111***	0.000
<b>Labour market segment</b> (ref.: <i>informal</i> )		
<i>Formal</i>	0.275**	0.000
<b>Status of occupation</b> (ref.: <i>self-employed</i> )		
<i>Employee</i>	-0.097	0.766
<b>Sector</b> (ref.: <i>public sector</i> )		
<i>Private</i>	-0.081	0.252
<b>Work contract</b> (ref.: <i>indefinite duration contract</i> )		
<i>Fixed term contract</i>	0.009***	0.883
<i>Employment assistance device</i>	-0.345*	0.008
<b>Industry</b> (ref.: <i>manufacturing</i> )		
<i>Building &amp; construction</i>	-0.152	0.162
<i>Health</i>	-0.158***	0.000
<i>Education</i>	-0.472***	0.000
<i>Trade</i>	-0.169**	0.041
<i>Other market services</i>	-0.107	0.132
<i>Non-market services (administration)</i>	-0.089	0.310
<b>Country</b> (ref.: <i>Algeria</i> )		
<i>Egypt</i>	-0.755***	0.000
<i>Tunisia</i>	-0.429***	0.000
<i>Morocco</i>	-0.020**	0.862
<b>Constant</b>	5.180***	0.000
<b>Multiple R</b>	0.517	
<b>R-square</b>	0.268	
<b>Adjusted R-square</b>	0.256	
<b>Standard Error</b>	0.706	
<b>N (observations)</b>	1,941	

Note: \*\*\* p<0.01, \*\* p<0.05 and \* p<0.1.

Source: Authors

Table 3 records the results of the model, whose explanatory power (adjusted R<sup>2</sup>) is 25 per cent. Variables related to human capital are positive and significant as regards females' earnings. An additional year of schooling increases individuals' earnings by 11 per cent. Work experience is not significant given the young age of the individuals surveyed. Males' incomes are 25 per cent higher than those of females. Being in formal employment increases the earnings of individuals by 27 per cent as compared to those in informal employment. Contract is significant, it is negative as for those who are recruited with an employment assistance device. Operating in the building industry decreases the earnings of youth by 15 per cent compared to those in the manufacturing industry. Education industry reduces the incomes of individuals by 47 per cent as compared to those in manufacturing. Trade reduces the



earnings of youth by 16 per cent as compared to those in manufacturing. Egyptians' earnings are 75 per cent lower than the earnings of Algerians; Tunisians' incomes are 42 per cent lower than those of Algerians.

### 3.2. Estimation of earnings functions in formal and informal -employment

We take into account the gender wage gap between males and females with respect to labour market segmentation (i.e. the formal/informal divide). In the sample of 1,941 individuals employed outside agriculture, two out of three (1,324) operate as informal workers -335 females (25%) and 989 males (75%), whereas 617 operate as formal workers - 212 females (34%) and 405 males (66%). Female informal workers are one and a half as many as female formal workers; male informal workers are twice as many as male formal workers.

With respect to occupational status, 1,324 informal workers include 979 informal employees (74%) and 345 informal self-employed (26%); whereas 617 formal workers gather 475 formal employees (77%) and 142 formal self-employed (23%).

Wage employees (1,454) amount to three out of four workers, whereas self-employed (487) account for the remaining fourth quarter. Among wage employees (981), over two thirds are urban ones, whereas urban self-employed (316) account for almost two thirds. It is worth mentioning that these figures apply to youth and not to the overall labour force.

According to Table 4, average gender gap in earnings is quite the same for employees, whether formal or informal (14%). Average gender gap in earnings is also similar for self-employed, whether formal or informal (40%), although it is almost three times higher than that of employees. Interestingly, the ratio of Formal employee /Informal employee is almost the same for females as for males (1.77) and such is also the case for the ratio of Formal self-employed /Informal self-employed with respect to females and males, although it is higher (2.2) than the former ratio. Hence, formal employment proves more attractive as regards earnings than informal employment, whatever is the work status.

**Table 4. Average monthly income (\$ PPA)**

	Females	Males	Gap (%)
Formal employee	742.35	868.36	14.51%
Formal self-employed	859.82	1429.25	39.84%
Formal workers (employee+self-employed)	751.49	961.32	21.82 %
Informal employee	417.42	489.28	14.68%
Informal self-employed	380.73	650.18	41.44 %
Informal workers (employee+self-employed)	407.51	536.56	24.05 %
Formal employee /Informal employee	1.778	1.774	
Formal self-employed / Informal self-employed	2,258	2,198	

Source: Authors' calculation

### Estimate of the earnings function of young employees

We apply the Mincer earnings function to 1,454 employees, both males and females. The logarithm of wages using \$ PPP is the explained variable. Table 5 reports the outcomes.

Variables related to human capital prove non-significant as for experience and quadratic experience, whereas the years of schooling exert a very significant and positive effect on the performance of young employees, an additional year of study increasing the level of wages by 1.2 per cent. As for gender, being a man raises wages by 4.7 per cent compared to being a woman. Operating in the private sector increases the wages of young employees by 5.12 per cent compared to the public sector. In comparison with a permanent contract, holding a fixed-term employment contract reduces wages by 2.5 per cent, and operating within the framework of employment assistance systems shrinks wages by 48 per cent. Most variables related to industries (building, health, education and trade) prove not significant, whereas being employed in public administration reduces wages by 12 per cent.

**Table 5. Estimation of the earnings function of young employees**

Explanatory variables	Coefficient	P-value
<i>Experience</i>	0.0012	0.4589
<i>Experience –square</i>	0.0123	0.1258
<b>Gender</b> (ref.: <i>female</i> ) <i>Male</i>	0.0478***	0.0012
<b>Duration of schooling</b>	0.0124***	0.0009
<b>Labour market segment</b> (ref.: <i>informal</i> ) <i>Formal</i>	0.0014***	0.0001
<b>Sector</b> (ref.: <i>public sector</i> ) <i>Private</i>	0.0512***	0.0002
<b>Work contract</b> (ref.: <i>indefinite duration contract</i> )		
<i>Fixed term contract</i>	-0.025**	0.0125
<i>Employment assistance device</i>	-0.489**	0.0023
<b>Industry</b> (ref.: <i>manufacturing</i> )		
<i>Building &amp; construction</i>	1.1256	0.998
<i>Health</i>	0.0019	0.125
<i>Education</i>	2.3691	0.996
<i>Trade</i>	0.2480	0.698
<i>Other market services</i>	0.0119**	0.0012
<i>Non-market services (administration)</i>	-0.125***	0.0001
<b>Country</b> (ref.: <i>Algeria</i> )		
<i>Egypt</i>	-0.998***	0.000
<i>Tunisia</i>	-0.235***	0.000
<i>Morocco</i>	-0.888**	0.862
<b>Constant</b>	0.385	0.000
<b>R-square</b>	0.219	
<b>Adjusted R-square</b>	0.203	
<b>Standard Error</b>	0.609	
<b>N (observations)</b>	1,454	

Note: \*\*\* p<0.01, \*\* p<0.05 and \* p<0.1.

Source: Authors' design

## Estimate of the earnings function of young self-employed

Table 6 reports the estimate of the Mincer earnings function applied to 487 young self-employed workers, both males and females. The logarithm of incomes using \$ PPP is the explained variable.

**Table 6. Estimation of the earnings function of young self-employed**

Explanatory variables	Coefficient	P-value
<i>Experience</i>	0.0023***	0.0002
<i>Experience –square</i>	0.0015***	0.0003
<b>Gender</b> (ref.: <i>female</i> ) <i>Male</i>	0.547***	0.001
<b>Duration of schooling</b>	0.0005***	0.009
<b>Labour market segment</b> (ref.: <i>informal</i> ) <i>Formal</i>	0.0015***	0.006
<b>Size of the firm</b>	0.056***	0.001
<b>Industry</b> (ref.: <i>manufacturing</i> )		
<i>Building &amp; construction</i>	0.0058***	0.001
<i>Health</i>	0.0012**	0.025
<i>Education</i>	-0.236***	0.008
<i>Trade</i>	0.236**	0.036
<i>Other market services</i>	0.236	0.998
<i>Non-market services (administration)</i>	0.986	0.562
<b>Country</b> (ref.: <i>Algeria</i> )		
<i>Egypt</i>	-0.256***	0.000
<i>Tunisia</i>	-0.888***	0.000
<i>Morocco</i>	-0.693**	0.062
<b>Constant</b>	0.2369	0.000
<b>R-square</b>	0.326	
<b>Adjusted R-square</b>	0.312	
<b>Standard Error</b>	0.753	
<b>N (observations)</b>	487	

Note: \*\*\* p<0.01, \*\* p<0.05 and \* p<0.1.

Source: Authors' design

The variable professional experience, alongside the quadratic effect of the experience, exerts a positive and very significant impact upon the performance of young self-employed workers. An additional year of seniority increases earnings by 0.23 per cent and no non-linear trend shows up because the sample includes only young people aged up to 29. Returns for men prove 54.7 per cent higher than that of women. Self-employment in the formal sector slightly increases the income of youth by 0.15 per cent. The size of the company has a positive effect on the income of the self-employed. Working in the building industry

increases income by 0.58 per cent, whereas operating in education decreases income by 23.6 per cent, due to gender distribution.

### 3.3. Distribution of monthly incomes: quantile regressions

We use quantile regressions, because it is unlikely that all explanatory variables (age, professional experience, duration of schooling, gender, country of origin, industry, employment contract, etc.) bear the same impact along the distribution of (the logarithm of) incomes in PPP \$. The OLS technique used so far shows how the average monthly incomes depend on the explanatory variables, whereas quantile regressions indicate how the various levels of the distribution of monthly incomes depends on these variables..

We first apply regressions upon the range of quartiles such as Q1 (25%), Q2 (50%) and Q3 (75%), and then to deciles such as D1 (lowest 10%) and D9 (highest 10%) over each group of employees and self-employed, both males and females.

#### Quantile regressions for employees

Table 7 record the results of the regressions upon employees.

Table 7. Quantile regressions for employees

Variables	OLS	D1 (10%)	Q1 (25%)	Q2 (50%)	Q3 (75%)	D9 (90%)
<b>Age</b>	-0.0312*** 0.0042	-0.0184** 0.0038	-0.0269 0.0036	-0.0225 0.0033	-0.0418 0.0238	-0.0449 0.0114
<b>Age –square</b>	0.0004***	0.0005***	0.009***	0.0005***	0.0007	0.0019***
<b>Experience</b>	0.1289 0.1478	0.1269 0.0269	1.2369 0.753	0.147* 0.0159	0.741 0.213	0.789 0.121
<b>Experience –square</b>	0.548 0.237	0.0121 0.374	0.2252 0.411	0.4785 0.215	0.0484 0.314	0.4582 0.023
<b>Gender</b> (ref.: female)	0.1189**	0.109**	0.119**	0.128**	0.125**	0.136**
<i>Male</i>	0.0253	0.024	0.0096	0.0091	0.0089	0.0012
<b>Duration of schooling</b>	0.065***	0.0678**	0.0897***	0.0941**	0.0951**	0.0988*
<b>Labour market segment</b> (ref.: informal)	0.0002	0.0125	0.0012	0.0459	0.0056	0.006
<i>Formal</i>	0.2951**	0.126**	0.159*	0.2014**	0.3145**	0.325**
<b>Place of residence</b> (reference : Urban)	0.056	0.0231	0.0157	0.008	0.0091	0.002
<i>Rural</i>	-0.125*	-0.089*	-0.0912*	-1.25***	-1.178***	-1.189***
<b>Work contract</b> (ref.: Indefinite duration contract)	0.024	0.047	0.023	0.002	0.003	0.004
<i>Fixed term contract</i>	-0.1236 0.5891	0.1578 0.5691	0.5692 0.2361	-0.6871 0.5591	0.5698 0.2361	-0.2694 0.2598
<i>Employment assistance device</i>	-0.2369 0.2364	-1.236 0.5654	-2.369 0.1256	1.369 0.968	2.3694 0.2369	2.3691 0.2458
<b>Industry</b> (ref.: manufacturing)						
<i>Building &amp; construction</i>	0.1236	1.2369	-1.2871	-1.2369	-1.4581	1.2369
<i>Health</i>	0.1287 2.2369	0.7845 2.6981	0.2587 1.2589	0.2258 2.2369	0.2369 2.2369	0.8974 2.369
<i>Education</i>	0.1258	0.2589	0.2698	0.0158	0.3841	0.9871
<i>Trade</i>	-0.1369 0.02369	0.1256 0.7891	0.1259 0.2369	1.2369 0.1259	0.548 0.369	1.2369 0.2159
<i>Other market services</i>	1.2587	1.0236	0.0854	0.2591	0.1289*	0.2581
<i>Non-market services ( public administration)</i>	0.7896	0.1256	0.7531	1.2360	0.0236	0.1289
	0.1479	0.1578	1.987	0.159	0.2369	0.148
	0.1259	0.2591	0.236	0.002	0.7891	0.369
	0.147	1.597	-2.369	-0.236	-5.236	-2.145
	0.123	0.123	0.269	0.125	0.124	0.699
<b>Country</b> (ref.: Algeria)						
<i>Egypt</i>	-0.986*** 0.000	-0.458 0.000	-0.125 0.000	-0.123 0.000	-0.852 0.001	-0. 0.000
<i>Tunisia</i>	-0.569*** 0.000	-0.753 0.000	-1.159 0.000	-0.789 0.0000	-0.756 0.000	-0.894 0.000
<i>Morocco</i>	-0.0159*** 0.789	-0.789 0.852	-0.478 0.753	-0.598 0.129	-0.753 0.845	0.159 0.789
<b>Constant</b>	2.3698*** 0.0001	2.0158*** 0.0000	2.1598*** 0.0658	2.500*** 0.0051	2.0569** 0.0059	2.5987* 0.0476
<b>R-square</b>	0.315	0.326	0.296	0.215	0.178	0.195
<b>Adjusted R-square</b>	0.309	0.312	0.281	0.230	0.167	0.189
<b>N (observations)</b>	1,454					

Note: \*\*\* p<0.01, \*\* p<0.05 and \* p<0.1.

Source: Authors' design.

Age proves non-significant, whereas quadratic age proves very significant increasing the level of wages from the first up to the ninth decile.

Experience proves non-significant.

As for gender, wages of female employees are systematically lower than are those of males, and the gap is all the greater one is positioned the higher in the distribution: conditionally on other observable characteristics, the effect increases by almost 3 points from first up to ninth decile (10.9% to 13.6%).

The number of years of schooling is always significant and positive, driving the advantage upwards the distribution of wages.

Working as a formal employee proves positive and significant compared to an informal employee. There is an increasing impact upon the wage distribution, from 12.6 per cent in the first decile to 32.5 per cent in the last decile.

Working in a rural environment exerts a growing though negative impact on the wage distribution. Conversely, urban workers enjoy an increasing advantage of 8.9 per cent in the first decile up to 18.9 per cent in the ninth decile.

Variables related to industry and employment contracts are not significant.

### Quantile regressions for self-employed

Table 8 reports the outcomes of the regressions upon self-employed workers.

Table 8. Quantile regressions for self-employed

Variables	OLS	D1(10%)	Q1 (25%)	Q2 (50%)	Q3 (75%)	D9 (90%)
<b>Age</b>	-0.132***	-0.145***	-0.149***	-0.156***	-0.0159**	-0.016**
	0.0001	0.002	0.0003	0.0012	0.0004	0.0052
<b>Age –square</b>	0.0012	0.0013	0.0014	0.0156	0.0112	0.0016
	0.002	0.001	0.0003	0.0123	0.003	0.0009
<b>Experience</b>	0.0149	0.0121	0.0129	0.0138	0.0148	0.159
	0.003	0.006	0.0235	0.0098	0.009	0.0128
<b>Experience –square</b>	0.0009***	0.0005***	0.0008***	0.0008***	0.0009***	0.0012***
	0.002	0.000	0.0003	0.0002	0.0001	0.000
<b>Gender (ref.: female)</b>	0.1062**	0.115**	0.152**	0.162**	0.205*	0.228*
<i>Male</i>	0.0023	0.005	0.012	0.0084	0.0897	0.0598
<b>Duration of schooling</b>	0.1236	0.0066	0.0026	0.0054	0.0025	0.007
	0.0009	0.002	0.0001	0.0003	0.0269	0.006
<b>Labour market segment(ref.: informal)</b>	-0.0169**	-0.0259	-0.03269	-0.0331	-0.0289	-0.033
<i>Formal</i>	0.012	0.002	0.0312	0.0023	0.009	0.006
<b>Place of residence (ref.: Urban)</b>	-0.036**	-0.0059*	-0.006**	-0.012***	-0.097***	-0.088***
<i>Rural</i>	0.0023	0.026	0.003	0.0154	0.0047	0.004
<b>Firm size</b>	0.256***	0.159***	0.1698***	0.3001***	0.391***	0.421***
	0.002	0.001	0.003	0.001	0.003	0.003
<b>Industry(ref.: manufacturing)</b>						
<i>Building &amp; construction</i>	0.1369*	0.2369**	0.256**	0.2369**	0.256**	0.296**
	0.0128	0.0147	0.0587	0.0258	0.0029	0.074
<i>Health</i>	2.2369	2.6981	1.9879	2.235	1.5478	0.963
	0.147	0.1259	0.5368	0.2569	0.879	0.036
<i>Education</i>	-0.259	0.2569	0.1589	-1.256	-0.954	-1.225
	0.236	0.596	0.0236	0.147	0.936	0.989
<i>Trade</i>	0.2587*	0.2361**	0.215**	0.331**	0.3125**	0.332***
	0.0789	0.0256	0.0531	0.036	0.0236	0.0089
<i>Other market services</i>	0.1479	0.1578	1.987	0.159	0.2369	0.148
	0.1259	0.2591	0.236	0.002	0.7891	0.369
<i>Non-market services (public administration)</i>	1.2361	-5.236	0.235	2.222	3.256	-2.369
	0.998	0.896	0.145	0.987	0.147	0.236
<b>Country(ref.: Algeria)</b>						
<i>Egypt</i>	-0.456***	-0.852***	-0.741***	-0.485***	-0.569***	-0.125***
	0.000	0.000	0.000	0.000	0.001	0.000
<i>Tunisia</i>	-0.569***	-0.753	-0.159	-0.789	-0.756	-0.894
	0.000	0.000	0.000	0.0000	0.000	0.000
<i>Morocco</i>	-0.0159***	-0.789	-0.478	-0.598	-0.753	0.159
	0.789	0.852	0.753	0.129	0.845	0.789
<b>Constant</b>	2.2965***	2.009***	2.1435***	2.147***	2.5002***	2.6987
	0.000	0.0001	0.0003	0.0023	0.0002	0.000
<b>R-square</b>	0.285	0.268	0.301	0.302	0.312	0.296
<b>Adjusted R-square</b>	0.271	0.259	0.292	0.295	0.301	0.289
<b>N(observations)</b>	487					

Note: \*\*\* p<0.01, \*\* p<0.05 and \* p<0.1.

Source: Authors' design.

Age proves very significant, whereas quadratic age proves non-significant, although negative increasing the level of incomes from the first up to the ninth decile.

Gender variable is very significant and the gap rises by almost half from the first (11.5%) up to the ninth decile (22.8%).

Returns to quadratic work experience prove positive and significant: every additional working year exerts an increasing impact. It is worth recalling that this variable is not significant for employees. Conversely, years of schooling prove positive but non-significant, whereas this variable is significant for employees.

Operating as a formal self-employed worker provides significant although negative returns compared to informal self-employment, follows a non-linear pattern over distribution and proves non-significant.

Size of the company displays a significant and positive effect, rising across the distribution. The larger the size, the higher the yield: 15 per cent in the first decile up to 42 per cent in the ninth decile.

Working in the building & construction and especially trade industries proves positive and significant, further improving the yield of self-employed compared to those working in the manufacturing industry at all points of distribution. Health and education, positive for the former and negative for the latter, are not significant.

#### 4. GENDER wage gap: estimation with an Oaxaca-Ransom decomposition model

In order to take into account various explanations for gender wage gap, including discrimination (Blau, 1984; Phelps, 1972) on the demand side of employers as well as self-selection on the supply side, we use a decomposition model between males and females over the subsample of 1,941 workers.

##### Box 2. The Oaxaca Ransom model of decomposition

The Oaxaca Ransom model (1994) designs a non-discriminated norm enabling the estimation of an earnings equation over the sample of workers. It allows a decomposition of the unexplained part: namely an advantage for men and a disadvantage for women.

The gap in the logarithm of average monthly gross wages is broken down into three parts. One (1<sup>st</sup> term) is explained by the characteristics of the two gender groups valued with the norm; a second one (2<sup>nd</sup> term) is the additional output of being a man; a last one (3<sup>rd</sup> term) is the deficit in output from the characteristics of being a woman.

The Oaxaca Ransom model is designed as follows:

$$\ln \omega_M = \alpha_M + \beta_M \chi_M + \varepsilon \quad [1]$$

$$\ln \omega_F = \alpha_F + \beta_F \chi_F + \varepsilon \quad [2]$$

$\omega_M$ : gross monthly wages of men;

$\omega_F$ : gross monthly wages of women;

$\alpha$ : constants;

$\beta$ : vector of the returns on characteristics  $\chi$

$\chi$ : vector of the characteristics allowing to measure labour productivity;

$\varepsilon$ : error term.

$$\ln \bar{\omega}_M - \ln \bar{\omega}_F = \beta_N (\bar{\chi}_M - \bar{\chi}_F)' + \bar{\chi}_M (\beta_M - \beta_N) + \bar{\chi}_F' (\beta_N - \beta_F) \quad [3]$$

= (1<sup>st</sup> term)                      (2<sup>nd</sup> term)                      (3<sup>rd</sup> term)

$\beta_N$ : norm;

$\beta_M$ : returns of men;

$\beta_F$ : returns of women;

$\ln \bar{\omega}_M$ : logarithm of the average income of men;

$\ln \bar{\omega}_F$ : logarithm of the average income of women;

$\bar{\chi}_M (\beta_M - \beta_N)$ : advantage of men;

$\bar{\chi}_F' (\beta_N - \beta_F)$ : disadvantage of women;

$\beta_N (\bar{\chi}_M - \bar{\chi}_F)'$ : share of the wage gap related to structural differences between men and women.

Source: Authors

The outcome from the decomposition of the wage gap depends on the standard whereby the differences in the characteristics of the two groups will be valued. The Oaxaca Blinder (1973) model uses males' returns as the standard. However, the labour market in North Africa is strongly gendered as regards industries wherein male participation is prominent (e.g. construction and manufacturing) vs. female participation (e.g. public administration, health and education). Conversely, using females returns as the standard would prove unreliable due to low female participation in the labour market.

We apply hereafter the Oaxaca-Ransom (1994) model, which encapsulates a non-discriminatory standard based on the estimation of an earnings equation over the sample. (See box 2). We provide two distinct estimates, one for the subgroup of 1,454 employees and the other one for the subgroup of 487 self-employed.

Table 9 reports the results of the Oaxaca-Ransom estimates.

**Table 9. Income gap distribution by gender and occupational status**

$\ln \bar{\omega}_H - \ln \bar{\omega}_F$	Employees			Self-employed		
	Coefficients	Share (%)	P-value	Coefficients	Share (%)	P-value
Males	6.15489		0.000***	8.45912		0.000***
Females	5.91488		0.000***	7.97924		0.000***
<b>Income gap<sup>a</sup></b>	<b>0.24001</b>	100.00		<b>0.47987</b>	100.00	
Endowments	0.03408	14.2	0.0126***	0.04842	10.9	0.001***
Valuations	0.17449	70.9	0.0001***	0.34752	72.42	0.000***
Interaction	0.03144	13.1	0.0066***	0.08393	17.49	0.002***
<b>Income gap</b>	<b>0.24001</b>	100.00		<b>0.47987</b>	100.00	
Explained	0.14184	59.1	0.002	0.02927	6.1	0.000
Unexplained	0.09816	40.9	0.001	0.45060	93.9	0.009
Constant	0.95632		0.000	0.78961		0.000
Adjusted R <sup>2</sup>	0.1445			0.1789		
Observations	1,454			487		

Note: \*\*\* p<0.01, \*\* p<0.05 and \* p<0.1. <sup>a</sup> Gross average gap adjusted with inverse Mills ratio.

Source: Authors

Gross average income as regards men and women are respectively 6.15 and 5.19 for employees, and by 8.45 and 7.97 for the self-employed. The difference is Gross income gap, which is half as large for employees (0.24 points) compared with that of self-employed (0.48). This difference is divided into three components: endowments or characteristics, valuations or coefficients and interaction.

Endowments reflect the gap that would exist in the absence of discrimination on the labour market, a rise in the average income of men and women only due to their characteristics. This component as regards employees (0.034) amounts to a 14.2 per cent share of the income gap, whereas the share is 10.9 per cent for the self-employed (0.048).

Valuations gauge the advantage of males' income if the characteristics of females did apply. This component respectively accounts for a 70.9 per cent share of the income gap as for employees (0.17) and a higher 72.42 per cent share concerning the self-employed (0.34). Hence, both the employees and self-employed males enjoy an advantage as compared to their female counterparts.

Interaction is the simultaneous effect combining characteristics and the coefficients. A component that amounts respectively to a 13.1 per cent share for employees (0.0031) and a 17.49 per cent share for the self-employed (0.083).

On the one hand, if all the relevant characteristics and the structure of the two groups was the same concerning all variables considered as personal (e.g. age, educational attainment, professional experience, place of residence) and job characteristics (e.g., industry, size of company, work contract), any income gap could only come from a difference in the performance of these characteristics. On the other hand, if all the returns were similar, the income gap would result entirely from structural effects.

The income gap is broken into two parts. The explained part represents the gender difference as regards characteristics, both of the supply side (human capital) and on the

demand side (work contract); its share is prominent for employees but very small for self-employed. The unexplained part encapsulates differences in unobserved characteristics or discrimination between men and women; its share proves prominent for females and for self-employed. It may be due to limited access of females to the most profitable activities (e.g. subcontracting) and/or because they target a low purchasing power clientele.

## Conclusion

We first recap our key findings.

According to the binary logistic estimates upon the over sample of 7,816 individuals aged 15-29, males are twice as likely as females to be active and the access of youth to the labour market increases with age in the four North African countries. Individuals from poor households have a higher probability of participating in the labour force and conversely for wealthy households, although a university degree no longer guarantees a job. Tunisia is the most advanced country as for the inclusion of youth into the labour market, especially for women. A robustness check makes sure the results remain consistent.

With respect to occupational status, over two thirds of the youth labour force is informal. Applying two separate earnings functions to 1,454 employees and 487 self-employed, results show that human capital increase the income of both genders; Women are more likely to work for lower income than men do. Women working in the informal sector, and who come from rural areas enjoy lower returns as compared with urban women. Women who work in the informal sector on a fixed-term contract earn less than men do in the same occupational status.

According to two distinct quantile regressions for employees and self-employed workers, human capital, formal employment and male gender explain the income gap. As for employees, schooling provide a rising advantage over the wage distribution, whereas experience is the main driver for self-employed.

The Oaxaca-Ransom decomposition model applies to income differentials according to gender. There is little incidence of individual and job characteristics, namely human capital and informal employment, upon the gender income gap, which depends on unequal returns from these characteristics. Income gap remains unexplained, especially as for self-employed and women, suggesting that there is discrimination alongside labour market segmentation. Hence, despite higher educational attainment, women would face penalty as entrepreneurs and wage earners.

There are limitations in this paper. First, the *Sahwa* sample may not prove fully adjusted, especially as regards Morocco. Second, our results are restricted to youth labour force and should not be extended to more mature age groups. Third, the decomposition model did not allow for disentangling gender self-selection on the supply side and discrimination gender pay on the demand side.

With respect to research avenues, larger data set collection and/or a closer focus on the conditions of recruitment and job remunerations would improve explanations addressing both the demand-side and the supply side.

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## Appendix

**Table A1. Self-employment in North Africa (percentage of non-agricultural employment), by gender (1980-2000)**

	1980-1990		1990-2000		Trend (1980-2000)				
	All	Women	Men	All	Women	Men	All	Women	Men
Algeria	13	5	13	28	35	27	+	+	+
Egypt	24	4	27	25	12	27	+	+	
Morocco	36	44	33	40	46	37	+	+	+
Tunisia	21	40	15	30	61	20	+	+	+
North Africa	23	23	22	31	38	28	+	+	+

Source: ILO (2002)

**Table A2. Informal employment in North Africa (percentage of non-agricultural employment), by gender and component (1994-2000)**

	Non-agricultural employment			Non-agricultural informal employment					
	Informal employment (%)			Wage employment (%)			Self-employment (%)		
	Total	Women	Men	Total	Women	Men	Total	Women	Men
Algeria	43	41	43	33	19	36	67	81	64
Egypt	55	46	57	50	33	53	50	67	47
Morocco	45	47	44	19	11	22	81	89	78
Tunisia	50	39	53	48	49	48	52	51	52

Source: ILO (2002)

**Table A3. Distribution of the participation rate (percentage) by gender across Northern Africa in 2015**

Country	Algeria	Tunisia	Morocco	Egypt
Males	66.8	68.7	71	70.5
Females	16.4	26.3	24.4	22.5
Total	41.8	47.1	46.9	46.9

Source: Authors from Statistical Offices -ONS, HCP, CAPMAS and INS (2010-2018).

**Table A4a. Estimation of logistic regressions as for males-vs. females' access to employment**

Variables	Males		Females	
	Coefficient	Prob.	Coefficient	Prob.
<b>Age</b> (ref.: [15-19])				
[20-24]	0.483	0.487	2.120	0.145
[25-29]	0.102	0.749	3.254*	0.071
<b>Educational attainment</b> (ref.: <i>medium</i> at most)				
<i>Secondary</i>	0.003	0.146	0.555**	0.006
<i>Tertiary</i>	3.051*	0.081	0.732***	0.000
<b>Marital status</b> (ref.: <i>single</i> )				
<i>Married</i>	-1.132***	0.000	0.323	0.570
<b>Standard of living</b> (ref.: <i>poor</i> )				
<i>Medium</i>	0.727*	0.099	0.133	0.715
<i>Rich</i>	-0.540***	0.000	0.289	0.289
<b>Household size</b>	2.680	0.102	0.085**	0.027
<b>Place of residence</b> (ref.: <i>urban</i> )				
<i>Rural</i>	0.287	0.592	-0.395**	0.014
<b>Country</b> (ref.: <i>Algeria</i> )				
<i>Tunisia</i>	0.326***	0.010	0.978***	0.000
<i>Egypt</i>	-1.575***	0.000	0.051	0.821
<i>Morocco</i>	-1.242***	0.000	-1.900***	0.000
<b>Constant</b>	-0.775***	0.000	-1.507***	0.000
<b>Log likelihood-2</b>	1987.555 <sup>c</sup>		1024.001 <sup>b</sup>	
<b>Cox &amp; Snell R -square</b>	.112		.150	
<b>Nagelkerke Pseudo R -square</b>	.172		.207	
<b>N (observations)</b>	2,116		911	

Note: \*\*\* p<0.01, \*\* p<0.05 and \* p<0.1.

Source: Authors

**Table A4b. Estimation of logistic regressions as for males-vs. females' access to employment (without Morocco)**

Variables	Males		Females	
	Coefficient	P-value	Coefficient	P-value.
<b>Age</b> (ref.: [15-19])				
[20-24]	0.044	0.834	2.049	0.152
[25-29]	0.104	0.845	2.175	0.140
<b>Educational attainment</b> (ref.: <i>medium</i> at most)				
<i>Secondary</i>	2.118	0.146	0.489**	0.017
<i>Tertiary</i>	0.339**	0.028	0.608***	0.002
<b>Marital status</b> (ref.: <i>single</i> )				
<i>Married</i>	-1.118***	0.000	1.572	0.210
<b>Standard of living</b> (ref.: <i>poor</i> )				
<i>Medium</i>	2.727*	0.099	0.136	0.815
<i>Rich</i>	-0.560***	0.000	2.289*	0.089
<b>Household size</b>	1.789	0.181	3.771**	0.052
<b>Place of residence</b> (ref.: <i>urban</i> )				
<i>Rural</i>	1.729	0.189	-0.445***	0.005
<b>Country</b> (ref.: <i>Algeria</i> )				
<i>Tunisia</i>	1.599**	0.026	0.891***	0.000
<i>Egypt</i>	-1.904***	0.000	0.759	0.384
<b>Constant</b>	-0.491***	0.000	-0.926***	0.00
<b>Log likelihood-2</b>	2162.931 <sup>c</sup>		1024.001 <sup>b</sup>	
<b>Cox &amp; Snell R -square</b>	.093		.086	
<b>Nagelkerke Pseudo R -square</b>	.165		.178	
<b>N (observations)</b>	1,767		709	

Note: \*\*\* p<0.01, \*\* p<0.05 and \* p<0.1.

Source: Authors