

**FORMAL-INFORMAL GAP IN RETURN TO SCHOOLING
AND PENALTY TO EDUCATION-OCCUPATION
MISMATCH A COMPARATIVE STUDY FOR EGYPT,
JORDAN, AND PALESTINE**

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Abstract

This paper is a comparative study for three labor economies in the Middle East (Egypt, Jordan, and Palestine). The purpose of this paper is to investigate for differences in return to education between formal and informal types of employment. The paper investigates the presence of wage penalty to education-occupation mismatch and the differences in wage penalty between formal and informal employment. Using labor force survey data from the three countries, a hierarchical linear model is estimated in order to test for heterogeneity in wage penalty across occupations. Results show lower rate of return to education for informal employees. Moreover, wage penalty to over-education is observed in Egypt and Palestine for informal employees. A wage penalty to under-education of informal employees is observed only in Egypt.

JEL Classification: J1, J3

Keywords: Labor economics, education, wage penalty, Egypt, Palestine and Jordan

ملخص

هذه الورقة هي دراسة مقارنة لثلاثة اقتصادات للعمل في الشرق الأوسط (مصر، والأردن، وفلسطين). والغرض من هذه الورقة هو دراسة الفروق في العودة إلى التعليم بين الأنواع الرسمية وغير الرسمية للعمال. نقوم بالتحقيق في وجود عقوبة الأجر في التعليم وعدم التطابق والاختلاف في عقوبة الأجر بين العمل الرسمي وغير الرسمي. وباستخدام بيانات مسح القوى العاملة من الدول الثلاث، نقوم بتقدير النموذج الخطي الهرمي من أجل اختبار عدم التجانس في عقوبة الأجر عبر المهن. أظهرت النتائج انخفاض معدل العائد على التعليم غير الرسمي للموظفين. وعلاوة على ذلك، لوحظ وجود عقوبة الأجر في حالة الإفراط في التعليم في مصر وفلسطين للموظفين في القطاع غير الرسمي. ويلاحظ أيضا وجود عقوبة الأجر إلى ما دون التعليم من الموظفين في القطاع غير الرسمي في مصر فقط.

1. Introduction

The recent Arab revolutions have revealed questions on poverty, inequalities and economic exclusion of a large part of the population. Economic exclusion, corruption and bureaucratic regulations forced the poorest and middle income categories to accept informal employment.

Providing decent work conditions is an important challenge in Arab states. Under high rates of informal employment and in the presence of informal firms, decent work is difficult to be under the control of governments.

Economic growth theories state that investment in education and human capital is an essential input for sustainable development. However, returns of education may vary for individuals in similar jobs. One important reason can be education-occupation mismatch. Literature finds that informal employees are more likely to be over-educated. They also have lower returns to education on their wages.

Learning outcomes in Arab countries do not usually satisfy job requirements, which imply high unemployment among graduates, wage penalties and demand for over-educated labor for jobs that require lower skills. Meanwhile, high unemployment motivates job-searchers to accept informal employment with lower wages and/ or less satisfying conditions. This research paper analyzes the return to schooling in formal and informal sectors of employment. It analyzes how different are income penalties to education-occupation mismatch to formal and informal employees.

The paper will compare these features for three Arab countries (Egypt, Jordan, and Palestine). These countries have different characteristics of the labor market. The Egyptian labor market is characterized by low-skilled labor, large heterogeneity across individuals and occupations and features imperfect information on employees' skills (El-hamidi, 2009; Herrera and Badr, 2011). The Jordanian market is an immigrant market for unskilled labor (Charmes, 2010) and it has advancement to other Arab labor markets including governmental strategies to achieve labor market efficiency, such as an ILO program for decent work. The Palestinian labor market is characterized by high unemployment rate and important unskilled employment rate in Israeli territories and settlements.

Two specific objectives will be tackled in this research paper:

- to measure how different is return to education between formal and informal employment
- how different are wage penalties to education-occupation mismatch in formal and informal employment.

The paper finds important differences in return to required education, over-education and under-education between formal and informal employees, with differences between countries. While Egyptian informal employees have lower return to required education and lower return to over-education, the wages of Palestinian informal employees are independent on education. The paper finds significant bias of selection to informality in Egypt and Palestine, which confirms the theory of segmented markets. However, no significant selection bias is found for Jordanian employees, which implies equal rates of return to education between formal and informal employees.

The paper is organized as follow: Section 2 presents literature review to wage penalty to education mismatch and to the MENA region. Section 3 presents the methodology and how it deals with the objectives of the paper. While, section 4 explores descriptive statistics in the three countries, section 5 shows the results of the model estimation. Finally, section 6 concludes the paper.

2. Literature Review

A number of explanations have been offered to explain why some earning-relevant characteristics, for example, education, are better rewarded in the formal sector than in the informal sector. An important bulk of these explanations is based on a segmented view of the labor market. For instance, the presence of extremely restrictive labor market institutions and strict regulation of entry into the formal sector could pose a possible cause; so that some workers that do not have access to the formal sector are forced to accept informal sector jobs characterized by inferior earnings (Fields, 1975). However, several more recent studies postulate, for both firms and workers the decision of being formal turns out to be extremely costly, due to the non labor costs associated with health and pension contributions, payroll taxes, commuting subsidies, among others, which significantly increases the attractiveness of informal activities. Maloney (1999), for instance, introduces a standpoint in which workers may find informal employment a desirable alternative, due to inefficiencies in the provision of public services, that is, health and pension, or because their level of human capital do not fulfil the requirements for performing formal jobs. In the last case, a wage penalty for informal employment may be due to sorting, where those with low levels of human capital are also those more likely to work in the informal sector (Tokman, 1982). This type of sorting may result from the fact that firms in the informal sector have limited access to financing and employers choose to substitute physical capital for low-skill labor (Amaral and Quintin, 2006).

Wage penalty due to education-occupation mismatch is analyzed in many papers. Nordin, Persson and Rooth (2008) use Swedish labor force data and find that income penalty to education mismatch decreases with higher experience. Moreover, they find that mismatched workers do not move to matching occupations overtime. Thus, income penalty seems to be permanent.

Chiswick and Miller (2008) analyze the difference in returns to education between native and foreigners in United States. They find that the lower payoff to schooling for foreign-born workers is due to under education (linked with positive self-selection in immigration among immigrants with low levels of schooling) rather than to over-education (related to the less-than-perfect international transferability of human capital). Under the same line, Ren and Miller (2012) also use the over-under education framework for analysing the difference in the returns to schooling between men and women in China.

As far as I know, the idea of distinguishing the difference in the returns from required, over and deficit years of education for formal and informal workers is a recent contribution by researchers. One of these contributing researches is the paper of Arbex, Galvao and Gomes (2010). Based on a theoretical two-period model, Arbex, Galvao and Gomes estimate a quantile regression model and find evidence for Brazil that there exists an education penalty for informal workers, notably for highly-skilled informal workers.

In another study, Herrera-Idarraga, Lopez-Bazo, and Motellon (2012), using micro-data for Colombia, find that after controlling for other characteristics and correcting for endogeneity, informal salary workers are more likely to be over-educated than formal workers. Thus it is not a sorting problem as discussed Tokman (1982). Instead, it is possibly an education-occupation mismatch in the informal sector that derives the penalization in terms of wages to informal workers.

In addition to the above literature, other studies consider the informality as a choice by employees, not only as a market-institution-driven variable. Thus, Carneiro and Henley (2001), Pratap and Quintin (2006) and Herrera-Idarraga, Lopez-Bazo, and Motellon (2013) adjust the Mincer regression equation to the bias of selection in the formal-informal sectors. Carneiro and Henley, by applying Lee's (1978) approach, find a significant selection bias and

a significant wage penalty in Brazil. However, Pratap and Quintin find no evidence for wage penalty to informality in Argentina after controlling for the selection bias into the formal sector. Herrera-Idarraga *et al* find evidence of a double penalty for mismatched employees to occupations in Columbia's informal sector.

In the Middle East and North Africa, little literature is found on education-occupation mismatch with formal-informal comparison. Herrera and Badr (2011) find that the return to education varies between 1998 and 2006 in Egypt, with higher return for high skilled labor and lower return for unskilled and intermediate-educated labor. This change is due to changes in the labor supply and demand factors. On the supply side, the number of intermediate education and illiterates outpaced the growth rates of all other categories. On the demand side, structural changes in the industrial sector require highly-skilled labor. Moreover, El-Hamidi (2009) uses Egyptian labor force survey data of 1998 and 2006. The paper finds evidence of an education-occupation mismatch in the Egyptian private sector. The incidence has declined from 51% to 42% during the eight year period, and males are more likely to be mismatched than females. However, the paper does not explore the formal-informal gap and does not correct for self-selection bias.

For the Palestinian labor force, Angrist (1998) finds that return to schooling is low relative to neighbour countries. Daoud and Sadeq (2012) find that labor demand by Israel, which is mostly informal, is the most important variable in determining return to education, with a negative effect, using quarterly data 1996 – 2011. Palestinian labor in Israeli territories and settlements is an important component of informal and low-skilled labor but they earn high wages relative to local Palestinian workers. As a result, there is a need to analyze the difference in return to schooling and in wage penalty to education mismatch between formal and informal employees.

The Jordanian labor market exhibits different features since it has been an immigrant market, especially after political tensions in neighbour Arab countries such as Iraq, Syria, and Libya. An ILO report on informal economy and labor market policies in the MENA region (Charmes, 2010) observes that Jordanian nationals are more likely to refuse low-skill jobs. Thus, immigrants fulfil the gap in low-skill jobs.

3. Methodology

In this paper, Mincer equation is estimated with two-level data. The first level is individual and the second level is job level. The regression model adjusts for selection bias in informal employment using Lee's (1978) approach. Mincer equation is estimated separately for formal and informal employees ($k = F$ and $k = I$, respectively) with an additional term for selection bias correction.

$$\ln W_{ijk} = \beta_{0,k} + \beta_{1,k} \bar{S}_j + \beta_{2j,k} OS_{ij,k} + \beta_{3j,k} US_{ij,k} + \beta_{4,k} age_{ij,k} + \beta_{5,k} age_{ij,k}^2 + \alpha_k X_{ij,k} + \lambda_k \theta_{ij,k} + u_{ij,k} \quad (1)$$

Individual index is denoted by i and occupation index is j . W is daily wage, X is a set of individual characteristics of waged employees, \bar{S} is required years of schooling for job j , OS is the years of over-education above the job's required years of schooling, US is the years of under-education lower than the job's required years of schooling. The observed years of schooling can be defined as:

$$S_{ij} = \bar{S}_j + OS_{ij} - US_{ij}$$

The effects of over-education and under-education years are assumed to be variant across occupations. The effects are decomposed of a fixed component (γ) and a random component (u_j). Two-level mixed models estimate the fixed effects and the variance of random effects.

$$\beta_{2j,k} = \gamma_{2,k} + u_{2j,k} \quad (2)$$

$$\beta_{3j,k} = \gamma_{3,k} + u_{3j,k} \quad (3)$$

In order to adjust for selection bias into informal employment, Lee's (1978) approach is used through the inclusion of the terms $\theta_{ij,F}$ in formal employment equation and $\theta_{ij,I}$ in informal employment equation. Employees are assumed to accept an informal employment if it gives them higher payoff than formal employment (i.e: $\log\left(\frac{W_{ij,I}}{W_{ij,F}}\right) > \rho_{ij}$), where ρ is the reservation percentage difference in wages between informal and formal employment in the same circumstances. Lee (1978) suggests the following adjustment terms:

$$\theta_{ij,I} = \frac{-f(\varphi_{ij})}{F(\varphi_{ij})}$$

$$\theta_{ij,F} = \frac{f(\varphi_{ij})}{1 - F(\varphi_{ij})}$$

The term φ is the logit of going to informal employment, f is the normal density function and F is cumulative normal probability distribution. This approach is also used by Herrera-Idarraga, Lopez-Bazo, and Motellon (2013).

The dependent variable of the logit function is informality with a value of 1 for informal employment. Angel-Urdinolo and Tanabe (2012) find that the main determinants of informal employment in the MENA region are sex, age and years of schooling. In this paper, the logit model controls for other additional important variables: marital status, urban locality indicator variable, informality of the first job, union membership, firm size and firm's sector for the primary job. Table A2 in the appendix reports the findings of the logit model estimations.

The measurement of over-education and under-education varies between studies. Broadly, the following four measures are used in the literature:

- Direct self-assessment: A subjective way of measuring education-occupation mismatch is through asking respondents whether they find themselves overeducated, undereducated or rightly educated (Groenveld, 1997). However, this method is subjective and may depend on the individual characteristics of the respondent.
- Indirect self-assessment: One can ask the respondents to provide the required educational level to their jobs, and then compute the difference between their achieved years of education and the required level (Duncan and Hoffman, 1981). This is also a subjective way, where the provided required level depends on individual's perception of the job's duties level.
- Realised matches: Verdugo and Verdugo (1989) define the required educational based on the educational level distribution of workers in each occupation. They define a worker to have the required level of education if his educational level is within one standard deviation of the occupation's mean (El-Hamidi, 2009). This measure has been criticized since the choice of one standard deviation is completely subjective and since the job level is endogenously related to the educational level of workers.
- Job analysis: The job analysis method bases the required educational level on the occupations' classification. A broadly used classification is the ILO's International Standard Classification of Occupations (ISCO) which defines the required skills of occupations. The problem with occupations' classification is the changing required skills due to technological progress. Thus, classifications should be frequently updated to take into account changes. Although important technological progress in the MENA region in

the recent years, they are not more innovative than global changes. Moreover, the use of an international definition of required skills is more relevant for cross-country comparisons. Hartog (2000) concludes that job analysis is the most relevant method.

The required year of education is determined based on the International Standard Classification of Occupations (ISCO – 2008), which defines the required skills to each job. Table 1 shows the required years of education.

Herrera-Idarraga, Lopez-Bazo, and Motellon (2013) use mean years of education by job as proxy variable for required educational level. However, this paper has a statistical concern that they ignore the presence of a two-level hierarchical data.

The model of this paper will be estimated using labor force survey for Egypt (2010), Jordan (2012) and Palestine (2012). Informal employees are defined as those who work without contract.

Hierarchical linear models are usually estimated by restricted maximum likelihood (REML) method. Maximum likelihood estimation leads to biased estimation of variance and covariance of random effect components since it assumes one-level data. The advantage of REML is that it partitions the likelihood into two parts, where one component is free of fixed effects. The maximization of this part with respect to the variance matrix implies an unbiased estimation of variance and covariance of random effects.

4. Descriptive Statistics

This section illustrates the characteristics of the three labor markets, notably in terms of educational attainment, education mismatch, informality of employment and mean wages.

The three countries are characterized by low participation rate in the labor force, especially for females. Females' are facing higher unemployment in Egypt and Palestine than males. Informality is the characteristic of around half of wage employment in Egypt and Palestine, relatively high compared to 27.3% in Jordan. A gender gap in informal employment is found in the three labor markets, where females' rate of informal employment is lower than males. This cannot be observed as a positive point for females since they have a much lower rate of participation, where they may refuse to get into the labor market due to the deteriorated labor conditions, including informal employment.

Wage employment is the main employment status, from 64% in Egypt to 83.8% in Jordan. Females in Egypt and Palestine are less likely to work as wage employees and more likely to work in unpaid family work. However, in Jordan women prefer wage employment than in the other countries, probably due to more secure jobs. This paper will study wage penalty, thus it will tackle only wage employees.

Table 4 shows how large the gap in the rate of informality across occupations. In general, the low-skill level occupations have higher rates of informality. The next table confirms that unskilled workers are more likely to work in informal employment.

The other feature that I study in this paper is education-occupation mismatch. The required years of education are computed as explained in the section 3. Table A1 in the appendix explores the education-occupation matching status. While Egyptian workers are mostly under-educated (66.5% of all wage employees), Palestinian workers are more likely to be over-educated (41%). Jordan employees are more likely to match the required skills of occupations (41.2%). In general, it can be observed in the three countries that over-education is more recurrent in clerical and elementary jobs. However, under-education is the most likely among services workers, skilled agriculture workers, craft workers and machine operators.

It is important to notice that informal employment is not only associated low skill levels as described in table 5. Informality is also at high rates in Egypt and Palestine among over-educated workers.

The objective of the paper is to analyze the wage penalty to mismatch and to informality. Table 7 shows a prior outlook of the wage penalty, which is calculated as the wage difference between matching education and mismatching education and between informal and formal employees.

The wage penalty due to informality is the largest for skilled jobs (Managers and professionals) in Egypt and Palestine. Formal employees in skilled jobs usually benefit from allowances and benefits better than informal employees. This explains the large penalty of informality to high skilled jobs. However, informality of employment in Jordan is more severe in low skill level occupations, probably due to the fact that immigrant non-Jordanian workers are more likely to go to informal low-skilled jobs. It is important to notice that informal employment rate among Jordanian employees is 24.0%, compared to 80.3% among immigrants. Wage penalty due to education-occupation mismatch is more severe in Egypt than in Jordan and Palestine, due to a larger supply of unskilled labor. However, this analysis may change after controlling for other characteristics of employees.

5. Results

The econometric model of equation (1) is estimated separately for formal and informal employees, in order to adjust for selection bias. A significant coefficient of selection bias correction means that there are segmented markets of formal and informal employment, where employees have lower wages because they have lower probabilities to enter a market. The below table explores the estimation results of fixed effects for a hierarchical linear model.

Selection bias adjustment is significant in Egypt and Palestine, which confirms the segmentation of the markets of formal and informal jobs. However, selection bias is significant in Palestine only for formal employees. Moreover, a positive sign of the coefficient of selection bias means that employees in that sector have higher wages because they can enter the market. Thus, Egyptian employees, with negative coefficients, select formal or informal jobs with lower wages because they do not have access to the other market (informal and formal). This is a strong fragmentation in the Egyptian labor market. The logit model estimation confirms this result, where one of the important variables is the informality of the first job. This means that employees who start by an informal/ or formal employment are more likely to stay in the same type of jobs. This can be expressed as a rigidity of the Egyptian labor market. For Palestine, only formal, but not informal, employees have a positive selection bias. Formal Palestinian employees would select formal employment for higher wages than informal employment in the same circumstances.

The insignificance of the selection bias in the case of informal employment in Palestine can be explained by the presence of employment in Israeli territories and settlements, which constitutes around 20% of total employment, mostly (96.3%) informal and paid more than similar jobs in the local market. Thus, local informal employees have lower wages than formal employees, but informal employees working in Israeli territories and in settlements balance the wage gap with higher wages than in the local market. Daoud and Sadeq (2012) find that employment in Israel is the most determinant factor of return to education. This result is present here in another way; employment in Israeli territories and settlements, which is mostly informal, implies that when the regression model is split between formal and informal employment education effect completely disappears for informal employees. In other words, informal employment in Palestine has a zero rate of return to education, compared to a higher level for formal employment. This result is an important contribution to

the literature that searched why return to education in Palestine is low relative to other countries in the region (Angrist, 1998).

The three countries show close rate of return to required years of education for formal employees, between 7.8% and 8.4%. In Egypt and Palestine, rate of return to job-required educational level is penalized for informal employees. This means that wage penalty in Egypt and Palestine, is not penalized only due to individual characteristics of employees, but also due to a lower market wage for informal employment, relative to a formal job in the same conditions.

Over-education is positively awarded for formal employees in the three countries, with a rate of return 5.4% to 8.9%. However, the rate of return to over-education of informal employees is penalized in Egypt with a lower rate of return of 3% compared to 8.9% to formal employees. El-Hamidi (2009) finds a high rate of return to over-education to professional jobs and low rates to low-skill jobs in Egypt. She explains that by the imperfect information model, where employers use education as an indicator of the cost of training. Employers prefer higher educated employees for lower cost of training, especially among professionals and managers. However, for low-skill jobs, employers have a lower cost of training and they care less about over-education. This explains the wage penalty of over-education among informal employees, where informal employees are more likely to work low-skill jobs. In Egypt, we can conclude, based on the above analysis, that there is a double penalty to over-education for informal employees. One penalty is due to the informality of employment, with lower market wages, and the other is due to a lower rate of return to over-education. This was also found by Herrera-Idarraga, Lopez-Bazo, and Motellon (2013) for the Columbian labor market.

In Jordan, an evidence for segmented markets was not found. Thus, in the absence of segmented markets, rates of return are expected to be equal between formal and informal markets. As a result, no significant wage penalty, for informal employees, is found on all rates of return to education.

Under-education is penalized only for formal employees in the three countries. This penalty is due to a large labor supply of unskilled employees. It can also be noticed that under-education penalty is less penalized than over-education is awarded in formal employment. This is an interesting result, which means that under-education does not matter for employers as matters over-education. In other words, the outcomes of education in the three countries do not match employment needs and are partially substituted by on-job training to under-educated or by higher demand to over-educated labor. A World Bank report on youth employment in the MENA region (Kabbani and Kothari, 2005) and ILO's School-to-Work Transition Surveys highlight a problem of education outcomes among youth graduates. Nevertheless, under-education is not penalized for informal employees. This can be explained by the fact that informal employment is more likely to occur in low-skill jobs. Moreover, informal sector employers prefer to substitute capital by under-educated labor for lower cost (Amaral and Quintin, 2006).

Regarding the other controlling variables, the gender gap is important in the region. Moreover, gender gap of wages is even higher among informal employees. Double penalty is observed for females, especially in Palestine and Egypt. In addition, wages are concave with respect to age, but an interesting finding is that age is not significant in the equation of formal employees' wages after controlling for the selection bias in Egypt and Jordan. In other words, age is only a matter of selection in formal employment. With a negative sign of age in the selection equation, the insignificance of age in the wage equation means that only older employees (or more experienced) have the motivation to select formal employment instead of informal for higher wages.

The heterogeneity of education-occupation mismatch wage-penalty across occupations for formal and informal employment is examined by testing the significance of the random components' variance. The below table explores the variance estimates of random effects for the three countries.

The results show more heterogeneity of wage penalty to under-education in Egypt than in Jordan and Palestine, especially in formal employment. Based on our analysis to the effect of under-education, the matching between education's outcomes and employment seems to vary across occupations. Egypt needs further analysis of the requirements of each job from the educational system. Wage-penalty of over-education is heterogeneous across informal jobs in Jordan. Wage penalty in Palestine does not show any significant heterogeneity across occupations

6. Conclusions

This paper found important rates of informal employment and education mismatch to job skills in Egypt, Jordan and Palestine. It examined the difference in return to required education and found an important difference (up to 5.7%) between formal and informal employment.

The paper found differences in wage penalties to education mismatch across countries. While a significant double wage penalty to over-education and informality is found in Egypt, penalty to under-education is not found in Jordan and Palestine. Under-education is penalized in both sectors in Egypt, but with a lower penalty to informal employees.

Wage penalty to under-education is found to be more heterogeneous across occupations in Egypt than in Jordan and Palestine. The paper found evidence of segmented markets of formal and informal employment in Egypt and Palestine.

It is more than evident, but important to state, that informality of employment and mismatch of skills imply important penalties to workers' earnings. Thus, governments are strongly recommended to act for policies that orient workers and employers to decent and formal work conditions.

Governments are urgently required to restructure the educational system, quality and access in order to match acquired skills to jobs' requirements. Governments should study labor supply and demand in detailed occupations, not only in general, and should orient students to market needs.

For Palestine, informal employment is found independent on education, which is a reason for low return to education relative to the other countries. This requires a further work to analyze the reasons of informality and to restructure the educational system accordingly.

In general, government programs should also be oriented toward self-employment and entrepreneurship as a way to overcome the labor supply-demand gap and high unemployment in the region, by creating new jobs.

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Table 1: Required Skills of Occupations Definition by ISCO – 2008

Occupation	Required years of education
Managers	16
Professionals	16
Technicians and associate professionals	14
Clerical support workers	12
Service and sales workers	12
Skilled agricultural, forestry and fishery workers	12
Craft and related trades workers	12
Plant and machine operators, and assemblers	12
Plant and machine operators, and assemblers	12
Elementary occupations	6

Table 2: Main Indicators of Labor Markets

Main indicators	Egypt			Jordan			Palestine		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Labor force participation rate	80.8	23.4	51.6	70.7	17.1	43.7	69.6	20.6	45.8
Unemployment rate	4.0	14.3	7.1	6.9	4.0	5.4	19.9	24.0	20.8
Informal employment rate of wage employees	52.6	16.0	46.1	29.4	18.3	27.3	56.1	24.5	50.3

Table 3: Employment Status by Country and Sex

Employment status	Egypt			Jordan			Palestine		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Wage employee	73.1	40.6	64.0	82.3	91.0	83.8	69.0	56.3	66.3
Employer	12.1	2.1	9.3	6.4	1.9	5.7	5.8	.8	4.7
Self-employed	9.7	5.7	8.6	10.6	4.7	9.6	18.4	9.4	16.4
Unpaid family worker	5.2	51.6	18.1	0.7	2.4	1.0	6.8	33.5	12.6
Total	100	100	100	100	100	100	100	100	100

Table 4: Rate of Informal Employment by Occupation and Country

Occupation	Egypt	Jordan	Palestine
Managers	5.0	12.7	11.2
Professionals	6.6	9.9	7.4
Technicians and associate professionals	7.4	13.2	14.9
Clerical support workers	14.8	9.4	24.1
Service and sales workers	61.7	23.7	38.8
Skilled agricultural, forestry and fishery workers	97.1	83.3	85.7
Craft and related trades workers	88.2	59.0	93.3
Plant and machine operators, and assemblers	48.7	46.0	81.4
Elementary occupations	39.6	36.4	82.6
Total	46.1	27.3	50.3

Table 5: Rate of Informal Employment by Years of Schooling and Country

Years of schooling	Egypt	Jordan	Palestine
0 – 10	72.5	46.4	77.1
11 – 12	48.5	24.9	65.0
13 – 16	18.1	14.6	21.0
17+	5.5	11.0	9.6
Total	46.1	27.3	50.3

Table 6: Rate of Informal Employment by Status of Education–Occupation Matching and Country

Matching status	Egypt	Jordan	Palestine
Over-education	38	23.7	54.9
Under-education	54.2	40.7	65.3
Matching	23.7	17.2	25.1

Table 7: Percentage of Mean Wage Penalty by Occupation and Country

Occupation	Egypt		Jordan		Palestine	
	Mismatch penalty %	Informality penalty %	Mismatch penalty %	Informality penalty %	Mismatch penalty %	Informality penalty %
Managers	-8.5	-51.9	-6.8	-17.4	-3.0	-78.1
Professionals	-33.6	-61.3	7.5	-6.2	24.5	-71.6
Technicians and associate professionals	-13.0	-39.5	-13.2	-25.4	14.0	-56.2
Clerical support workers	-23.5	-44.0	7.4	-34.3	-3.0	-29.4
Service and sales workers	-7.6	-29.4	-12.8	-51.7	-6.5	-55.4
Skilled agricultural, forestry and fishery workers	-8.1	-6.7	11.2	-51.4	-27.3	22.2
Craft and related trades workers	-7.0	-1.2	-2.6	-41.9	2.7	5.9
Plant and machine operators, and assemblers	-2.2	-22.0	6.8	-28.7	21.0	-14.3
Elementary occupations	-0.2	0.0	-11.7	-22.0	-4.0	5.8

Table 8: Fixed Effect Estimates by Country

Fixed effect	Egypt		Jordan		Palestine	
	Informal	Formal	Informal	Formal	Informal	Formal
Female	-0.544***	-0.3121***	-0.2872***	-0.2253***	-0.7235***	-0.1343***
Married	-0.0191	0.106***	0.0032	0.1398***	0.0632	0.0721***
Required	0.021	0.0786***	0.076**	0.0843***	0.0204	0.0779***
Over-education	0.030**	0.0887***	0.081*	0.0640***	0.0275	0.0538***
Under-education	0.001	-0.0342***	-0.0135	-0.0527**	0.001	-0.0316**
Age	0.033***	0.0069	0.0441***	-0.0008	0.0757***	0.0614***
Age squared	-0.0004***	0.0001	-0.0005***	0.0001	-0.0009***	-0.0007***
Selection adj.	-0.114**	-0.2172***	-0.0248	-0.0129	0.0306	0.0898***
Intercept	6.192***	6.0792***	0.2528	1.4364***	1.8364***	2.0069***

Notes: * significant at 10. ** significant at 5. *** significant at 1.

Table 9: Random Effect Variance Estimates by Country

Random effect	Egypt		Jordan		Palestine	
	Informal	Formal	Informal	Formal	Informal	Formal
Residuals	0.4396***	0.3864***	0.5674***	0.4017***	0.4299***	0.1155***
Intercept	0.0003	0.0016	0.0461**	0.0013	0.0267**	0.0147**
Over-education	0.0000	0.0008	0.0058*	0.0009	0.0006	0.0007
Under-education	0.0095*	0.0139**	0.0004	0.0022*	0.0001	0.0009

Notes: * significant at 10. ** significant at 5. *** significant at 1.

Appendix

Table A1: Distribution of Education-Occupation Matching Status by Occupation and Country

Occupation	Egypt			Jordan			Palestine		
	Matching	Over-education	Under-education	Matching	Over-education	Under-education	Matching	Over-education	Under-education
Managers	47.9	5.5	46.5	50.8	31.7	17.5	38.3	38.3	23.4
Professionals	39.7	8.6	51.7	61.5	22.3	16.1	64.8	29.9	5.4
Technicians and associate professionals	7.4	18.4	74.3	62.1	11.5	26.4	43.3	30.3	26.4
Clerical support workers	43.1	33.5	23.4	45.1	28.6	26.3	28.0	47.2	24.8
Service and sales workers	12.8	24.2	63.0	41.1	17.0	41.9	16.1	24.1	59.8
Skilled agricultural, forestry and fishery workers	6.5	3.7	89.8	18.2	6.1	75.8	16.0	8.0	76.0
Craft and related trades workers	9.5	6.4	84.1	27.5	12.0	60.5	12.2	9.2	78.6
Plant and machine operators, and assemblers	14.8	8.2	77.0	24.7	6.8	68.5	11.6	10.9	77.6
Elementary occupations	11.1	52.0	36.9	10.8	71.8	17.4	9.2	80.5	10.3
Total	18.6	14.9	66.5	41.2	21.7	37.2	25.7	41.0	33.3

Table A2: Logit Model Estimation of Informal Employment

	Egypt	Jordan	Palestine
Years of schooling	-0.1071***	-0.1430***	-0.1583***
Age	-0.0675***	-0.0273***	-0.0243***
Female	-0.3716***	-0.1023	-0.3436**
Married	-0.6655***	-0.4888***	-0.3381**
Rural ^a	-0.1301*	-0.7321***	-0.1832669
Camps ^a	NA	NA	-0.145108
Gaza strip	NA	NA	0.3798**
Union membership	-2.0678***	-0.3464	-0.1130
First job informal	1.4064***	2.4194***	NA
Firm size 1 ^b	0.2734**	NA	0.0473
Firm size 2 ^b	-1.2478***	NA	-1.0453
Firm size 3 ^b	-1.9850***	NA	-1.9196**
Firm size 4 ^b	-2.5325***	NA	-3.8634***
Firm size 5 ^b	-3.3965***	NA	NA
Manufacturing ^c	-2.7913***	-2.6222***	-0.0314
Construction ^c	-1.1987***	-1.6591***	-0.0453
Commerce, hotels and services ^c	-3.6224***	-2.4758***	-1.3056***
Transport and storage ^c	-4.0414***	-1.7223***	-1.6321***
Other ^c	NA	-4.5918***	-4.3485***
Work in Israeli territories	NA	NA	2.6338***
Intercept	8.0589***	5.8858***	7.0515***
Nagekerke R ²	0.632	0.558	0.859

Notes: * significant at 10 . ** significant at 5 . *** significant at 1 . a. Reference group is urban. b. Egypt: 1=5-9, 2=10-24, 3=25-49, 4=50-99, 5=100+, reference group is: 1-4 employees. Palestine: 1=2-4, 2=5-9, 3=10-19, 4=20+, reference group is: only one employee. c. Reference category: Agriculture