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Education Mismatch in North Africa: Determinants and Impact

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Education Mismatch in North Africa: determinants and impact

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Abstract

Using the SAHWA survey, this paper examines the determiannts and impact of the education-job mismatch in three North African countries . The results show that men and low educated workers are more likely to be in an unmatched situation. The presence of unemployed in the household has ambiguous effects (positive in Algeria and negative in Tunisia). Youth living in urban areas are less likely to be in the "Unmatched situation" compared to young people living in rural areas. The analysis of the distribution of wages by types of job "Matched" vs "Unmatched" shows a difference between the countries, with a large positive gap in Morocco, a lower gap in Algeria and no difference between Matched and Unmatched jobs in Tunisia. The estimation of the determinants of wages shows that youth who are in the Unmatched situation earn on average less than youth who are in the "Matched Situation" at least in the case of Algeria and Morocco. The results show also that men in an Unmatched Situation earn more compared to women in the same situation.

Keywords: Over-education, Skill mismatch, Underschooling, Structural shifts
JEL Classifications: I21, J21, J24

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List of acronyms

MENA	Middle East and North Africa
ONS	Office National des Statistiques
INS	Institut Nationa de la statistique
HCP	Haut Commissariat au Plan
ILO	International Labour Organization
ISCO	International Standard Classification
LFP	Labor force participation rate
FLFP	Female Labor Force Participation

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1 Introduction

The uprising of 2011 in many Arab countries have highlighted the vulnerability and fragility of their labor markets, characterized by high unemployment rates, especially for young people. The lack of job opportunities for young people is a major challenge for these societies. The youth unemployment rate is three times higher (13%) comparatively to adults (4.3%). This problem is more alarming in North Africa, where almost 30% of young people in the labor market are unemployed. According to the National Institutes of Statistics was more than 35% in Tunisia (INS 2018), 29.3% in Morocco (HCP 2017) and 26.4% in Algeria (ONS 2018). Graduates' unemployment is also a major issue in the region reaching 29.3% in Tunisia (18% for men and 38.7% for women), 23.5% in Morocco (18.9% for men and 32.2% for women) and 16.8% in Algeria (10% for men and 23.1% for women). Unemployment is not the only issue. The region suffers also from underemployment and skill or education mismatch. The objective of this paper is to study labor market dynamics from the angle of trade-offs between choosing an unmatched job and staying unemployed and the consequences of these decisions.

Labor market mismatches are a social and economic problem. At the economic level, the unemployment of graduates implies loss of productive human resources. This has a direct effect on growth and economic development. At the social level, unemployed graduates create a sense of frustration in society as education loses its role of social mobility determinant.

The belief in the virtues of education as one of the main engines for growth explains in a large part the spectacular increase of education enrollment in developing countries witnessed in the past decades (Pritchett, 2001). Education was also considered by many progressive political leaders of newly independent countries as the perfect mean for social mobility and the modernization of societies. However, coupled to a youth bulge and modest economic performances, this rapid increase in education resulted in high youth unemployment for graduates, frustration and rebellions in some developing countries such as those witnessed in the present decade in many Arab countries (Nordås and Davenport, 2013). Urdal (2006) notes that the Middle-East is not the only region threatened by age composition but also most of Africa and parts of Asia.

Given what precedes, school to work transitions are increasingly under the scrutiny of researchers and policymakers. Nilsson (2019) reviews the literature on the determinants of transition duration and employment status at the individual and macro levels in developing countries. Family backgrounds, social networks, cognitive and non-cognitive skills are among the main factors. When educated youth face a longer duration this is often due to higher expectations, queuing and skill mismatches.

Education-job mismatch corresponds to a situation where a university graduate for example is only able to compete for jobs requiring secondary education. She's overeducated. The opposite situation is also possible (undereducation). Robst (2007) considers that the quality match is also an important dimension, sometimes ignored. He focuses on the relationships between education fields and work activities and highlights which majors have the highest mismatch levels. Allen and Van der Velden (2001) also distinguish educational mismatch from skill mismatch. While the former is based on the comparison of the required level of education for a given occupation and the worker's degree, the latter is based on the difference between actual and required skills. This distinction allows the authors to show that skill mismatch

is a better predictor of job satisfaction than education mismatch. Similarly Chevalier (2003) considers that individuals at the queue of the distribution in terms of ability are "apparently" overeducated, while those with similar skills with "perfectly matched" workers are "genuinely" overeducated. The picture is completed by Leuven and Oosterbeek (2011) who highlight that most of the literature dealing with education mismatch was not able to separate its effects from those of unobserved ability. They survey among other aspects the individual determinants of education mismatch and its impact on earnings. At the region's level it is worth noticing that Khthiri (2019) studied the determinants of overeducation in Tunisia

Before moving to the methodological implications of these concepts applied to developed countries' case studies, let us define the context in most developing countries where unemployment of graduates is high. These countries are characterized by a youth bulge, an increase of the share of educated workers in the labor force, a modest (at best) structural change towards higher valued-added sectors and a lack of skills. Although the demographic dimension is specific to developing countries, Kupets (2016) shows that the problem of oversupply of graduates is prevalent in transition countries such as Ukraine, a particularly interesting case-study where demand and supply sides determinants of over education were affected simultaneously.

This paper examines changes in the incidence of education-job mismatch in North Africa (Algeria, Morocco and Tunisia) and the determinants of over education and under education. It also analyzes shifts in the occupational and sectoral structure of employment. We take in consideration the gender and age (youth vs adults) factors.

The outline of the final paper is as follows. After the introduction and the review of the literature, Section 2 describes the data sources and methods adopted in our analysis, Sections 3 present the background information on labor markets in the countries we consider. Section 4 presents the results of the analysis in several parts. The first part examines the determinants of participation in the labor force and occupational choice. The second and third parts focus on the determinants of skill Mismatch and effect of skill mismatch on wages. Section 5 concludes.

2   Methods and Data

We analyze changes in skills demand in North Africa (Algeria, Morocco and Tunisia) on the basis of changes in the occupational structure of jobs. We follow the subjective methods (Self-assessment). We analyze the shift-share decomposition into within and between industry components, examine the link between shifts in occupational employment patterns and in the age distribution of the workforce. We also estimate changes in the relative supply and demand for educated workers from 2005 to 2017. We aggregate occupations into nine major groups in line with ISCO classification and we aggregate occupations into four skill level groups, from skill level 4 for managers and professionals to skill level 1 for elementary occupations (ILO 2012).

In this paper we examine the incidence of over education on wages.
To answer our research questions we use micro data from official labor force surveys for several years (2005 - 2017) and SAHWA Youth Survey data which targets young people between 15 and 29 years-old in Algeria, Egypt, Lebanon, Morocco, and Tunisia conducted among 10,000

young (2000 per country) between 2015 and 2016. The main topics under study in the SAHWA project are education, employment and social inclusion, political mobilization and participation, culture and values, international migration and mobility, gender, comparative experiences in other transitional contexts and public policies, and international cooperation.

3 Background on labor markets in the countries considered

The economies of the countries studied differ in terms of their natural resources and structure. However they tend to share the fact that the recent economic growth is not sufficient to generate enough jobs.

Table 1: Labor Market Indicators by Country (%)

	Algeria			Morocco			Tunisia		
	Man	Women	Total	Man	Women	Total	Man	Women	Total
Labor force participation rate (LFP)	67.4	14.9	41.3	70.4	21.4	45.4	69.9	24.1	46.5
LFP rate (Youth 15-24 years)	42	8.4	25.5	39.3	13.2	26.6	43.5	20.5	32.3
Unemployment rate	10.1	21.3	12.1	8.6	10.4	9	12.9	22.6	15.5
Unemployment rate -Youth (16-24 years)	26.8	46.3	30	21.7	22.4	21.9	33.6	37.5	34.8
Level of education - University	9.9	23.3	16.4	17.8	29.9	21.9	17.2	38.8	28.8

source: World Bank (2018)

Female labor force participation is very low in the MENA region. Algeria has the lowest female participation rate 12.6%.The highest rate is observed in Tunisia (24.1%). Youth find more difficulty in entering the labor market as it is the case in many countries. However, the situation is more complex for young females. In fact, the participation rate in the labor force is particularly low for young females with 8.4% in Algeria, 13.2% in Morocco and 20.5% in Tunisia.The highest unemployment rate is observed in Tunisia with 15.5% in 2018, followed by Algeria with 12.1% and 9% in Morocco.Youth, in particular females have high unemployment rates. This rate has reached 46.3% in Algeria, 37.5% in Tunisia and 22.4% in Morocco. Unemployment affects particularly youth, women and educated people. Tunisia has the highest unemployment rate 28.8% (17.2% for men vs 38.8% women) for those with higher level of education compared to Morocco 21.9% (17.8% for men vs 29.9% for women) and Algeria 16.4% (9.9% for men vs 23.3% for women).

Figure 1: Evolution of youth unemployment rates
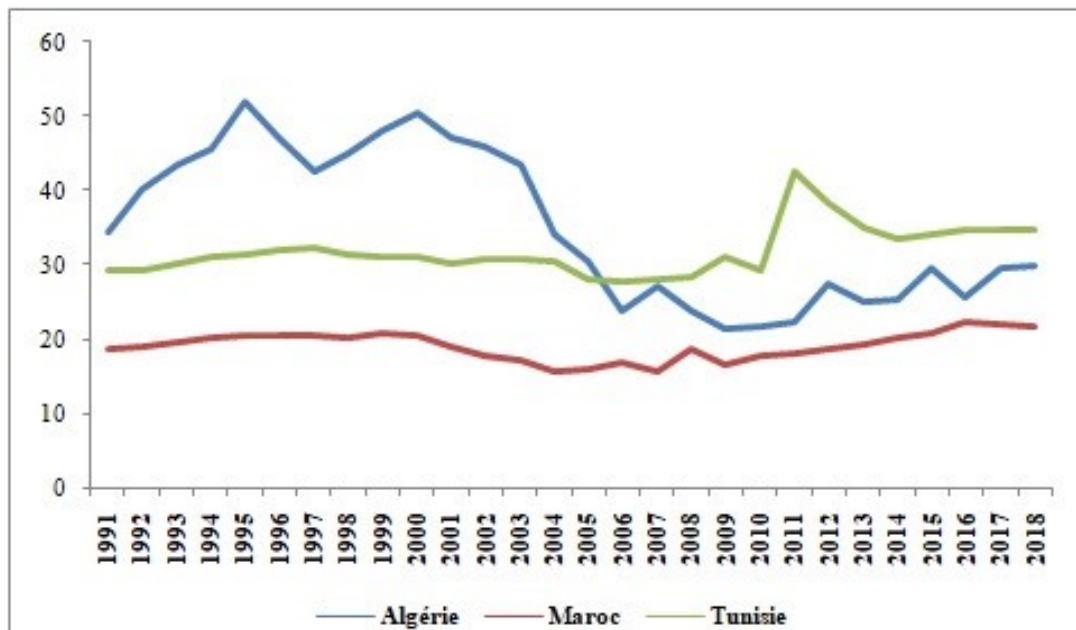
Figure 1 shows that for Tunisia and Morocco the youth unemployment rate remained stable until 2018 (around 20% for Morocco and 30% for Tunisia), date of the global financial crisis. For Algeria, the youth unemployment rate fell sharply from 52% in 1995 to 24% in 2008. After 2018 we can see an increase in the unemployment rate of young people in the three countries, 30% in Algeria in 2018 (24 in 2008), 22% in Morocco in 2018 (18.5% in 2008) and 34.8% in Tunisia in 2018 (28.6% in 2008).

Figure 2: Evolution of the number of graduates 1998/2017
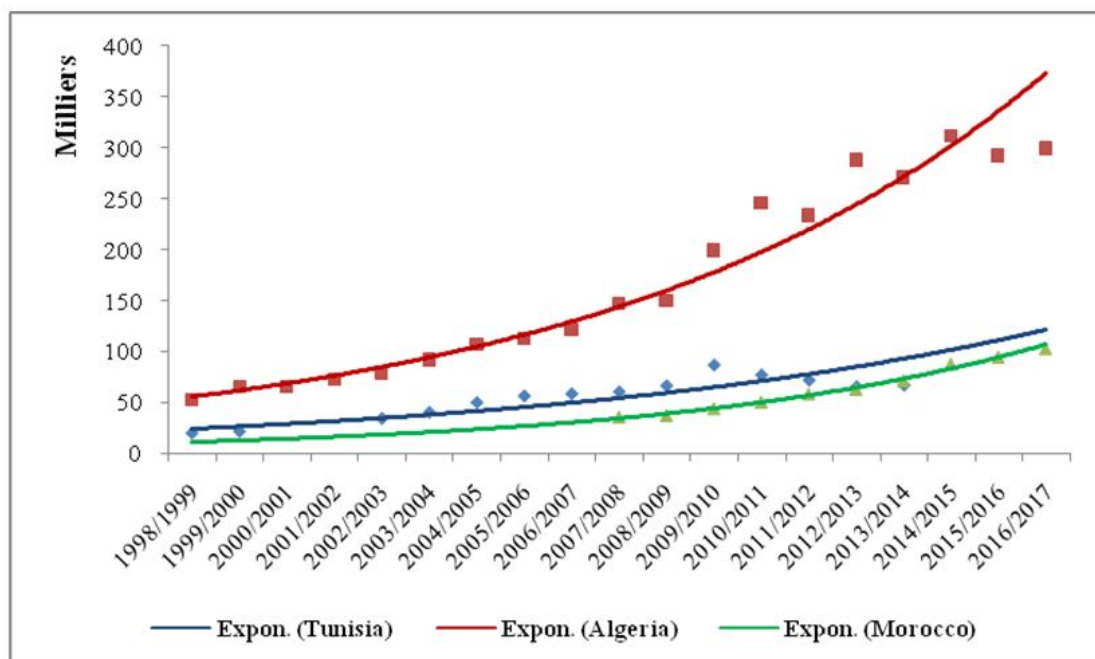
Figure 2 shows an exponential evolution of the number of university graduates particularly in the case of Algeria where the evolution is much sharper. For Tunisia we see a decrease in the

number of graduates since 2009/2010. Indeed, the number of graduates in Tunisia has decreased from 87 thousand (2009/2010) to 65 thousand in 2016/2017. In Algeria, the number of graduates has exceeded the 300 thousand graduates (2016/2017), three times more compared to Morocco (100 thousand graduates). The growing number of graduates who enter every year the labor market is a real challenge. In fact, employment survey statistics in the three countries (Algeria, Morocco and Tunisia) show that graduates are the most affected by unemployment. The situation is likely to worsen, on the one hand the public sector (the main source of employment for educated people) can not create enough skilled jobs (less employment opportunity for educated people) and on the other hand the private sector has not compensated the jobs lost in the public sector (Assaad et al., 2018).

Figure 3: Distribution of graduates by major field of education
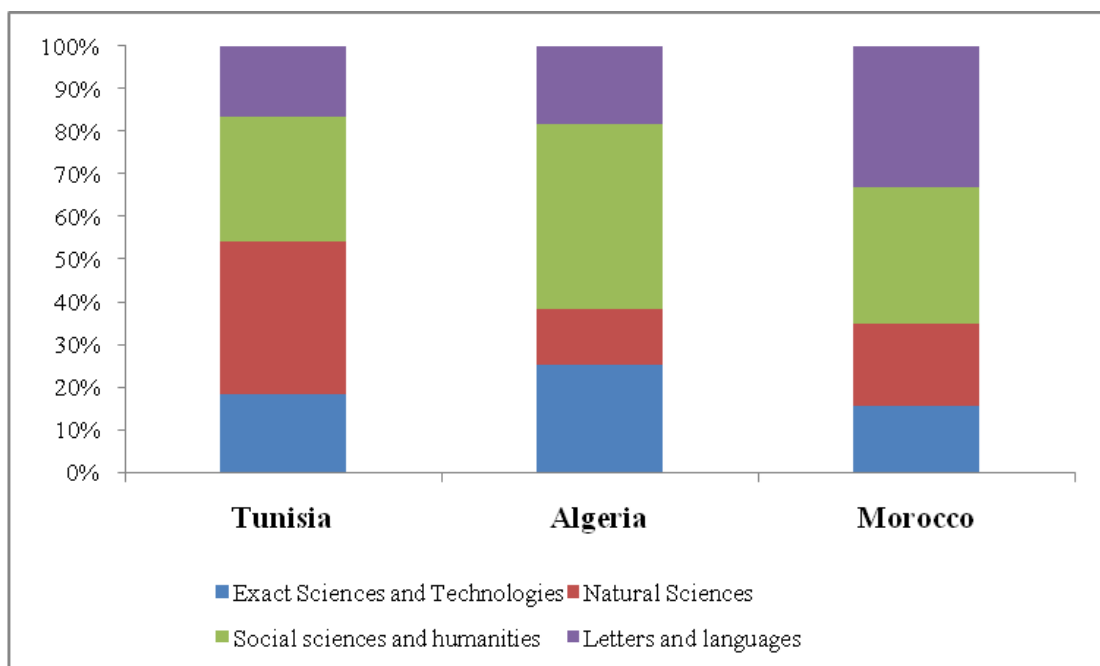
The distribution of graduates by field of education shows significant differences between the three countries (Algeria, Morocco and Tunisia). In Hard Sciences Algeria has the highest share of graduates (25% for Algeria, 18.5% for Tunisia and 15.7% for Morocco). Algeria has also the highest proportion of graduates in social Sciences and Humanities (43%) followed by Morocco (32%) and Tunisia (29%). The proportion of graduates in Letters and Languages is more important in Morocco 33% against 19% for Algeria and 16% for Tunisia. More than 35% of graduates in Tunisia have follow the field of Natural Sciences, this proportion is 19.5% in Morocco and 13.1% in Algeria.

Figure 4: Changes in employment shares of broad occupational groups Algeria
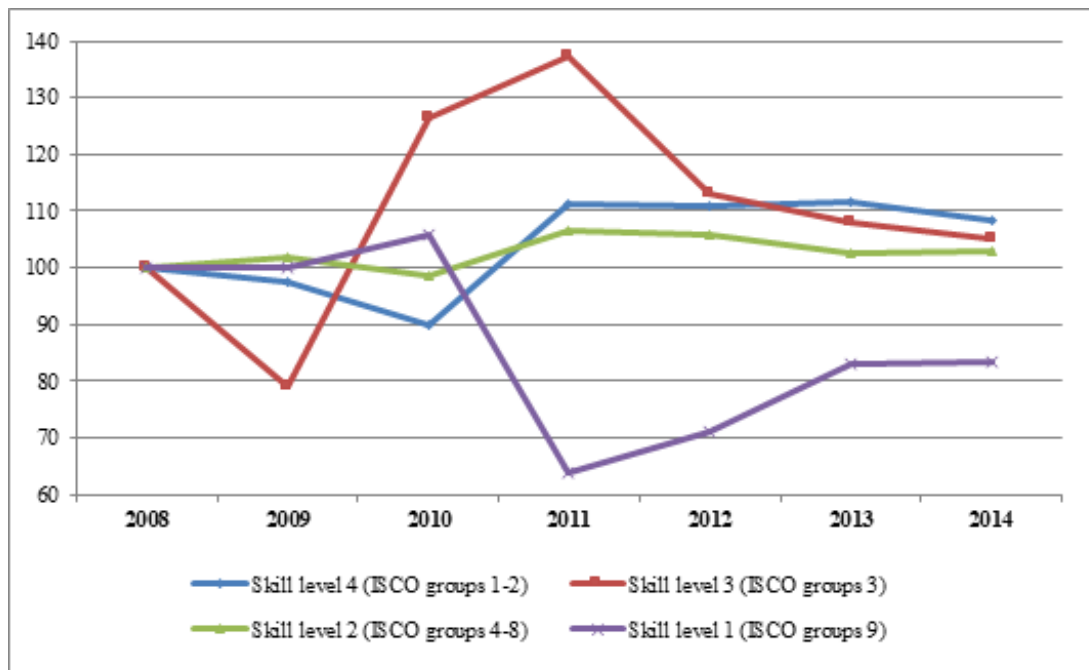
Skill level 4 = Senior officials and managers, Professionals; Skill level 3 = Technicians and associate professionals; Skill level 2 = Clerks, Service workers and shop and market sales workers, Skilled agricultural and shery workers, Craft and related trade workers, and Plant and machine operators and assemblers; Skill level 1=Elementary occupations.

Figure 5: Changes in employment shares of broad occupational groups Morocco
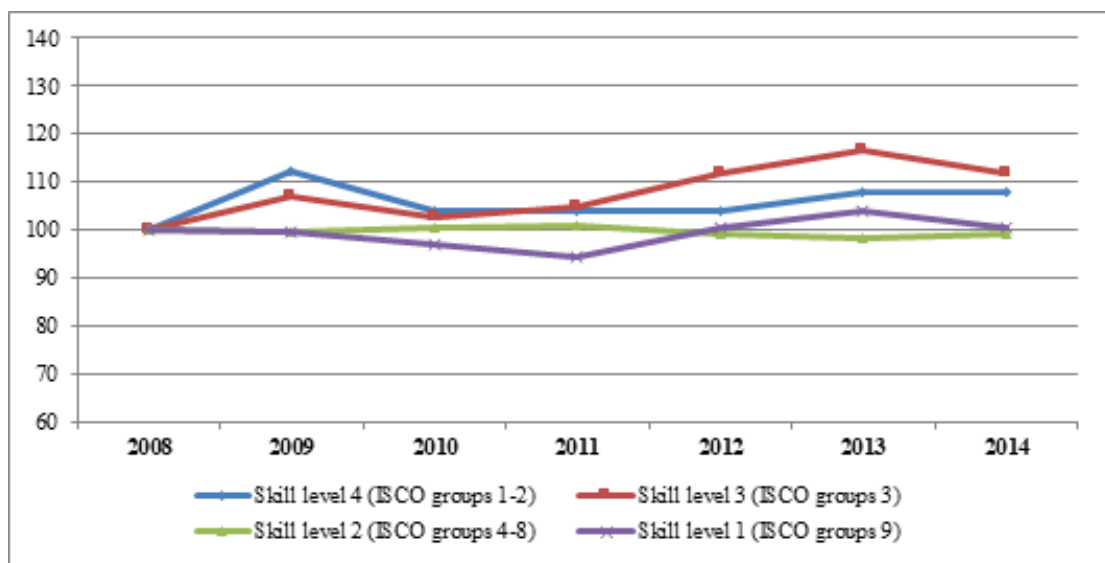
Figure 6: Changes in employment shares of broad occupational groups Tunisia
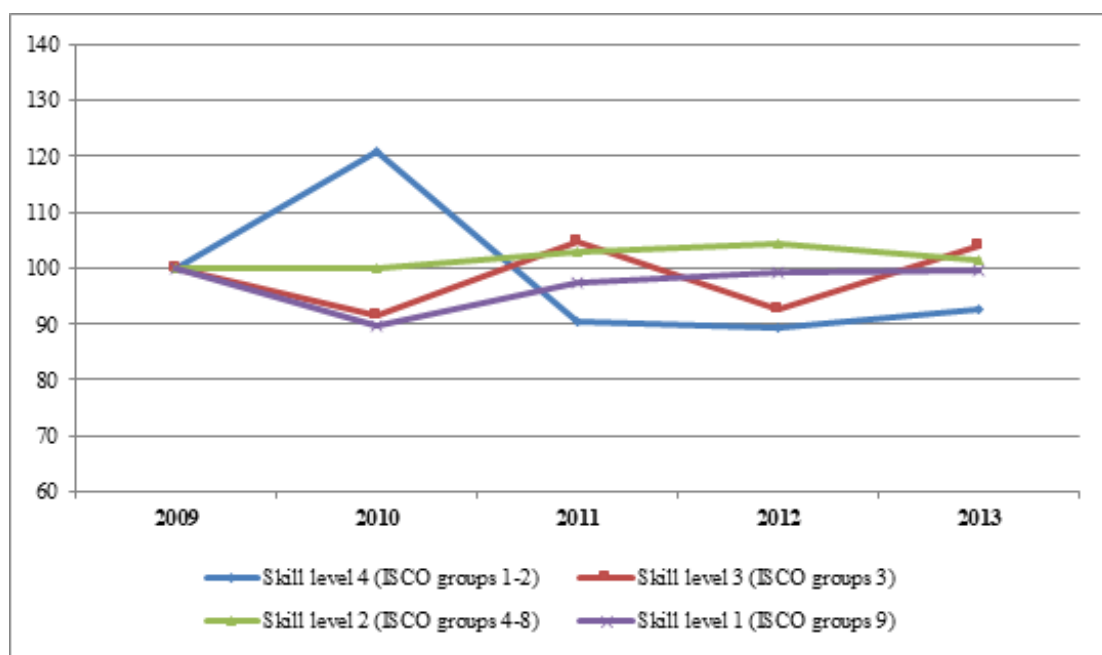
In Algeria the most notable changes are the high increase of the share of technicians and associate professionals and the high decrease of elementary occupations. From 2010 these two movements operate almost like a substitution of Skill level 1 by Skill level 3. The demand for the two other skills is stable since 2011 after a slight increase in 2010.

In Morocco the evolution is smoother than Algeria. The share of highest skills increases regularly, in particular technicians and associate professionals (Skill level 3).

In Tunisia the most striking result is that the share of the highest skilled workers decreased by 10% since the 2011 Revolution. If this evolution lasts this would have consequences on long term growth and productivity.

4   Results

4.1   Determinants of participation in the labor force and occupational choice

The decision to participate in the labor market can be formalized by a discrete choice structure: (Y = 1) if the individual i participates in the labor force, and (Y = 0) if the individual i does not. The explanatory variables we include in these models are age, gender, region (urban vs. rural), own education (four categories), marital status (ever married vs. never married), education of parents (father vs. mother), Father insured by social security (yes vs.no) and household characteristics. These models are estimated separately by country and by gender.

Table 2: Determinants of participation in the labor force travail (Active vs Inactive) – Logit

	Algeria			Morocco			Tunisia		
	Man	Women	Total	Man	Women	Total	Man	Women	Total
Age (ref: 15-19 years)									
20-24 years	33.04***	4.150***	9.676***	1.901	36.30***	2.304**	22.22***	14.72***	16.07***
	(10.42)	(1.154)	(1.796)	(0.782)	(46.75)	(0.828)	(7.896)	(5.507)	(3.863)
25-29 years	203.8***	17.05***	35.87***	11.57***	172.5***	12.50***	233.7***	36.94***	58.98***
	(88.55)	(5.585)	(8.147)	(6.317)	(274.6)	(5.686)	(119.2)	(15.92)	(17.37)
Gender (ref: women)									
Man	—	—	4.355***	—	—	3.203***	—	—	2.932***
			(0.621)			(1.056)			(0.528)
Marital status (ref: Never Married)									
Ever Married	4.974	0.307**	0.147***	2.409	7.62e-05***	0.58	1.927	0.0802***	0.0840***
	(6.323)	(0.183)	(0.0534)	(2.153)	(0.000255)	(0.433)	(2.872)	(0.0481)	(0.0381)
Level of education (ref: university)									
Without instruction / Primary	370.0***	2.472*	9.608***	13.76***	56.20*	13.05***	95.22***	2.400*	5.973***
	(299.9)	(1.217)	(3.271)	(9.963)	(116.5)	(7.97)	(83.29)	(1.261)	(2.33)
Less than secondary	75.15***	3.192***	8.606***	15.49***	27.03*	11.22***	46.41***	4.870***	9.319***
	(30.40)	(1.012)	(1.886)	(10.17)	(49.11)	(6.132)	(24.10)	(2.109)	(2.824)
Secondary	14.49***	1.850**	3.493***	1.365	1.345	1.168	4.821***	1.087	1.767**
	(5.025)	(0.529)	(0.696)	(0.657)	(1.396)	(0.463)	(1.817)	(0.361)	(0.409)
Father's level of education	0.809	1.540	1.124	1.858	0.598	1.507	1.293	1.778*	1.521**
	(0.215)	(0.422)	(0.2)	(1.039)	(0.873)	(0.715)	(0.419)	(0.550)	(0.32)
Mother's level of education	2.368***	1.473	1.845***	0.777	0.407	0.633	2.936***	1.403	1.973***
	(0.721)	(0.467)	(0.377)	(0.528)	(0.884)	(0.355)	(1.117)	(0.580)	(0.51)
Live with parents (ref: I live with both my parents)									
No, I don't live with my parents	2.566	0.105***	0.396***	0.145***	2.029	0.105***	1.215	0.224***	0.425**
Yes	(1.618)	(0.0636)	(0.132)	(0.106)	(3.870)	(0.0618)	(1.000)	(0.121)	(0.172)
Father insured by social security (ref:non)									
Yes	1.896	3.807***	2.151**	1.678	0.0512*	1.109	0.751	1.315	1.054
	(1.448)	(1.906)	(0.834)	(0.885)	(0.0795)	(0.468)	(0.240)	(0.354)	(0.2)
Household Characteristics									
Number of children under 5 in the household	0.819	0.644**	0.770**	0.756	0.0494*	0.364**	1.763	0.558***	0.619***
	(0.172)	(0.123)	(0.0919)	(0.444)	(0.0837)	(0.152)	(0.781)	(0.123)	(0.104)
Number of people with higher level of	1.003	1.799***	1.339***	1.818*	1.211	1.710***	1.758***	1.476***	1.498***
education in HH	(0.114)	(0.218)	(0.0941)	(0.560)	(0.942)	(0.428)	(0.252)	(0.211)	(0.139)
Number of people Unemployed	1.891***	2.046***	1.899***	6.538***	115.1***	9.088***	3.971***	4.436***	4.126***
in the household	(0.225)	(0.226)	(0.138)	(1.578)	(123.6)	(1.979)	(0.776)	(0.758)	(0.51)
Father Employer-Employee & mother inactive	1.840	2.358**	2.049***	7.234***	30.18**	7.712***	2.935***	3.723***	2.935***
Yes	(0.683)	(0.903)	(0.49)	(4.660)	(52.33)	(4.273)	(1.228)	(1.504)	(0.802)
Constant	0.0267***	0.0538***	0.0216***	1.680	0.180	1.281	0.0260***	0.0576***	0.0211***
	(0.0179)	(0.0365)	(0.00942)	(2.154)	(0.506)	(1.398)	(0.0259)	(0.0481)	(0.0129)
Observations	1066	909	1975	1026	534	1560	992	981	1973

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

The results show that women are less likely to participate in the workforce compared to men. This result is valid in the case of the three countries. The labor force participation ratio for women compared to men is higher in Algeria compared to Morocco and Tunisia, which means that women find more difficulties to participate in the labor force in Algeria compared to women in Morocco and Tunisia. Indeed, in Algeria, women are 4.3 times less likely to participate in the workforce compared to men, this proportion is 3.2 in Morocco and 2.9 in Tunisia. Also women are less likely to be employed vs. unemployed compared to men with a greater effect in the case of Morocco where women are 10.6 times less likely to be employed compared to men. In Algeria women are 2.3 less likely to be employed (see Annex). Age is significant, the youngest (15 - 19 years) are least likely to participate in the workforce, the probability of participation increases with age.

4.2 Determinants of skill Mismatch

In the survey youth are asked if their current job offers sufficient scope to use their knowledge and skills. We use this variable as a proxy of skill Mismatch. We estimate binary logit model : (Y = 1) if the individual i is in "Matched situation" (Skills and Job) and (Y = 0) if the individual

i is in "Unmatched situation".

For the question "Do you think your studies prepare you/ have prepared you for the labour market?" The person can answer by: 1) Yes, 2) More or less and 3) No. For the first proxy, the variable Y takes the value 1 if the answer is "More or less" or "No" and Y takes the value 0 if the answer is "Yes". For the second proxy, the variable Y takes the value 1 if the answer is "No" and Y takes the value 0 if the answer is "Yes" or "More or less". We use the second proxy to check if the results are robust.

We use as control variables : socio-demographic variables (age, gender, marital status), level of education, household characteristics (education of parents, situation of parents in the labor force, the composition of the household). We estimate the model first for all and afterwards for men and women separately.

The results show that men are more likely to be in the "Unmatched situation" compared to women. This is probably due to the fact that men are more likely to take up this type of jobs compared to women who are more selective. Also this result is probably due to the fact that men have more pressure to quickly find a job. They have to financially help the family compared to women who do not have the same pressure, especially never married women. The level of education is significant for all countries with a negative effect to be in the "Unmatched situation". In other words, the higher the level of education, the less likely is the probability to be in the "Unmatched situation".

The presence of unemployed in the household has a positive effect for adult members in the household to be in the "Unmatched situation" in the case of Algeria, however the effect is negative for the case of Tunisia. Youth living in urban areas are less likely to be in the "Unmatched situation" compared to young people living in rural areas. The variable is significant only in the case of Morocco for both women and men (see annex). Overall we find similar results when we use the second proxy variable of the skill-Mismatch, which means that our results are robust.

Table 3: Determinants of skill Mismatch – logit (odds ratio)

	Algeria	Morocco	Tunisia
Age (ref: 15-19 years)			
20-24 years	1.184	1.081	1.147
	-0.169	-0.158	-0.165
25-29 years	1.271	1.198	1.380**
	-0.203	-0.234	-0.219
Gender (ref: women)	1.399***	0.953	1.231*
Man	-0.164	-0.124	-0.136
Marital status (ref: Never Married)	1.182	0.557***	1.125
Ever Married	-0.143	-0.0748	-0.135
Level of education (ref: university)			
Without instruction / Primary	5.533***	3.042***	3.650***
	-1.436	-0.752	-0.798
Less than secondary	4.448***	2.533***	1.990***
	-0.845	-0.564	-0.354
Secondary	2.192***	1.509**	1.117
	-0.405	-0.263	-0.17
Father's level of education (ref: university)	1.022	0.781	1.088
	-0.158	-0.147	-0.157
Mother's level of education (ref: university)	1.139	1.243	1.054
	-0.201	-0.328	-0.185
Live with parents (ref: I live with both my parents)			
I live with one of my parents	0.744	0.616	0.941
Yes	-0.135	-0.184	-0.181
No, I don't live with my parents	1.653*	0.909	1.019
Yes	-0.449	-0.231	-0.262
Father insured by social security (ref:no)	1.105	0.170*	0.731
Yes	-0.494	-0.183	-0.253
Mother insured social security (ref:no)	0.741	1.216	1.207
Yes	-0.243	-0.282	-0.167
Number of children under 5 in the household	1.003	1.312	0.984
	-0.0977	-0.242	-0.117
Number of people with higher level of education in the household	1.016	1.323***	1.039
	-0.0548	-0.132	-0.0577
Number of people Unemployed in the household	1.239***	0.869**	1.039
	-0.0573	-0.0623	-0.0545
Father Employer-Employee & mother inactive	1.745**	1.211	1.521**
Yes	-0.407	-0.271	-0.282
Employer-Self-employment - Informal	0.711	0.509	0.696
Yes	-0.267	-0.531	-0.282
Employee - Formal	1.465**	1.967**	0.958
Yes	-0.219	-0.548	-0.154
Employee - Informal	0.889	0.627	0.742
Yes	-0.359	-0.66	-0.285
Constant	0.0593***	0.48	0.220***
	-0.0296	-0.538	-0.112
Observations	1982	1560	1975

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

4.3 Determinants of participation in the labor force Vs. Skill Mismatch

In this section we estimate a Bivariate probit model. This model provides a convenient setting for estimating the effect of an endogenous binary regressor y_2 on a binary outcome variable y_1. The standard model assumes a constant treatment eect, the presence of exclusion restriction, and the absence of simultaneity.

In our analysis, Y_1 is the equation of participation in the labor force: $Y_1 = 1$ if the person participates in the labor force and $Y_1 = 0$ otherwise. Y_2 is the Skill-Mismatch equation: $Y_2 = 1$ if the person is in an "Unmatched" situation and $Y_2 = 0$ if the person is in a "Matched" situation.

The age variable is significant only at the first level (participation in the work force) with a positive relationship. The youngest are less likely to participate in the labor force compared to the older ones. The gender variable is significant for both levels for the case of Algeria and Tunisia with a positive effect for both levels. This means that men are more likely to participate in the labor force compared to women, but the likelihood that they will be in a "Unmatched" (Skills-Job) situation is higher compared to women. For Morocco the variable is significant only for the first level with a positive effect for participation in the labor force.

The marital status is significant only for the first level for the case of Algeria and Tunisia with a negative effect for participation in the labor force for married women. The educational level of the parents (father vs. mother) has an effect on labor force participation for their children but no effect for the type of job occupied (Matched vs. Unmatched).

The number of children in basic age (under 5 years old) is significant for the first level (participation in the labor force) only for women with a negative effect for participation in the labor force. We find this result for all countries. The effect of this variable is more important for the case of Morocco (women are 1.46 times less likely to participate in the labor force, the ratio is 1.27 for the case of Tunisia and 1.20 for the case of Algeria). This variable has no significant effect for the type of Job "Matched" vs "Unmatched".

Table 4: Employment & Skill mismatch - Bivariate probit (odds ratio)

	Algeria		Morocco		Tunisia	
	Employed vs out of labor market	UnSkill vs Skill	Employed vs out of labor market	UnSkill vs Skill	Employed vs out of labor market	UnSkill vs Skill
Age (ref: 15-19 years)						
20-24 years	3.167***	1.107	1.13	1.046	2.562***	1.088
	-0.379	-0.0923	-0.223	-0.0917	-0.316	-0.0934
25-29 years	5.504***	1.149	2.579***	1.119	3.594***	1.219**
	-0.707	-0.109	-0.582	-0.132	-0.479	-0.117
Gender (ref: women)	2.208***	1.211***	3.036***	0.964	1.504***	1.126*
Man	-0.186	-0.0829	-0.608	-0.0747	-0.131	-0.0742
Strate (ref: rural)	0.986	1.112	1.387*	0.697***	1.104	1.076
Urban	-0.0826	-0.0795	-0.238	-0.056	-0.105	-0.0782
Level of education (ref: university)						
Without instruction / Primary	1.783***	2.699***	3.386***	1.919***	1.699***	2.215***
	-0.316	-0.409	-1.049	-0.282	-0.296	-0.295
Less than secondary	1.816***	2.341***	2.752***	1.725***	2.494***	1.521***
	-0.213	-0.248	-0.785	-0.227	-0.336	-0.163
Secondary	1.370***	1.533***	0.74	1.268**	1.405***	1.07
	-0.152	-0.156	-0.168	-0.129	-0.158	-0.0964
Marital status (ref: Never Married)	0.666**	1.018	0.581	0.769	0.262***	0.848
Ever Married	-0.13	-0.176	-0.218	-0.158	-0.0576	-0.147
Father's level of education (ref: university)	1.302**	1.009	1.453	0.865	1.212*	1.048
	-0.138	-0.0907	-0.41	-0.0952	-0.134	-0.0902
Mother's level of education (ref: university)	1.368**	1.045	1.164	1.128	1.283*	1.026
	-0.169	-0.106	-0.37	-0.171	-0.171	-0.106
Household Characteristics						
Number of children under 5 in the household	0.834**	1.002	0.681*	1.17	0.782**	0.992
	-0.0633	-0.0576	-0.143	-0.133	-0.077	-0.0705
Number of people with higher level of education in the household	1.191***	1.008	1.898***	1.180***	1.316***	1.023
	-0.0441	-0.0321	-0.257	-0.0702	-0.057	-0.0342
Number of people Unemployed in the household	0.607***	1.139***	0.197***	0.917**	0.422***	1.025
	-0.0245	-0.0313	-0.0243	-0.0394	-0.0239	-0.0328
Father Employer-Employee & mother inactive	1.163	1.375**	1.905**	1.106	1.791***	1.284**
Yes	-0.17	-0.177	-0.521	-0.144	-0.253	-0.14
Employer-Self-employment - Informal	0.851	0.832	146.4	0.668	0.506**	0.792
Yes	-0.225	-0.183	-174699	-0.447	-0.152	-0.191
Employee - Formal	0.98	1.239**	0.823	1.448**	0.974	0.973
Yes	-0.0967	-0.108	-0.237	-0.22	-0.119	-0.0931
Employee – Informal	0.647	0.964	120.1	0.754	0.422***	0.826
Yes	-0.188	-0.228	-143268	-0.51	-0.121	-0.189
Constant	0.0988***	0.194***	0.00253	0.668	0.193***	0.406***
	-0.0333	-0.0552	-3.023	-0.474	-0.0751	-0.123
Observations	1982	1982	1560	1560	1975	1975
LR test of rho=0	chi2(1) = .235399	Prob >chi2 = 0.6275	chi2(1) = 1.01818			

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

The hypothesis H0 is not rejected. Two independent equation.

4.4 Does Skill-Mismatch affect Wages?

The analysis of the logarithm distribution of the monthly wages by types of job "Matched" vs "Unmatched" shows that the wage distribution for Unmatched jobs is shifted to the left and its apex is slightly lower compared to Matched jobs, reflecting lower wages for Unmatched jobs. The wage gap between Matched and Unmatched jobs is more visible for the case of Morocco. For Tunisia, the distribution of wages does not show a significant difference between the two situations "Matched" vs "Unmatched".

Figure 7: Wage distribution Matched vs Unmatched
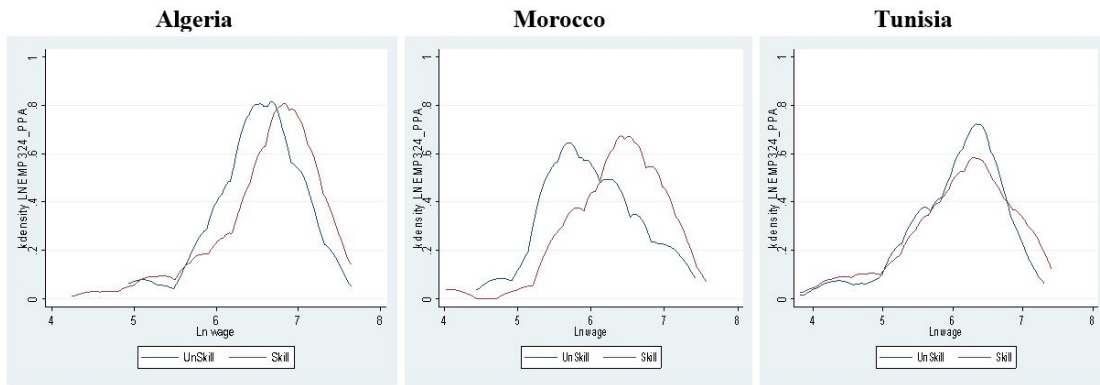
The Kolmogorov Smirnov test shows that the wage distribution is significantly different between the two situations "Matched" and "Unmatched" only in the case of Algeria and Morocco. In the case of Tunisia the difference is not significant.

Table 5: Two-sample t test with unequal variances

	Algeria			Morocco			Tunisia		
Group	Mean	Std.Err.	Std. Dev.	Mean	Std.Err.	Std. Dev.	Mean	Std.Err.	Std. Dev.
Skill	6.627	.0384	.633	6.353	.070	.652	6.090	.050	.776
UnSkill	6.507	.051	.527	5.999	.101	.644	6.047	.059	.669
combined	6.593	.031	.607	6.240	.059	.668	6.075	.039	.739
diff	.121	.064		.354	.122		.043	.077	
t	1.877			2.894			0.557		
Ha: diff <0	Pr(T <t) = 0.969			Pr(T <t) = 0.998			Pr(T <t) = 0.711		
Ha: diff != 0	Pr(T >t) = 0.062			Pr(T >t) = 0.005			Pr(T >t) = 0.578		
Ha: diff >0	Pr(T >t) = 0.031			Pr(T >t) = 0.003			Pr(T >t) = 0.289		

diff = mean(Skill) - mean(UnSkill); Ho: diff = 0

4.5 Determinants of wage with correction of selection

The standard human capital model (Mincer, 1974) assumes that wage earners are paid for their marginal productivity and that it increases with accumulated human capital. The net benefit of an additional year of schooling can then be estimated from data on the incomes of individuals with different levels of education.

To determine the rate of return of S years of education, Mincer (1974) estimates an equation of the form:

$$LogY_s = c + rS + aE + bE_2 + u \tag{1}$$

Y_s: individual income, S: number of years of education, E: work experience. It takes a concave quadratic form of the earnings profile due to post-school investment in human capital, that is, the decreasing returns from experience, c: the constant, which human capital theorists interpret as the wage base without human capital and u a stochastic term representing the unobserved factors that affect income. These are zero average factors that the individual does not necessarily know.

For the correction of the selection, we followed the Heckman procedure in two stages. The estimation of the maximum likelihood-probit selection equation produces the reduced equation of participation of the model. From the latter, it is possible to correct the possible selection bias of the sample related to the estimation of the gain equations. The correction of the selectivity bias is performed by introducing into the earnings functions an additional explanatory variable, the inverse of the Mill's ratio (T) calculated from the reduced participation equation.

The gain equations corrected for sample selection bias can then be written as follows:

$$Logw_i = B'X_i + z'T_i + u_i \tag{2}$$

Where $LogW$ corresponds to the logarithm of wages, X_i a vector of individual characteristics influencing earnings. If u is normally and independently distributed, equation (2) can be estimated by the ordinary least squares method.

We have estimated an extended Mincer equation with selection processing. The dependent variable is the logarithm of the monthly salary in in Purchasing Power Parity (*PPP*). For the independent variables, we introduced several blocks of variables: demographic characteristics, human capital, employment characteristics, and household characteristics.

Table 6: Determinants of wage with correction of selection

Ln wage (PPA)	Total	Algeria	Morocco	Tunisia
Education years	0.0177***	0.0235**	0.0414***	0.0123
	-0.00635	-0.0101	-0.0121	-0.00965
Experience	0.0126	-0.0267	0.0616**	0.0425*
	-0.0164	-0.0248	-0.0292	-0.0243
Experience squared	-0.00035	0.00149	-0.0021	-0.00196
	-0.00117	-0.00183	-0.00198	-0.00176
Skill-job match				
1. skill under utilisation	-0.276***	-0.787***	-0.476*	-0.0145
	-0.0888	-0.146	-0.257	-0.126
1.Gender	0.105*	0.0325	-0.0152	0.0913
	-0.0634	-0.103	-0.204	-0.0927
1. skill under utilisation#1.Gender	0.258***	0.687***	0.566**	0.0717
	-0.0992	-0.157	-0.265	-0.147
Type of school (ref Private)	-0.2	-0.385	-0.117	-0.182
Public	-0.183	-0.542	-0.201	-0.265
Had/has private tutoring (ref No)	0.0676	-0.0472	0.0541	0.126*
Yes	-0.0476	-0.0713	-0.15	-0.0693
Had/has professional training (ref No)	-0.163**	-0.264**	0.00858	-0.164
Yes	-0.0802	-0.109	-0.355	-0.132
1. Had/has professional training #1.Gender	0.195**	0.241*	-0.524	0.287*
	-0.0944	-0.129	-0.391	-0.154
Had/has done an internetship (ref No)	0.0615	0.0683	-0.00078	0.082
Yes	-0.0611	-0.108	-0.141	-0.0837
Job Search				
Social Networks	-0.203***	-0.301***	-0.166	-0.0677
	-0.0532	-0.0744	-0.105	-0.0897
Placement by the public employment office	-0.230**	-0.318***	-0.176	-0.00218
	-0.0911	-0.106	-0.289	-0.181
Competition or exam	0.303***	0.206	-0.294	0.450**
	-0.109	-0.139	-0.585	-0.19
Contacted by an employer	-0.160*	-0.382***	0.0131	0.0816
	-0.0884	-0.141	-0.17	-0.133
Creation of my business through national employment funding	0.00153	0.433	-0.295	-0.104
	-0.204	-0.317	-0.271	-0.383
Strate (ref Rural)	0.0825*	-0.0144	0.335**	0.108
Urban	-0.0442	-0.0564	-0.132	-0.0774
Sector activity (ref : Education)				
Agriculture	0.0824	0.242	-0.456	-0.0321
	-0.113	-0.16	-0.422	-0.179
Industry	0.335***	0.489***	0.00596	0.241
	-0.106	-0.158	-0.406	-0.164
Construction	0.107	0.2	-0.327	-0.00052
	-0.108	-0.148	-0.412	-0.174
Health services	0.359***	0.252*	-0.307	0.557***
	-0.122	-0.153	-0.453	-0.204
Trade	0.204**	0.213	-0.061	0.145
	-0.104	-0.15	-0.4	-0.165
Other commercial services	0.224**	0.191	-0.0199	0.239
	-0.101	-0.144	-0.395	-0.162
Administration non-commercial services	0.336***	0.329**	-0.0619	0.389**
	-0.105	-0.132	-0.409	-0.185
Situation professional (ref: self-employment)				
Public	0.0518	-0.0686	0.455***	0.0813
	-0.0794	-0.116	-0.164	-0.144
Private formal	0.194***	0.0685	0.339**	0.238**
	-0.0651	-0.0929	-0.141	-0.107
Private informal forced	-0.200***	-0.156*	-0.308***	-0.284***
	-0.0574	-0.0814	-0.118	-0.0942
Private informal voluntary	-0.199***	-0.240**	-0.335***	-0.174*
	-0.0616	-0.0996	-0.121	-0.0964
Country (ref : Morocco)				
Algeria	0.294***			
	-0.0657			
Tunisia	-0.189***			
	-0.0658			
Constant	6.143***	6.910***	5.799***	5.706***
	-0.26	-0.592	-0.583	-0.354
Observations	1114	471	176	467

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Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Statement : My current job offers me sufficient scope to use my knowledge and skills.

The most important variable in the equation is the variable related to skill mismatch, if skills are underused or not. We introduce in the equation the dummy variable Skill Mismatch and the interaction of this variable with gender to check if the effect on wages is different between men and women.

The results show that youth who are in the Unmatched situation earn on average less than youth who are in the Matched situation (Skills vs. Job) at least in the case of Algeria and Morocco. Also, the results show that men in Unmatched situation earn more compared to women in the same situation. Therefore women earn on average less than men regardless of their situation Matched vs. Unmatched.

As expected, the returns to education are significant with positive effect for the case of Algeria and Morocco. Nevertheless, the effect of education on wages is more important in the case of Morocco 4% more for each year of additional education. For Algeria each additional year of education increases the wage by 2% and for Tunisia by 1.2%. In Tunisia, young people who have followed private tutoring, earn more (1.26%) compared to young people who have not followed training. This variable is not significant for the case of Algeria and Morocco. The results show that the effect of vocational training on wages is different between men and women. Indeed, for men the effect is positive (for the case of Algeria and Tunisia). However for women the effect is rather negative for the case of Algeria. Also, the years of experience have a positive effect on the wage. This variable is significant for the case of Morocco and Tunisia. In the model (with all countries pooled), the results show that women are less paid compared to men. Gender is not significant in the models that correspond to each country.

Different job search methods provide different types of jobs. Social networks is a popular method for finding jobs in MENA countries but often for less skilled jobs and protect (Lassassi and Alhawarin, 2018). Youth who have found a job through social networks earn less. Also, Youth who have found a job through public agencies earn less. This is probably due to the types of jobs generally offered by public agencies, which are intermediate jobs. On the other hand, those who have found a job through competitions or exams earn more compared to youth who have found jobs through who informal research methods.

Youth living in urban areas earn less than those living in rural areas at least in the case of Morocco. Industry, Health services, Non-commercial administration workers earn on average more compared to those who work in the education sector for the case of Algeria. For Tunisia, Health Services and Non-Commercial Administration workers earn on average more than those working in the education sector.

The status of youth in the labor market has a direct effect on wage levels. Indeed, for the case of Algeria, the dummy private informal (forced) and private informal (voluntary) are significant. Youth in these two segments earn less compared to those who are self-employed. We find similar results in Morocco for those who are in these two segments (Private Informal : Forced vs Voluntary). For those who are in the public sector and private formal sector, they earn on average more compared to those who are in self-employment. We find similar results for the case of Tunisia. Those who work in the public sector earn more and those who work in the informal private sector force vs informal private sector voluntary earn less compared to those who work as self-employment. Finally we include dummy country (the reference is Morocco).

The results show that on average youth in Algeria earn more compared to youth in Morocco. On the other hand, on average youth earn less in Tunisia compared to youth in Morocco.

5 Conclusion

Using the SAHWA survey this paper examined the determinants of overeducation in North Africa (Algeria, Morocco and Tunisia) and its impact on wages. The results show that men are more likely to be in the "Unmatched situation" compared to women. Moreover, the higher the level of education, the less likely is the probability to be in the "Unmatched situation". The presence of unemployed in the household has ambiguous effects (positive in the case of Algeria and negative for the case of Tunisia). Youth living in urban areas are less likely to be in the "Unmatched situation" compared to young people living in rural areas.

The analysis of the distribution of wages by types of job "Matched" vs "Unmatched" shows a difference between the countries, with a large positive gap in Morocco, a lower gap in Algeria and no difference between Matched and Unmatched jobs in Tunisia. The estimation of the determinants of wages shows that youth who are in the Unmatched situation earn on average less than youth who are in the Matched situation at least in the case of Algeria and Morocco. The results show also that men in Unmatched situation earn more compared to women in the same situation.

This work deserves to be further explored by following the objective approach (in addition to the subject approach we used) to measuring skill mismatch, as a robustness check. It would also be interesting to analyze the impact of skill mismatch on work satisfaction and on the migration intention, particularly for the youth. Finally the investigation of the link between structural change and overeducation seems a very promising route for this literature, particularly in the MENA region where structural change has stagnated in the recent decades.

Policy Recommendations

The first recommendationis to provide prospective studentsaccess to dashboardsallowingthem to assesstheirrisk of overeducation. As shown by the studythisriskdepends on variousfactorslinked to the individualcharacteristics, herenvironment and choices. This recommendation has the objective of decreasing the supply of overeducatedworkers.

The second recommendationis to provide the mostdisadvantagedovereducatedworkerswith on the job training possibilitiesallowingthem to obtain a bettermatched job. Indeed, as the study shows the impact on wagesisheterogenousacross countries, regions, sectors, etc. This recommendationisintended to improve the quality of the match.

Putting a higher focus on internships in the various curricula and associatingprofessionals in teaching and in advisorycouncilscanalso help improving the match. Betterintermediation techniques canalsoallowcontribute to improve the quality of the match.

6 Annex

Table 7: Determinants of participation in the labor force (Employed vs Unemployed) – Logit

	Algeria			Morocco			Tunisia		
	Man	Women	Total	Man	Women	Total	Man	Women	Total
Age (ref: 15-19 years)									
20-24 years	2.713***	2.231***	8.186**	0.330	0.387	0.343	1.757	1.771	1.737*
	(0.747)	(0.679)	(7.121)	(0.429)	(0.329)	(0.375)	(0.621)	(0.963)	(0.505)
25-29 years	4.252***	3.861***	9.630**	8.373	5.988**	2.534	2.610***	1.982	2.292***
	(1.263)	(1.274)	(8.642)	(12.75)	(5.211)	(2.898)	(0.970)	(1.130)	(0.695)
Gender (ref: women)									
Man	—	—	2.329***	—	—	10.59*	—	—	1.604**
			(0.475)			(12.85)			(0.296)
Marital status (ref: Never Married)	1.753	1.267	8.950*	0.000457**	5.133	0.0722	0.346	0.226**	0.256***
Ever Married	(0.813)	(0.678)	(10.14)	(0.00171)	(6.132)	(0.146)	(0.283)	(0.140)	(0.117)
Without instruction / Primary	1.072	1.041	0.251	31.50	2.824	16.06	3.031**	2.012	2.165**
	(0.443)	(0.495)	(0.284)	(94.11)	(3.272)	(27.49)	(1.493)	(1.072)	(0.794)
Less than secondary	1.026	1.148	0.973	123.3	2.317	24.34*	4.378***	1.990	3.060***
	(0.298)	(0.429)	(0.504)	(427.1)	(2.619)	(44.04)	(1.732)	(0.946)	(0.890)
Secondary	0.772	0.890	0.534	1.170	0.215	1.913	2.075**	1.902*	1.893***
	(0.210)	(0.324)	(0.247)	(3.498)	(0.216)	(2.846)	(0.719)	(0.729)	(0.468)
Had/has private tutoring (ref: No)	1.090	1.104	1.051	0.304	0.255	0.197	0.949	0.836	0.909
Yes	(0.239)	(0.309)	(0.395)	(0.763)	(0.245)	(0.329)	(0.240)	(0.252)	(0.173)
Strate (ref: rural)	0.857	0.698*	1.667	0.555	1.417	1.176	1.121	1.566	1.254
Urban	(0.161)	(0.152)	(0.678)	(0.754)	(1.051)	(1.130)	(0.292)	(0.522)	(0.254)
Father's level of education	1.874***	1.789**	2.554**	0.399	6.643	1.816	1.493	1.082	1.412
	(0.436)	(0.506)	(1.208)	(1.387)	(8.223)	(3.707)	(0.472)	(0.405)	(0.335)
Mother's level of education	1.259	1.124	1.172	0.412	0.375	0.519	1.336	0.996	1.120
	(0.354)	(0.385)	(0.617)	(1.524)	(0.533)	(1.328)	(0.525)	(0.487)	(0.333)
Live with parents (ref: I live with both my parents)									
I live with one of my parents	1.052	1.029	0.993	0.508	1.694	0.545	2.206*	1.170	1.554
Yes	(0.265)	(0.301)	(0.509)	(2.014)	(1.812)	(1.419)	(1.036)	(0.559)	(0.502)
No, I don't live with my parents	0.942	1.565	0.138*	0.143	4.542*	0.259	4.956**	1.338	1.807
Yes	(0.402)	(0.770)	(0.153)	(0.432)	(3.875)	(0.520)	(3.663)	(0.788)	(0.790)
Father insured by social security (ref:non)	1.037	0.824	1.156	0.0227	2.888	0.144	0.710	0.680	0.705*
Yes	(0.523)	(0.492)	(1.223)	(0.0552)	(2.289)	(0.202)	(0.187)	(0.212)	(0.138)
Mother insured social security (ref:non)	0.862	0.933	1.191	0.0973	18.88**	0.832	1.166	0.991	1.074
Yes	(0.424)	(0.546)	(1.170)	(0.257)	(24.77)	(1.472)	(0.381)	(0.353)	(0.253)
Household Characteristics									
Number of children under 5 in the household	0.751	0.756	0.648	12.68	2.412	6.906	0.868	0.946	0.895
	(0.141)	(0.155)	(0.338)	(20.77)	(2.464)	(8.845)	(0.310)	(0.297)	(0.207)
Number of children 5 to 14 years	0.897	0.955	0.637*	1.712	1.952	1.221	0.764	0.688	0.725**
in the household	(0.0987)	(0.120)	(0.165)	(2.812)	(1.203)	(1.597)	(0.155)	(0.170)	(0.112)
Number of children 15 to 64 years	1.076	0.990	1.260	0.0233	7.655	0.189	1.190	1.194	1.141
in the household	(0.168)	(0.185)	(0.383)	(33.52)	(31.60)	(6.723)	(0.313)	(0.423)	(0.237)
Number of people with higher level of	1.361***	1.342**	1.276	13.14**	3.237**	7.279***	1.649***	1.452**	1.541***
education in HH	(0.123)	(0.154)	(0.205)	(17.20)	(1.571)	(5.447)	(0.195)	(0.261)	(0.154)
Number of people ever married in the household	1.375***	1.605***	0.938	193.5***	0.578	12.40***	2.167**	2.290***	1.960***
	(0.146)	(0.207)	(0.195)	(381.8)	(0.257)	(11.90)	(0.692)	(0.613)	(0.388)
Number of people Unemployed	0.218***	0.220***	0.271***	3.33e-06***	—	0.000354***	0.0931***	0.0759***	0.0883***
in the household	(0.0246)	(0.0283)	(0.0606)	(1.12e-05)		(0.000501)	(0.0182)	(0.0203)	(0.0139)
Number of people out of the labor force	0.855*	0.807**	1.073	0.576	0.738	0.665	0.606***	0.596**	0.618***
in the household	(0.0740)	(0.0804)	(0.196)	(0.284)	(0.264)	(0.282)	(0.0984)	(0.137)	(0.0791)
Father Employer-Employee & mother inactive	1.020	1.658	0.317*	0.413	3.360	0.397	2.690**	1.262	1.874**
Yes	(0.350)	(0.706)	(0.201)	(1.081)	(3.630)	(0.745)	(1.147)	(0.541)	(0.563)
Father Mother inactive 3.116***		1.761	2.211	0.809	10.59	1.435	6.057	5.436***	1.410
Yes	(0.782)	(1.185)	(0.688)	(29.95)	(2.509)	(12.21)	(3.062)	(0.925)	(1.295)
Constant	0.268**	0.477	0.203	9,337**	0.0103**	23.93	0.0859***	0.415	0.174***
	(0.167)	(0.345)	(0.276)	(41,384)	(0.0211)	(81.87)	(0.0792)	(0.401)	(0.112)
Observations	974	689	313	464	180	545	660	500	1144

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 8: Determinants of skill Mismatch - Skill1 – Logit

	Algeria			Morocco			Tunisia		
	Man	Women	Total	Man	Women	Total	Man	Women	Total
Age (ref: 15-19 years)									
20-24 years	1.261	1.117	1.194	0.935	0.863	0.908	1.284	1.548**	1.399**
	(0.232)	(0.209)	(0.154)	(0.165)	(0.218)	(0.129)	(0.245)	(0.312)	(0.191)
25-29 years	1.188	1.040	1.119	1.614*	1.163	1.419*	1.557**	1.471*	1.494**
	(0.246)	(0.230)	(0.166)	(0.400)	(0.397)	(0.279)	(0.338)	(0.344)	(0.233)
Gender (ref: women)									
Man	—	—	1.554***	—	—	0.936	—	—	1.231**
			(0.161)			(0.118)			(0.128)
Marital status (ref: Never Married)	0.956	3.128***	1.755*	0.492*	2.385	0.702	3.251*	1.141	1.597
Ever Married	(0.418)	(1.383)	(0.510)	(0.206)	(1.619)	(0.239)	(2.016)	(0.413)	(0.458)
Without instruction / Primary	3.275***	2.974***	3.104***	1.858**	3.439***	2.206***	3.853	2.411***	3.148***
	(1.142)	(1.147)	(0.789)	(0.534)	(1.553)	(0.522)	(1.452)	(0.768)	(0.753)
Less than secondary	3.794***	2.571***	3.175***	3.358***	4.102***	3.355***	2.701***	1.909***	2.350***
	(0.843)	(0.568)	(0.487)	(0.903)	(1.542)	(0.718)	(0.693)	(0.479)	(0.413)
Secondary	3.475***	1.739***	2.482***	1.880***	1.900**	1.876***	1.555**	1.785***	1.700***
	(0.736)	(0.348)	(0.350)	(0.359)	(0.501)	(0.286)	(0.323)	(0.354)	(0.239)
Had/has private tutoring (ref: No)	0.730*	0.588***	0.646***	0.539***	0.597**	0.559***	0.648***	0.680***	0.654***
Yes	(0.125)	(0.0932)	(0.0736)	(0.0942)	(0.138)	(0.0758)	(0.103)	(0.102)	(0.0705)
Strate (ref: rural)	1.530***	0.891	1.203*	0.651***	0.797	0.690***	1.332	0.971	1.154
Urban	(0.242)	(0.146)	(0.135)	(0.105)	(0.210)	(0.0937)	(0.235)	(0.159)	(0.137)
Father's level of education	1.215	0.909	1.051	1.139	0.783	0.998	1.292	1.112	1.204
	(0.230)	(0.180)	(0.141)	(0.244)	(0.233)	(0.170)	(0.251)	(0.205)	(0.159)
Mother's level of education	1.623**	0.760	1.175	1.321	2.242**	1.580**	1.147	0.982	1.059
	(0.335)	(0.175)	(0.177)	(0.385)	(0.841)	(0.355)	(0.251)	(0.225)	(0.165)
Live with parents (ref: I live with both my parents)									
I live with one of my parents	0.806	1.120	0.898	0.969	1.151	1.047	0.715	0.909	0.852
Yes	(0.175)	(0.278)	(0.145)	(0.294)	(0.555)	(0.264)	(0.202)	(0.228)	(0.156)
No, I don't live with my parents	1.227	0.575	0.942	1.001	0.297**	0.796	0.564	1.239	0.889
Yes	(0.504)	(0.243)	(0.256)	(0.305)	(0.150)	(0.196)	(0.231)	(0.405)	(0.223)
Father insured by social security (ref:non)	1.463	0.579	0.845	0.354***	0.385	0.406	0.876	0.921	0.933
Yes	(1.031)	(0.323)	(0.355)	(0.112)	(0.498)	(0.507)	(0.404)	(0.448)	(0.308)
Mother insured social security (ref:non)	0.569	0.818	0.763	0.966	1.797*	1.188	1.098	0.800	0.916
Yes	(0.315)	(0.329)	(0.241)	(0.231)	(0.619)	(0.226)	(0.220)	(0.143)	(0.120)
Household Characteristics									
Number of children under 5 in the household	0.922	0.872	0.899	0.865	2.187**	1.359	0.937	0.820	0.839
	(0.129)	(0.104)	(0.0807)	(0.236)	(0.721)	(0.276)	(0.217)	(0.112)	(0.0969)
Number of children 5 to 14 years	0.869*	0.969	0.915	0.967	0.948	0.966	0.960	1.063	1.018
in the household	(0.0708)	(0.0844)	(0.0539)	(0.158)	(0.210)	(0.123)	(0.103)	(0.111)	(0.0755)
Number of children 15 to 64 years	0.992	1.030	1.007	1.136	1.243	1.108	0.944	0.811	0.901
in the household	(0.153)	(0.154)	(0.106)	(0.627)	(1.049)	(0.506)	(0.177)	(0.145)	(0.114)
Number of people with higher level of	1.042	0.815***	0.942	1.346**	1.209	1.263**	1.101	1.026	1.064
education in HH	(0.0756)	(0.0625)	(0.0460)	(0.172)	(0.200)	(0.126)	(0.0827)	(0.0853)	(0.0580)
Number of people ever married in the household	0.854*	0.904	0.870**	1.371**	1.180	1.206*	0.742*	1.012	0.898
	(0.0727)	(0.0827)	(0.0530)	(0.188)	(0.177)	(0.136)	(0.132)	(0.148)	(0.0975)
Number of people Unemployed	1.206***	1.130*	1.169***	1.008	0.864	1.040	1.164*	0.978	1.068
in the household	(0.0788)	(0.0810)	(0.0555)	(0.0873)	(0.189)	(0.0763)	(0.0964)	(0.0719)	(0.0579)
Number of people out of the labor force	0.885*	0.974	0.941	0.963	1.156	1.017	0.889	0.902	0.896*
in the household	(0.0580)	(0.0691)	(0.0442)	(0.0616)	(0.120)	(0.0533)	(0.0750)	(0.0775)	(0.0530)
Father Employer-Employee - mother inactive	1.280	1.097	1.180	1.036	1.372	1.153	1.325	1.173	1.231
Yes	(0.319)	(0.280)	(0.209)	(0.267)	(0.481)	(0.233)	(0.332)	(0.267)	(0.205)
Father	Mother inactive	0.641	0.774	0.627	0.298***	0.999	0.521	3.157*	4.908**
3.766***									
Yes	(0.855)	(0.694)	(0.448)	(0.132)	(1.367)	(0.663)	(2.171)	(3.678)	(1.881)
Employer-Self-employment - Informal	1.506	0.601	1.007	0.709	0.843	0.852	0.746	0.746	0.766
Yes	(0.782)	(0.301)	(0.352)	(0.175)	(1.057)	(1.055)	(0.409)	(0.409)	(0.297)
Employee - Formal	1.842***	1.076	1.429***	1.343	1.073	1.252	0.906	0.908	0.918
Yes	(0.331)	(0.215)	(0.188)	(0.338)	(0.415)	(0.257)	(0.195)	(0.198)	(0.140)
Employee – Informal	1.033	0.584	0.859	1	0.686	0.963	0.763	0.753	0.773
Yes	(0.574)	(0.305)	(0.319)	(0)	(0.875)	(1.201)	(0.396)	(0.406)	(0.285)
Inactive	3.073	0.954	1.951	1	1	1	0.267**	0.280*	0.289***
Yes	(3.989)	(0.855)	(1.367)	(0)	(0)	(0)	(0.166)	(0.205)	(0.135)
Constant	0.354*	3.126*	0.719	0.788	0.546	0.669	1.218	1.072	0.910
	(0.219)	(1.931)	(0.306)	(0.788)	(0.772)	(0.863)	(0.847)	(0.740)	(0.440)
Observations	1,070	912	1,982	1,026	534	1,560	993	982	1,975

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 9: Determinants of skill Mismatch by Gender - logit

odds ratio	Algeria		Morocco		Tunisia	
	Man	Women	Man	Women	Man	Women
Age (ref: 15-19 years)						
20-24 years	1.224	1.033	1.047	1.122	1.185	1.06
	-0.229	-0.238	-0.193	-0.289	-0.23	-0.233
25-29 years	1.416*	1.018	1.505*	0.778	1.521**	1.198
	-0.295	-0.273	-0.369	-0.272	-0.322	-0.3
Strate (ref: rural)	1.289	0.914	0.541***	0.571**	1.229	1.007
Urban	-0.206	-0.177	-0.0897	-0.14	-0.209	-0.175
Level of education (ref: university)						
Without instruction / Primary Middle	6.092***	5.208***	2.432***	5.515***	3.652***	3.589***
	-2.292	-1.999	-0.738	-2.577	-1.17	-1.112
Less than secondary	6.707***	2.902***	2.432***	3.546***	2.049***	1.795**
	-1.945	-0.794	-0.664	-1.489	-0.509	-0.484
Secondary	3.816***	1.06	1.122	2.743***	0.936	1.31
	-1.079	-0.292	-0.24	-0.891	-0.203	-0.29
Father's level of education (ref: university)	1.045	0.894	0.764	0.752	1.153	1.02
	-0.212	-0.229	-0.183	-0.243	-0.239	-0.21
Mother's level of education (ref: university)	1.841***	0.540**	1.037	2.046	1.075	1.043
	-0.434	-0.152	-0.342	-0.938	-0.256	-0.276
Live with parents (ref: I live with both my parents)						
No, I don't live with my parents	1.444	1.805	0.859	0.911	1.105	0.998
Yes	-0.545	-0.844	-0.269	-0.465	-0.447	-0.347
Father insured by social security (ref:non)	1.261	0.927	0.165***	0.213	1.048	0.385*
Yes	-0.799	-0.634	-0.0645	-0.245	-0.488	-0.215
Mother insured social security (ref:non)	0.948	0.512	1.277	1.335	1.387	1.105
Yes	-0.452	-0.241	-0.383	-0.525	-0.277	-0.219
Number of children under 5 in the household	1.048	0.945	1.131	1.579*	0.879	1.012
	-0.153	-0.132	-0.312	-0.423	-0.203	-0.143
Number of people with higher level of education in the household	1.029	0.936	1.560***	1.128	1.023	1.089
	-0.0716	-0.0905	-0.2	-0.197	-0.0744	-0.0985
Number of people Unemployed in the household	1.245***	1.262***	0.844**	1.037	1.043	1.025
	-0.0734	-0.1	-0.0727	-0.214	-0.0771	-0.079
Father Employer-Employee & mother inactive	1.454	2.540**	1.206	0.939	1.780**	1.329
Yes	-0.434	-1.017	-0.346	-0.359	-0.476	-0.346
Employer-Self-employment - Informal Yes	0.804	0.561	0.655*	0.405	1.036	0.389
	-0.401	-0.344	-0.148	-0.434	-0.566	-0.25
Employee - Formal Yes	1.885***	1.18	2.168**	1.563	0.847	1.098
	-0.364	-0.297	-0.765	-0.747	-0.185	-0.266
Employee – Informal Yes	1.048	0.661	1	0.35	0.937	0.475
	-0.578	-0.421	0	-0.386	-0.489	-0.292
Constant	0.0315***	0.220*	0.437	0.393	0.200**	0.358
	-0.0209	-0.177	-0.259	-0.509	-0.143	-0.274
Observations	1070	912	1026	534	993	982

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Statement : My current job offers me sufficient scope to use my knowledge and skills.

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