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ABSTRACT

Is There an Informal Employment Wage Penalty in Egypt?*

This paper considers the private sector wage earners in Egypt and examine their wage distribution during 1998-2012 using Egyptian Labor Market Panel Survey. We first estimate Mincer wage equations both at the mean and at different quantiles of the wage distribution taking into account observable characteristics. Then we make use of the panel feature of the data and estimate models taking into account unobservable characteristics. We also consider the possibility of nonlinearity in covariate effects and estimate a variant of matching models. In all cases we find a persistent informal wage penalty in the face of extensive sensitivity checks. It is smaller when unobserved heterogeneity is taken into account and larger at the top than at the bottom of the conditional wage distribution. We also examine the informal wage penalty over time during the study period and in different groups according to experience and education. The informal wage penalty has increased recently over time and is larger for the better educated but smaller for the more experienced.

JEL Classification: J21, J31, J40, O17

Keywords: formal and informal wage gap, formal and informal employment, panel data, Egypt

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I. Introduction

Informal employment is an important characteristic of developing country labor markets. Egypt is not an exception with her quiet large informal sector. In fact, presence of large informal sector is one of the main differentiating characteristic of the developed and developing country labor markets. Recent estimates provided by Gatti et al. (2014) put the informality rate, measured as the percent of labor force not contributing to social security, at 67 percent in the Middle East and North Africa (MENA), 61 percent in Latin America, 39 percent in Europe and Central Asia, 91 percent in South Asia and 95 percent in Sub-Saharan Africa. Further, according to the same source there has been a rapid increase in informality in the entire developing world. Perry et al. (2007) reported an increase in informality during the 1990s in several Latin American countries. Informality may have adverse effects on growth and social well-being meriting its closer examination. Understanding the informal sector of employment is crucial for understanding the functioning of the labor markets as well as the structure of economic activities. Large informal sector has important implications for the efficiency of the allocation of labor. Grasping the nature, character and functioning of the informal sector is essential for understanding the income inequality, persistent poverty and labor market inefficiencies in these countries.

The concept of informal sector was first introduced by Hart (1971). However, it is only during the last two decades more attention is devoted to understanding the informal sector both by academicians and the policy makers. Currently, there is a large amount of empirical evidence for many developing and transition countries. Loayza (1996) and De Soto (1989) provide a detailed characterization of informal labor markets in developing countries. Several definitions are used to characterize informal employment. Some studies consider self-employment and employment in small or micro firms as informal. However, most frequently, informal employment is associated with workers being unregistered, not having a contract, not paying taxes, and not subject to labor market regulations such as minimum wage, employment protection, unemployment insurance and health and safety regulations and retirement benefits. Thus, it is often argued that informal employment is characterized not only by low earnings and inferior working conditions but also lack of several fringe benefits. Thus, from a social welfare

point of view informal sector is seen as undesirable. However this view is challenged as elaborated below.

There are two competing views of the developing country labor markets with large informal sector. The traditional view espoused for instance by Fields (1975) and Dickens and Lang (1985) implies that the labor market is segmented along formal informal lines and that workers enter informal employment in order to escape unemployment because they are rationed out of the regulated formal sector. They earn less than the identical workers in the formal sector. The presence of trade unions and regulations such as minimum wages and collective bargaining and efficiency wage considerations keep formal sector wages above market clearing levels In contrast, more recent writings support the competitive view of the labor market where presence of any wage gaps between formal and informal sectors could be attributed to compensating differentials prevailing in one sector or the other.

Rosen (1986) proposed a model of a frictionless labor market with homogenous workers. In such a model the average earnings is higher in the informal sector to compensate for the lack of non-pecuniary benefits which are assumed to have nonnegative value. In such an economy if there is a formal sector wage premium arbitrage will sweep away this wage differential. Persistence of formal sector wage premium suggests existence of barriers to entry into the formal sector jobs so that the labor market is deemed segmented. However, in the presence of heterogeneous workers a wage gap does not implying segmentation. Roy (1951) stressed the possibility of self-selection into the sector where the worker is most productive. Tokman (1982) suggested that workers with lower human capital are more likely to sort into informal sector. In this case the wage gap would be the results of productivity differentials. Heterogeneity of workers would be due to differences in individual observable and unobservable characteristics.

Persistent and significant formal sector wage premium after controlling for observable and unobservable individual characteristics indicates barriers to perfect mobility between formal and informal sectors and that formal jobs are rationed. Formal sector wages do not clear the market due to minimum wage laws, unions or other labor market regulations and efficiency wage considerations. This implies that the labor market is segmented as proposed in the mainstream

view. Maloney (2004) points out the above mentioned possibility of self-selection into the informal sector. Informal sector may be a desirable alternative to formal sector jobs while providing flexibility at work hours and location and tax savings. These are referred to as compensating differentials of the informal sector. For many women such differentials may offer a better balance between home and work responsibilities and closer location. It is also possible that the costs of social security and other benefit contributions and taxes may be more than their value perceived by the worker. Thus, the possibility of workers sorting themselves into the informal sector supports the competitive view of the labor market.

In addition to these two polar views, recently a third view emphasized the highly heterogenous nature of the informal sector as it is observed in many countries. Fields (1990) provided a theoretical framework and empirical evidence for a heterogeneous informal sector consisting of an upper-tier of those who are voluntarily informal and a lower-tier of those who cannot afford to be unemployed but rationed out of a formal job. In such a setting, the commonly accepted assumption is that the upper-tier often corresponds to self-employment, whereas the lower-tier segment consists mostly of informal wage workers. It is often suggested that the upper tier corresponds to competitive and the lower tier corresponds to segmented market structure. Several authors provided evidence for the two tier structure including Fields (1990), Cunningham and Maloney (2001) in Mexico, Tannuri-Pianto and Pianto (2002), Henley et al. (2009) and Botelho and Ponczek (2011) in Brazil and Gunther and Launow (2006).

In this paper we consider the private sector wage earners and examine the wage distribution in the Egyptian labor market during 1998-2012. The main questions asked are as follows. Is there a wage penalty for informal wage earners vis-à-vis formal wage earners? Does the wage penalty persist even after controlling for observable and unobservable characteristics? How does the informal wage penalty vary across different points of the wage distribution? In order to answer these questions we first estimate Mincer wage equations both at the mean and at different quantiles of the wage distribution taking into account observable characteristics. Then we make use of the panel feature of the Egyptian labor market data and estimate models taking into account unobservable characteristics. We also consider the possibility of nonlinearity in covariate effects and estimate a variant of matching models. In all cases we find a persistent

informal wage penalty which is robust to several sensitivity checks. It is smaller when unobserved heterogeneity is taken into account. It is larger at the top than at the bottom of the conditional wage distribution. We also examine the informal wage penalty over time during the study period and in different groups according to experience and education. The informal wage penalty has increased recently over time and it is larger for the better educated but smaller for the more experienced.

The organization of this paper is as follows. Following the introduction Section 2 gives a brief review of literature. Section 3 provides a brief background on Egyptian labor market. Section 4 explains the data used and the descriptive evidence. The methodology and the empirical strategy followed are described in Section 5. Empirical results are presented in Section 6. Concluding remarks appear in Section 7.

2. Review of Literature

There is a wide literature on measuring the wage gap between similar workers in the formal and informal sectors. A comprehensive survey of this literature in developing countries is given by Leontaridi (1998), Perry et al (2007) and Ruffer and Knight (2007). The overview in this section is not meant to be exhaustive. We review the papers which influenced our line of thinking in this area.

It is traditionally assumed and empirically widely shown that informal sector workers earn less than their formal sector counterparts. This is verified in particular early writings in the literature such as Mazumdar (1975), Heckman and Hotz (1986), Pradhan and van Soest (1995), Tansel (1997), Gong and van Soest (2002), Badaoui et al. (2008), Arias and Khamis (2008) and Blunch (2015) among other writers. The observed differences in the wage distributions may be due to a nonrandom selection process. In such a case the observed differences between the wage distributions do not have causal interpretation. There may be unobservable characteristics of workers that may determine simultaneously the sector choice and the earnings. This will render the sector choice endogenous producing biased and inconsistent estimates. Thus, one widely used empirical strategy employed cross-section data explicitly correcting for the possibility of self-

selection of workers into formal and informal sectors. They employ Heckman two-stage procedure. In this procedure in the first stage a sectoral choice equation is estimated and in the second stage wage equations augmented by the correction term are estimated. In this process, identification requires presence of relevant variables that will determine the sector choice but excluded from the wage equation and orthogonal to the errors of the wage equation. Some studies which use this procedure could be questioned on the use of suitable instruments for the identification purposes. Further, ignoring unobservable characteristics causes omitted variable bias in such cross-section studies. Tansel (1997, 2000 and 2002) are examples of this approach. She uses cross-section data and corrects for self-selection. She finds evidence that the labor market in Turkey is segmented along formal informal lines. This implies that workers in the informal sector queue for the formal jobs. In contrast, Magnac (1991) in Colombia, Carneiro and Henley (2001) in Brazil, Gong and van Soest (2002) in Mexico and Arias and Khamis (2008) in Argentina employ a similar approach and find evidence against segmented labor markets in these countries. This implies that workers choose a sector depending on their expected wage and a cost-benefit analysis in each sector as well as their observable and unobservable characteristics.

Recent availability of panel data in many developing countries enabled researchers to deal with the sector of work selection and other estimation problems by using alternative methodologies. With the panel data wage variations are observed while the same individual switches between formal and informal sectors over time. In particular, with the use of the panel data estimation of fixed effect (FE) models and purging of the effect of unobservables became possible and a number of researchers followed this route. The FE estimation deals with both issues of self-selection and unobservable characteristics providing consistent estimates provided that unobserved characteristics are time invariant. Such studies include Badaoui et al. (2008) in South Africa, Pratap and Quintin (2006) in Argentina, Botelho and Ponczek (2011) in Brazil, Tansel and Kan (2012) in Turkey, Nguyen et al. (2013) in Vietnam and Bargain, Kwenda (2014) in Brazil, Mexico and South Africa used FE estimation exploiting panel feature of the data. A common finding is that the informal sector penalty either gets smaller or disappears in these countries when unobservable worker characteristics are controlled for with FE estimation. Pratap and Quintin in Argentina and Badaoui et al. in South Africa are among those who find disappearing penalty when controlling for worker heterogeneity,

Most of the earlier studies in the literature focused on estimation at the mean of the earnings distribution. Limiting the estimation to the mean of the wage distribution may conceals important differentials that may exist along the earnings distribution due to intrinsic heterogeneity in jobs. For instance, Funkhouser (1997) in El Salvador, Gong and van Soest (2002) in Mexico, Pratap and Quintin (2006) in Argentina, Badaoui et al. (2008) in South Africa focused on estimation at the mean. However, recently several researchers addressed the heterogeneity that may exist along the earnings distribution by using quantile regression (QR) technique. Botelho and Ponczek (2011) in Brazil provided estimates along the earnings distribution. However, it is difficult to address estimation problems such as unobserved heterogeneity or sector selection while employing QR estimation. This is due to difficulties in the empirical implementation such techniques although they are theoretically well developed and available. There are there studies that attempt to overcome these difficulties. Tannuri-Pianto and Pianto (2008) adopt QR technique corrected for selection using instrumental variables (IV) in a cross-sectional data set in Brazil. Nguyen et al. (2013) in Vietnam and Bargain and Kwenda (2014) in Brazil, Mexico and South Africa adopt a fixed effect model estimation with QR technique (FEQR). Staneva and Arabsheibani (2014) use a QR decomposition technique taking into account self-selection of individuals into formal and informal employment types in Tajikistan. They find a significant informal employment wage premium across the earnings distribution. Lehmann and Zaiceva (2013) find wage penalty in Russia in the lower part of the wage distribution which disappears at the upper part implying a two tier informal labor market.

There is also a strand of literature that use IV techniques often in conjunction with other methodologies in order to address various econometric issues such as measurement errors. Such studies include Marcouiller et al. (1997) in El Salvador, Mexico and Peru, Carneiro and Henley (2001), Kingdon and Knight (2004) in South Africa, Tannuri-Pianto and Pianto (2008) in Brazil, Botelho and Ponczek (2011) and Falco et al. (2011) in Ghana and Tanzania.

More recently, several studies used various versions of propensity score matching (PSM) or propensity score weighting (PSW) techniques in order to secure formal and informal workers only with comparable observable and time-invariant unobservable characteristics for a better

comparison of their wages (Smith and Todd, 2005). Such techniques also address the issue of misspecifications that may occur due to linearity assumption on the covariates. Therefore, this procedure is used by Calderon-Madrid (1999) in Mexico, Pratap and Quintin (2006) in Argentina and Badaoui et al. (2008) in South Africa in order to estimate the wage gap at the mean. Botelho and Ponczek (2011) and Bargain and Kwenda (2014) use PSW technique in combination with QR in order to provide estimates along the quantiles.

Informal sector in the MENA countries has been the topic of investigation in several recent studies such as Alloush et al. (2013) and Gatti et al. (2014). Similarly there has been some recent studies investigating informal sector in Egypt such as Wahba (2009) and Tansel and Ozdemir (2014). However little is known about the informal sector earnings structure compared to that of the formal sector in Egypt. Gatti et al. (2014) is an exception but provide only cross section evidence in 2006 from Egypt as well as from several other MENA countries. We extend this analysis by taking unobserved characteristics into account and including estimating across the conditional wage distribution.

3. The Background on Egyptian Labor Market

In this study we define informal employment to include those wage earners who are not covered by social security or who do not have a contract. Several studies indicate existence of a rather large informal sector in Egypt. The labor force not contributing to social security was an average of 45 percent during 2000-2007 and an average of 35 percent of GDP during 1999-2007 was undeclared (Gatti et al. 2014). This is comparable to what is observed in Mexico which is 43% when social security definition is used (Marcoullier et al., 1997). Tansel and Ozdemir (2014) include an extensive recent review of the Egyptian economy and the labor market. For this reason, here we will provide only a brief summary of the Egyptian labor market.

According to the ELMPS 2012, formal, informal and irregular wage workers are about 10, 15 and 15 percent respectively of the male sample and around 2, 2 and 0.62 percent respectively of the female sample and the government employment is about 24 percent among men and 12 percent among women however, about 10 percent of men and 72 percent of women

are out of labor force (Tansel and Ozdemir, 2014). Currently, public sector employs 27 percent of all workers and 44 percent of the wage earners (Amin, 2014). The government employment opportunities have been declining during the past two decades. During the 2006-2012 period public administration lost about 40000 jobs (World Bank, 2014). In spite of this decline, government employment share is still rather high and it remains a more attractive option in particular for women than private sector jobs. Individual self employment and employment in household enterprises constituted more than a third of overall employment in 2006. Nearly half of private sector wage employment was in micro enterprises of fewer than five workers (Said, 2009).

Female labor force participation is very low as it is in most MENA countries and has been declining over 2006-2012 while that of male has increased slightly. The labor force participation rate was 23.1 percent for females and 80.2 percent for males in 2012 (Assaad and Krafft, 2013). Less than a quarter of the total labor force is 15-29 years of age. Unemployment rate was over 13 percent in 2013 (9.8 for males and 24.2 for females) (CAPMAS, 2014). Unemployment is a problem among young people. Over three-quarters of the unemployed was aged 15-29 years. The unemployment rate is also rather high among the highly educated. The secondary or above educated account about 75 percent of unemployed males and 90 percent of unemployed females (Assaad and Kraft, 2013). Thus, although unemployment rates of women and young are very high their labor force participations are very low.

According to Said (2009) inequality in earnings declined from 1988 to 1998 but increased from 1998 to 2006. The 90 to 10 percentile ratio was about 5.80 in earnings in 2006.The Gini coefficient in earnings was 39 percent in 1988, 37 percent in 1998 and 55 percent in 2006. The Gini coefficient for the private sector was 40 percent in 1988, 38 percent in 1998 and 45 percent in 2006.

Labor Law enforcement remains weak in Egypt (Lohmann, 2010). Further, labor legislation predominantly effects small number of wage and salary workers in the private formal sector, civil servants and public sector. Roushdy and Salwaness (2015) note that employers must contribute 41 percent of employees' basic wage as social security contribution which makes

microenterprises to formalize highly costly. Labor law in Egypt might be considered rigid de jure, especially concerning employment protection, hiring and termination, by international standards but, they are not enforced and widely evaded de facto and does not reach informal sector (Angel-Urdinola and Kuddo, 2011). Various practices allow avoiding the compliance with firing regulations by the employers. The trade union membership is weak due to restrictions on the rights to establish one and become a member (Angel-Urdinola and Kuddo, 2011). The trade union density rate in 2007 is as a proportion of total employment is 16.1 and as a proportion of wage and salary earners is 26.1 compared to 14.6 and 25.1 respectively in Turkey and 71.5 and 99.2 respectively in Denmark (Hayter et al., 2011). There is little scope for collective bargaining in the private sector. The collective bargaining coverage rate as a proportion of total employment is 2.1 and as a proportion of wage and salary earners 3.4 compared to 95.6 in Denmark as a proportion of total employment (Hayter et al., 2011). In 20012 the minimum wage is adjusted for the first time since the 1980's and increased to 700 and in 2014 to 1200 Egyptian Pounds (EP).[1] This is effective only in the public sector.

In 1998, 57 percent of all employment was informal and increased to 61 percent by 2006 although there was a trend toward greater formalization in private wage employment (Said, 2009). This increase is believed to be due to the privatization and the introduction of the 2003 Labor Law. The decline in public sector employment opportunities during the past two decades contributed to an increase in informalization of the labor market. The 2003 Labor Law 3 brought more flexibility in formal employment relations. It allowed temporary contracts and easier firing of workers. This is believed to contribute to an increase informal employment yet at the same time brought a certain degree of formalization since then according to Wahba and Assaad (2015). However, the World Bank (2014) notes that there has been a recent increase in informality nearly across every industry and at all education categories for men.

Two areas of concern are noted by several authors such as Assaad (2009) and Said (2009). One is the high unemployment rate among the university graduates and the other is the declining rates of participation among educated females who are discouraged that they cannot find government employment and drop out of the labor force. However, present authors believe

[1] The US dolar exchange rate was equal to 6.04 EP in May 2012 and it was an average of 7.05 in 2014. Thus, 700 EP was 116 US dolars and 1200 EP was 170 US dolars.

that none of these should be as large a concern as the presence of large informal sector with low wages.

4. The Data and Descriptive Evidence

This study is based on the Egypt Labor Market Panel Survey (ELMPS) which is a longitudinal survey carried out in 1998, 2006 and 2012. It was conducted by the Economic Research Forum (ERF) in cooperation with Egypt's Central Agency for Public Mobilization and Statistics (CAPMAS). ELMPS is a nationally representative panel survey that covers a wide-range of topics, ranging from individual, demographic and labor market characteristics to parental background, housing, time use, fertility and other topics. The data and their documentation are provided in the ERF web page. The 1998 round of the ELMPS includes a nationally representative sample of 4,816 households with 23,997 individuals. Similar numbers in the 2006 round are 8,351 households with 37,140 individuals and in the 2012 round are 12,060 households and 49,186 individuals. Attrition rate was substantial both at the household and individual level. We use the weights to adjust for attrition in the descriptive statistics table we provide. The attrition issue is discussed by Assaad and Krafft (2014) extensively.

We create a panel of observations that are seven years and five years apart in which workers are observed only twice or three times. These are two-year panels of 1998-2006 and 2006-2012 and a three year panel of 1998-2006-2012. We focus only on the private sector wage earners. Those who are employed by the government are excluded since the wage determination mechanisms differ vastly across public and private sectors.[2] We restrict the sample to 15-65 years old male wage earners who are not in education or training. We exclude unpaid family workers (UFW) as there is no information on their imputable earnings. Self-employed are excluded because the ELMPS does not have information on earnings of the self-employed at the time of preparation of this paper. We focus on private sector, full-time non-agricultural wage-earners. Further we trim the upper and lower one percent of the observation in order to exclude outliers. The real hourly wages are reported in the data set and computed as the monthly wages per hour of work in the primary and secondary jobs deflated by the CPI in terms of 2012 prices.

[2] For an analysis of the public versus private formal wage gap in Egypt see Tansel et al. (2015a).

In the recent literature there is a move towards using benefit-based definition of informality from other definitions based on type of employment or firm size. The International Conference of Labor Statisticians accepted in 2003 the benefit-based definition of informality as their official definition. Therefore accordingly, in this study we define informal employment as those wage earners who are not covered by social security through their employment and or do not have an employment contract. We conduct a separate analysis of the male and female samples. However, the labor force participation of women in Egypt is very low and most of them are either inactive or work as unpaid family worker (Tansel and Ozdemir, 2014) and we do not address the issue of women's selection into employment since selection within the QR framework is a nonstandard econometric procedure. Further, the number of observations is small in the female sample. Therefore, in this paper we focus only on male wage earners. We comment on the results for the female wage earners at the last part of the section on estimation results.

Table 1 shows the descriptive statistics for the male and female samples of formal and informal wage earners. We observe that 66 percent of the male sample and 46 percent of the female sample are informal. Thus, informality is higher among men than among women. Table 1 also shows that log hourly (real) wage is larger in the formal than in the informal employment for both males and females. The informal wage gap in the female sample (77 percent) is larger than in the male sample (33 percent). There is greater inequality in wages in the formal sector than in the informal sector implying that the formal jobs are more heterogenous than the informal ones. Informal wage earners work more hours per week than the formal wage earners in both the male and female samples. Formal wage earners are more experienced (older) and more educated than the informal wage earners in both the male and female samples. Women are better educated than men in both the formal and informal employment. In the male sample formal employment is dominated by manufacturing activities while informal employment is dominated by construction. In the female sample formal employment is primarily a service sector activity while informal employment is dominated by manufacturing. In both the male and female samples small firms are concentrated in the informal sector. Close to four fifths of the informal male and close half of the informal female wage earners work in firms with less than 10 workers. In contrast, about two fifths of the male and a third of the female formal wage earners work in firms with over 100

workers. Formal employment is concentrated in Greater Cairo informal employment is concentrated in Rural Lower for the males. Formal and informal female wage work is mostly observed in Greater Cairo. Over half of the formal and informal female employment is in this region.

Insert Table 1 About Here

Table A1 provides the marginal effects of the covariates from a probit model estimation of propensity to be in the informal sector. There is a U-shaped relationship between age and informality. The probability of being informal is higher for the young and the elderly in the male sample. It may be a point of entry to the labor market for the young as well as an option for the older workers who lack skills or physical capital. However, informality is not related to age in the female sample. The probability of being formal increases with education in both the male and female sample. Married are less likely to be informal. For men the highest probability of being informal is observed in the construction sector relative to manufacturing. Transportation has a lower probability of being informal relative to manufacturing. Each of the regions have higher probability of informal employment compared to Greater Cairo while highest such probability is observed for Urban Lower and Urban Upper. Finally, the probability of informality did not change from 1998 to 2006 but increased significantly from 1998 to 2012. This is consistent with the observation that recent public sector retrenchment and the flexibility in employment relations introduced after the 2003 Labor Law contributed to an increase in informal employment.

5. Econometric Methodology

We estimate Mincer wage equations including a dummy variable for the private informal employment the coefficient of which captures the conditional wage penalty/premium for the informal sector. We use Ordinary Least Square (OLS), Quantile Regression (QR) and Fixed Effects Quantile Regression (FEQR) techniques. The OLS model is estimated on a sample pooled panel observations. It is as follows:

$$y_{it} = \delta I_{it} + x'_{it}\beta + \varepsilon_{it} \qquad (1)$$

Next we estimate the FE model where we use panel feature of the data and control for time-invariant unobserved individual heterogeneity. The fixed effect estimator is consistent as long as unobserved characteristics are constant over time. The FE model can be written as follows

$$y_{it} = \delta I_{it} + x'_{it}\beta + \alpha_i + \varepsilon_{it} \qquad (2)$$

Where in models (1) and (2) y_{it} is log hourly wages, x_{it} is the vector of control variables for individual *i* at time *t* including a constant, I_{it} is a dummy variable taking a value one if the wage earner is informal at time *t*. The formal wage workers is the base category. α_i in model (2) is the individual fixed effect. ε_{it} is a normally, independently and identically distributed stochastic error term with zero conditional mean. The estimated δ measures the informal employment penalty/premium.

Next, we go one step further and investigate the informal employment wage penalty/premium along the conditional wage distribution using QR. Finally, we extend the standard QR method to using panel data and estimate the FEQR model. Estimating the QR models are especially important since the conditional earnings differentials across different quantiles proxy for unobservable earnings potential. The QR and FEQR models can be written as in equations (3) and (4) as follows.

$$q_\tau(y_{it}) = \delta(\tau) I_{it} + \lambda(\tau) G_{it} + x'_{it}\beta(\tau) + \varepsilon_{it}, \quad \forall \tau \in [0,1] \qquad (3)$$

$$q_\tau(y_{it}) = \delta(\tau) I_{it} + x'_{it}\beta(\tau) + \alpha_i + \varepsilon_{it}, \quad \forall \tau \in [0,1] \qquad (4)$$

Where $q_\tau(y_{it})$ is the τ^{th} quantile of the log hourly wages. α_i are the individual fixed effects that shift the location of the conditional quantiles of the log hourly wages in the same manner across the quantiles. However, the effects of the explanatory variables differ by the quantiles of interest. The vector of estimated coefficients $\beta(\tau)$ provide the estimated rates of return to the different

covariates at the τ %th quantile of the log earnings distribution and the estimated coefficient $\delta(\tau)$ represents informal employment earnings penalty/premium respectively at the various quantiles. Koenker (2004) was the first to suggest FEQR technique, as a direct extension of the standard QR method. Canay (2011) suggested a simple two-step approach to FEQR estimation. In the first step the individual effects which are pure location shifters are estimated by traditional mean estimations such as FE estimation. Then predicted individual effects are used to correct earnings as in $\hat{y}_i = y_i - \hat{\alpha}_i$. The corrected earnings are then used in the traditional QR estimation.

In the empirical specification of the models given above we use the following control variables. Age, age squared, years of education, marital status, presence of children, sectors of economic activity, regions of location. Two indicators of time, for 2006 and 2012 are included to control for the effect of macroeconomic environment on wages over time. The base year is 1998. There are nine sectors of economic activity are included to take into account the effect of differences in the structure of sectors on wages. They are manufacturing (including mining and electricity), construction, trade, transportation, and services (including finance). The base industry is manufacturing. There are six regions of location. They are Greater Cairo, Alexandria and Suveysh, Urban Lower, Urban Upper, Rural Lower and Rural Upper. The base region is Greater Cairo.

6. Estimation Results

6.1. Main Results

The main estimation results are reported in Figure 1. Figure 1 Panel A reports the raw (unconditional) informal log wage gap. Panels B and C report the estimated coefficient δ of the informal sector dummy (I) in the equations presented in the previous section. Panel B reports conditional informal log wage gap at the mean (OLS, horizontal solid line) and at the different quantiles (QR, solid curve). Similarly, Panel C reports the conditional informal log wage gap controlling for unobserved individual heterogeneity at the mean (FE, horizontal solid line) and at the different quantiles (FEQR, solid curve). The 95 percent confidence intervals are indicated by dashed lines for OLS and FE estimates and by the shaded areas for QR, FEQR and IPW-FEQR

estimates. The confidence intervals are based on robust standard errors for the OLS and FE estimates and on bootstrapped standard errors for the QR, FEQR and IPW-FEQR estimates. The estimation results in Figure 1 are based on Model (2) in Table A2-A3 for males in the Appendix.[3] A summary of the results for informal log wage penalty appear in Table 2. The unobserved characteristics may include not only preferences, tastes, and innate ability and talents, risk aversion and school quality but also differentials in access to social, personal or professional networking, unionization rates and bargaining power.

Insert Figure 1 About Here

The Kernel density estimates of the log hourly wages in the formal and informal sectors are provided in Figure 2 for the three years in our sample. The graphs indicate that the Kernel density curves for the informal sector lie to the left of those for the formal sector indicating that the informal sector wage distribution is dominated by the formal sector wage distribution and that informal wages are lower than the formal wages. Further, in the 2012 sample only 15 percent of the formal workers and 32 percent of the informal workers earn less than the minimum wage of 700 effective in the public sector. Therefore employment above the minimum wage (which is effective in the public sector) is large indicating that this is could not be a cause of informality in Egypt. The Figure 1 Panel A shows the raw (unconditional) wage gap. We observe an informal wage penalty of 27 percent at the mean. The raw informal wage penalty increases across the wage distribution and reaches 34 percent at the highest quantile. Kernel density distributions and the figures for raw wage gap do not take into account the differences in observable or unobservable characteristics between the formal and informal sectors which are best considered in a regression analysis framework as discussed below.

[3] Estimation results reported in the Appendix tables (based on Model (2)) indicate the following. The wage returns to experience (as proxied by age) are positive and exhibit a quadratic relationship. The wage returns to experience decreases as one moves to higher quantiles in the QR estimation while there is no discernable pattern across the quantiles in the FEQR estimation. The returns to education is quite low, 1.5 percent at the mean and increase smoothly across quantiles and about 2 percent at the highest quantiles (insignificant at the lowest quantiles). Largest returns are attained at the construction sector compared to manufacturing which is the sector with most concentration of informality. The wage returns in the construction sector is highest at the lowest quantile and decrease across quantiles. Assaad (1997) finds segmentation within the construction sector itself. The wage returns are higher both at the mean and across quantiles when unobserved heterogeneity is taken into account. The wage returns are lower in the trade and service sectors of economic activity compared to manufacturing. The wage returns are higher in Greater Cairo than in all of the other regions. Finally, the wage returns are significantly higher in 2006 and 2012 than in 1998.

Insert Figure 2 About Here

When we perform OLS estimation with controls for observable characteristics Figure 1 Panel B indicates a mean informal wage penalty of 18 percent for the entire sample. It is about 18 percent in the lowest quantile, decreases in the middle quantiles and increases to about 20 percent at the top quantile. This is 9 percentage points smaller than the mean raw wage penalty. This indicates that higher levels of education and experience in the formal than in the informal sector play a significant role in reducing the wage gap and they account for almost 33 percent of the raw wage gap. However OLS do not control for unobserved heterogeneity and the informal wage penalty may be driven by such omitted factors. When time-invariant unobservable factors are controlled for as in the FE estimation using panel feature of the data, given in Panel C, the mean informal wage penalty decreases to about 15 percent implying important role for unobserved heterogeneity. This is consistent with the hypothesis that informal sector dummy is negatively correlated with unobserved skills meaning lower unobserved skills in the informal sector and that workers negatively select into informal employment. Falco et al. (2011) find in Ghana and Tanzania that unobserved characteristics are much more important than observed human capital in explaining formal and informal wage gap. Therefore, there is an informal wage penalty even after controlling for observable and unobservable individual characteristics.

The QR results in the Panel B when controlling for observable characteristics confirm the informal wage penalty at each of the conditional quantiles and range from 18 percent at the bottom to 20 percent at the top of the distribution and they do not differ significantly across the quantiles. The FEQR results in Panel C further control for time-invariant unobservable heterogeneity and also confirm the informal wage penalty at each of the quantiles. In this case the penalties at each of the quantiles are lower than in case of QR estimates and range between 9 percent at the bottom and 17 percent at the top of the distribution. An F-test indicates that conditional informal wage penalty do not differ significantly across the quantiles. We have also tested for the statistically significance of the pairwise difference in the penalties observed in successive quantiles. Out of such four possible differences none of them are statistically significant in the QR and only one of them (q50-q25) is statistically significant at the 10 percent

level in the FEQR estimation. The larger informal penalty at the top than at the bottom of the distribution as we find in Egypt is also observed in Dominican Republic (Perry et al., 2007).

Above results indicate that the conditional informal wage penalty both at the mean and at different quantiles is lower when time-invariant unobserved individual heterogeneity is taken into account. These results imply that unobserved characteristics are better among the formal wage earners and that the observed and unobserved attributes are positively related in the sense that they are both better in the formal than in the informal sector.

The results indicate that informal wage penalty remains implying that formal wage earners are better off than the informal ones, even after controlling for observable and unobserved individual heterogeneity. There may be a number of factors responsible for this. It could be due to segmentation or exclusion restriction. It could be also due to differences in the firm level observed characteristics such as firm sizes between formal and informal sectors or other job attributes such as unobserved firm level factors such as risk independence and in-kind-rewards which we did not control for in this study but some of which may have been controlled for by the firm size variable we use. On this confer the discussion below in the section on sensitivity exercises.

The informal wage penalty of about 19 percent found in this study when controlling observable characteristics is comparable to that of 12 percent found by Gatti et al. (2014) in Egypt in 2006 also with observable controls. The penalties found for Egypt (15 percent) when both observable and unobservable characteristics are taken into account are modest and comparable to those found for Brazil (5 percent), Mexico (9 percent) and South Africa (19 percent) by Bargain and Kwenda (2004) and for Vietnam (11 percent) by Nguyen et al. (2013). Bargain and Kwenda (2004) also observe that unobservable characteristics play a larger role in South Africa than in Brazil and Mexico. Further, Bargain and Kwenda (2004) in Brazil, Mexico and South Africa, Tannuri-Pianto and Pianto (2008) in Brazil, Nguyen et al. (2013) in Vietnam and Lehman and Zeiceva (2013) in Russia found decreasing penalties over the quantiles which disappear in some cases at the top of the distribution such as in Russia. In contrast, we found that informal sector wage penalties increase across quantiles in Egypt. They are largest at the bottom

of the wage distribution than at the top. There are also several studies which found evidence for informal sector wage premium such as Marcouiller et al. (1997) and Maloney (199) in Mexico and Staneva and Arabsheibani (2014) in Tajikistan. The latter study also found that informal employment wage premium in Tajikistan is larger at the lower end of the conditional wage distribution than at the top. Informal wage premium could be a compensation for the fringe benefits that are not available in the informal sector.

6.2. Sensitivity Analysis

6.2.1 Inverse Probability Weighted Fixed Effect Quantiles Regression Estimation (IPW-FEQR)

The QR estimation assumes linearity of the effects of covariates. However, the distribution of covariates between formal and informal sectors may differ. This can be accounted for using matching techniques. Matching techniques enable a comparison of wage outcomes for formal and informal workers only with comparable characteristics. This deals with the lack of common support in OLS where we may be comparing very dissimilar workers. They provide consistent estimates even if the relationship between the dependent variable and the covariates are non-linear (Fortin, et al., 2011). Pratap and Quintin (2006) and Badaoui et al. (2006) used a combination of difference in differences and PSM approach at the mean. Botelho and Ponczek (2011) and Bargain and Kwenda (2014) extended this approach to quantile estimations by combining IPW and FEQR techniques as suggested by Firpo (2007). This procedure is in particular valuable because as shown by Smith and Todd (2005) it allows for selection on observable as well as selection on time-invariant unobservable characteristics. In this procedure observations are weighted by the inverse propensity scores of being in the formal and informal sectors. The propensity scores of being in the formal and informal sectors are estimated via a probit model of sector selection given in Table A1 in the Appendix. The conditional independence assumption required to hold in order to have unbiased estimates is likely to be satisfied since a large number of factors which determine both selection and earnings are considered. The resulting distributions of the derived propensity scores are shown in Figure A1. First, a mean FE, then a FEQR estimation is carried out on the inverse probability weighted

observations. The results are reported in Figure 2, Panel D and Table 2. These results are very similar to the FEQR estimates. Therefore, our conclusions of modest but increasing informal wage penalty across the quantiles of the conditional wage distributions are upheld.

Insert Table 2 About Here

6.2.2 Effect of Firm Size

We now investigate the role of one important job attribute namely the firm size as an additional control variable in the baseline specification. In both the developed and developing countries larger firms pay higher wages on average. Oi and Idson (1999) provide a survey on this. Söderbom et al. (2005) show that this is not a result of employing high ability individuals. Bulow and Summers (1986) and Ringuede (1998) suggest high monitoring costs in large firms and Bertola and Garibaldi (2001) suggest job matching and search costs in large firms as possible reasons. Brown and Medoff (1989) and Arai (2003) find sizable firm size effect even after controlling for individual heterogeneity. Stroble and Thornton (2004) find that the firm size effect in developing countries is larger than in developed countries. At the same time larger firms are more likely to be formal since because of their visibility they experience larger risk of being caught defaulting on regulations. Thus, formal wages will appear to be higher if firm size is not taken into account. Several authors such as Badaoui et al. (2010) draw attention to the observation that larger firms pay higher wages and that informal wage penalty may be a result of firm size effect.

First we note some observations on informality and firm size in our sample. The negative correlation coefficient of 67 percent between informal sector dummy and firm size indicates that as firm size increases informality decreases. Indeed, in our sample, within firms with less than 10 workers about 85 percent of the wage earners are informal while within firms with more than 100 workers only about 16 percent are informal. Thus, even the largest firms hire about one out of seven workers informally. Further, the distribution of the firm size across quantiles of the wage distribution indicate that in the bottom quantile 72 percent of wage earners work in firms with less than 10 workers while only 10 percent work in firms with more than 100 workers. Conversely, in the top quantile 55 percent of wage earners work in firms with less than 10 workers while 25 percent work in firms with more than 100 workers. Thus, firms with less than

10 workers are concentrated in the bottom quantile while firms with more than 100 workers are concentrated in the top quantile. In light of these we conclude that informality decreases as firm size increases and that informality is higher among small firms but it is less common among the large firms. Further, firm size increases as one moves across the quantiles.

Therefore, we re-estimate the models by adding dummy variables for different firm sizes. The results are reported in Table A2. Controlling for the firm size reduces the coefficient estimate of the informal wage penalty in both the OLS and FE estimations as expected given the above mentioned high correlation between informal sector dummy and the firm size. In particular, when firm size controlled for the penalty in the FE estimation is reduced from 15 to 14 percent both of which are strongly statistically significant. Therefore, the penalty itself decreases somewhat but does not disappear indicating that our results are not driven by the firm size effect.

6.2.3 Measurement Errors

We found in the previous sections that FE estimates are lower than their OLS counterparts both at the mean and at the conditional quantiles of the wage distribution. Grıliches and Hausman (1986) proposed the measurement error bias as an explanation for this finding since FE estimators can be seriously biased if measurement errors are present. It is possible that formal/informal sector status is incorrectly reported. If so, there will be measurement errors in the indicator of informal sector dummy. As it is well known this will lead to an attention bias in its coefficient estimate. Under classical measurement errors assumptions the First Difference (FD) estimator has a larger bias than the FE estimator which in turn has a larger bias than the OLS. Therefore, comparing the estimates from the FE and FD methods will give an idea about the importance of the measurement errors bias. Table 2 reports the FE and FD estimates of the informal wage penalty at the mean. We observe that these two estimates are essentially the same implying that possible measurement error due to incorrect reporting of the sector status is not a concern for our results.

6.2.4 Comparing Movers between Formal and Informal Sectors

The identification of the informal wage gap in our empirical strategy depends on the presence of substantial number of movers between the formal and informal sectors in both directions. If this is not the case the data would reduce to a cross-section sample where FE estimation will not be feasible. This is not a concern in our data for the following reasons.[4] We note that about 22 percent of the sample in 1998 moved in either direction between 1998-2006 and about 23 percent of the sample in 2006 moved in either direction between 2006-2012. Next, we note that the movers across sectors are also substantial at different quantiles. This is shown in Figure A2 in the Appendix for the two time periods. The figure shows the informal movers as percentage of the base period informal observations and the formal to informal movers as percentage of the base period formal observations. These computations are done at different quantiles of the base period wages for the two time periods. We observe that during both of the time periods formal to informal transitions are more frequent at the bottom and informal to formal transitions are more frequent at the top of the wage distribution. Nevertheless there are substantial numbers of transitions either direction at all quantiles of the wage distribution validating the identification strategy in our estimations.

Further, the identification of the informal wage gap also depends on the assumption that the informal wage penalty for those who move from the formal to informal sector is the same as the penalty for those who move in the opposite direction. That is, the movers must change states randomly. This issue becomes a problem in FE estimation if unobserved heterogeneity varies over time due to a shock on individual or job characteristics resulting in transitions between sectors. In recent years evidence has accumulated that individual or macroeconomic shocks or socioeconomic conditions may trigger changes in unobserved characteristics. For instance, Dohmen et al. (2015) reported a fall in willingness to take risks during the Great Recession in Germany and Ukraine with consequences about labor market dynamics and outcomes.[5] This will render formal informal sector choice endogenous and the FE estimator inconsistent (Botelho and Ponczek, 2013, Nguyen et al., 2013 and Bargain and Kwenda, 2014). In such case, wage penalty or premium associated with these transitions may differ. Since formal sector jobs are viewed better, the penalty for those moving from formal to informal sector would be larger than the penalty for those moving in the opposite direction.

[4] Further, the transition probabilities between sectors provided by Tansel and Ozdemir (2014) indicate substantial movements. They find that the transition probability from formal to informal wage work is 16 percent from 2006 to 2012 while the same probability is about 12 percent for the transition in the opposite direction for the male wage earners.

[5] In recent years evidence has accumulated that individual or macroeconomic shocks or socioeconomic conditions may trigger changes in unobserved characteristics. For instance, Dohmen et al. (2015) reported a fall in willingness to take risks during the Great Recession in Germany and Ukraine with consequences about labor market dynamics and outcomes.

In order to check for the relevance of such a possibility we carry out separate estimations of the wage gap for those moving from formal to informal sector and for those moving in the opposite direction. The resulting informal wage gaps are reported in Figure 1, Panels E and F. We observe that the informal wag gap for these two different transitions are similar except at the upper quantiles where the wage gap is larger for the formal to informal transitions than for the transitions in the opposite direction. Bargain and Kwenda found similar results in South Africa.

6.2.5 Informal Wage Penalty over Time

We now relax the assumption of constant wage penalty over time. The time period studied in this paper does indeed involve different macro-economic conditions. Now we ask the question has the size of penalty changed during the period of analysis? In order to observe the possible changes in the size of informal wage penalty over time we perform the same analysis for the two time periods of 1998-2006 and 2006-2012. The summary results for the OLS and FE estimation are reported in Table 3 and the QR and FEQR estimates appear in Table 4. We observe that the OLS estimate of the informal wage penalty increases from 18 percent during 1998-2006 to 24 percent during 2006-2012 periods while the FE estimate increases from insignificance to 19 percent during the same time periods. For both of the period FE estimates are lower than the OLS estimates. Thus, there is evidence that informal wage penalty increased over time during the 1998-2012 period. Table 4 confirms this increase in informal wage penalty over time with QR and FEQR estimates. Further, focusing on the FEQR estimates in Table 4 observe that informal penalty slightly decreases across quantiles during the 1998-2006 period while it increases across the quantiles from about 14 in the lowest quantile to about 21 percent at the top quantile during the 2006-2012 period. This is consistent with the finding of increasing penalty across quantiles for the entire period of 1998-2012 which is one of the main conclusions of this paper.

Insert Table 3 About Here

Insert Table 4 About Here

6.2.6 Informal Wage Penalty by Experience and Education

In the previous sections we saw that the formal sector workers are more experienced and better educated. In this section we relax the assumption that wage returns to experience (as proxied by age) and education are the same in the formal and informal sectors. Interaction terms of informal sector dummy with experience and education indicates significant differences between the two sectors in these respects. Therefore, repeat the analysis for two subsamples differentiated by levels of experience and education. Namely, we consider those who are younger than the mean age of the sample and older than the mean age of the sample. We also consider those who are less educated (whose years of schooling is less than the mean for the sample) and better educated (whose years of schooling is more than the mean for the sample). The OLS and FE results are reported in Table 3 and the QR and FEQR results appear in Table 4.

The FE results where both the observable and unobservable individual heterogeneity are taken into account indicate that informal wage penalty is larger for the less experienced than for the better experienced. That is, the penalty decreases as individuals become more experienced. This is similar to what is found by Bargain and Kwenda (2014) in Brazil, Mexico and South Africa. In contrast, Botelho and Ponczek (2011) found in Brazil that there is no informal wage penalty for the young and that there is a penalty for the older workers. The FEQR results indicate that informal sector wage penalty is larger for the less experienced than for the more experienced at all quantiles. Further, for both experience groups the penalty increases across the quantiles and it is highest at the top of the distribution. These results confirm that the young has less experience and informal sector provides an entry level job for them with a larger penalty regardless of whether at low-paying or high-paying jobs as pointed out by Bosch and Maloney (2007).

Considering the two groups with different levels of education the FE results (which are lower than the OLS estimates) in Table 3 indicate no informal wage penalty for the less educated and about 13 percent penalty for the better educated. This is similar to what is found by Botelho and Ponczek (2011) in Brazil. The FEQR results in Table 4 indicate that penalty for the less educated is less than that for better educated at all quantiles. That is less educated face smaller penalties than the better educated. The penalty for the less educated are somewhat smaller at the bottom and at the top of the wage distribution than those in middle. For the better educated the penalty increases across the quantiles and it is twice as large at the top of the distribution than at the bottom. We can say that the informal wage penalty increases with education in Egypt. This is similar to the findings of Botelho and Ponczek (2011) in Brazil where informal penalty increases both with experience and education and larger at the bottom than at the top of the

distribution. Bargain and Kwenda (2014) find in Brazil, Mexico and South Africa that those with higher experience face smaller penalties than those with less experience and there is a larger penalty for those with higher education in Brazil and Mexico.

6.2.7 Gender Dimension

In this section we remark on our estimates for the female sample. However, our estimates for the females should be considered cautiously since we did not take into account their selection into labor force participation and the number of observations in the female sample is small. As remarked earlier a large fraction of women are either inactive or work as unpaid family workers in Egypt (Tansel and Ozdemir, 2014). Women are less likely to be informal than men. Table 2 shows that the mean log hourly wage is larger in the formal than in the informal sector. The raw wage penalty at the mean is 76 percent but reduces to 41 percent when observable characteristics are taken into account as in OLS estimation. The penalty increases to 55 percent when unobservable characteristics are considered as in FE estimation. The penalties increase somewhat across the quantiles with QR and increase somewhat across the quantiles with FEQR estimation. The informal wage penalty is substantially larger for women than for men. This could be due to a discrimination against women in the informal sector. In a way this explains why women move out of the labor market when they cannot locate a government or a formal sector job.

7. Conclusions and Policy Implications

This paper considers the private sector wage earners and examines the wage distribution in the Egyptian labor market during 1998-2012 using ELMPS panel data. We analyse the wage differential across formal and informal sectors. The motivation is to add to our understanding of the labor market in Egypt. We extend the previous work by using panel data fixed effect estimation and estimation across the wage distribution with quantile regression technique. Workers who cannot access formal employment yet cannot remain unemployed experience wage penalty in the informal sector compared to the wage earners in the formal sector where workers benefit from retirement and health and safety regulations. Penalties are smaller for the FE and FEQR estimates than for the OLS and QR estimates confirming that unobserved skills are important. Thus informal workers have disadvantage not only in observable but also in unobservable characteristics. Informal workers face a larger wage penalty at the top of the wage distribution than at lower parts implying that the largest penalty is between the best paid formal and

best paid informal workers. The sensitivity analysis reveals that the main results are robust in qualitative terms in several dimensions. Further we find that the informal wage penalty has increased recently over time and it is larger for the better educated but smaller for the more experienced.

Informal wage earners are either younger or older than formal ones, they are less educated and more likely to work in construction. Construction sector employment has a wage premium. Married are less likely to be informal and has a wage premium. Greater Cairo is less likely to be informal and Urban Upper and Rural Upper has the highest likelihood of being informal. The likelihood of informality has increased recently possibly due to recent public sector retrenchment and the flexibility in employment relations brought about by the 2003 Labor Law. These issues need to be investigated further.

Our results are consistent with other studies which have shown that there is an informal sector penalty in developing countries. The results support the segmentation and exclusion hypothesis which implies that informal wage earners are prevented from the entry into formal sector that offer benefits and would prefer to move there if they had the opportunity. Accordingly, the informal wage workers constraint are in their mobility to the formal sector in Egypt as we conclude in this paper. Therefore, informal employment is not a choice in Egypt where identical workers receive higher wages in the formal sector than in the informal and exclusion from formality appears to be important.

In the literature earnings gap is taken as an evidence of the presence of institutional rigidities which may result in inequity and inefficiencies. However, it is difficult to say this in case of Egypt because although there are strict regulations in law there is no information on the extent of their enforcement and it is believed to be lacking. Therefore Egyptian labor market in general cannot be considered overly regulated in practice. However we can say that there is a large competitive informal sector in Egypt. Probably there is a more important segmentation along the public and private divide. Educated are known to queue for the public sector or formal sector jobs.

Government should implement policies that will alter the cost benefit calculations of

sector choice by both the workers and the employers. One policy implication is that raising human capital levels of the poor will give them a chance to find a formal sector job and increase aggregate productivity of the economy. Another is that the reduction in social security contributions for the low skilled workers could be implemented. Formality could increase if it is made easier to comply with. Therefore, further reforms in addition to the 2003 Labor Law changes could encourage formality

We believe that the informal wage penalty understates the disadvantage of the informal wage work. Considering the nonpecuniary advantages and disadvantages of formal and informal employment remains a challenge for future work.

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TABLE 1: DESCRIPTIVE STATISTICS FOR PRIVATE FORMAL AND PRIVATE INFORMAL SAMPLE BY GENDER, EGYPT, 1998-2012

	Male Wage Earner		Female Wage Earner	
VARIABLES	**formal**	**informal**	**formal**	**informal**
	mean	*mean*	*mean*	*mean*
Log Hourly Wage	1.58	1.25	1.62	0.85
	(0.63)	(0.54)	(0.68)	(0.60)
Weekly Hours	57.13	66.00	47.42	57.42
	(17.59)	(34.21)	(10.13)	(15.53)
Age	36.10	30.24	36.68	30.17
	(9.41)	(9.70)	(9.93)	(9.17)
Age Square	1391.49	1008.71	1444.35	994.04
	(726.80)	(677.46)	(815.16)	(640.13)
Year of Schooling	10.52	7.67	13.87	9.40
	(4.59)	(4.28)	(3.73)	(5.33)
Household Size	5.06	5.67	4.47	5.10
	(2.47)	(2.75)	(1.61)	(2.11)
Marital				
single	23.00	45.90	54.00	79.90
married	77.00	54.10	46.00	20.10
Children				
no child	36.90	40.60	64.20	66.10
with child	63.10	59.40	35.80	33.90
Firm Size				
1 - 4	25.00	56.40	4.90	27.50
5 - 9	6.90	22.80	9.50	16.30
10 - 24	9.40	10.60	18.80	20.20
30 - 49	8.90	4.00	22.70	8.90
50 - 99	9.60	2.80	12.10	1.50
More than 100	40.20	3.30	32.00	25.60
Sector				
Manufacturing	43.10	27.60	22.90	46.40
Construction	5.80	28.60	7.70	0.00
Trade	13.90	21.40	17.00	24.50
Transportation	21.80	10.30	2.60	0.00
Finance and Services	15.40	12.10	49.80	29.10
Region				
Greater. Cairo	35.80	18.50	68.50	58.50
Alexandria, Sz. C.	16.80	10.60	18.30	7.70
Urban Lower	9.10	13.50	5.40	6.70
Urban Upper	5.20	7.80	1.70	5.00
Rural Lower	22.40	29.40	6.10	22.10

Rural Upper	10.80	20.20		
Year				
1998	20.40	22.40	23.30	26.00
2006	43.50	44.30	44.50	42.80
2012	36.20	33.20	32.10	31.20
Number of Obs.	999	1977	80	68
Informal Sector (%)	33.57	66.43	54.05	45.95
Total Number of Obs.		2976		148
Total Number of ID's		1398		72

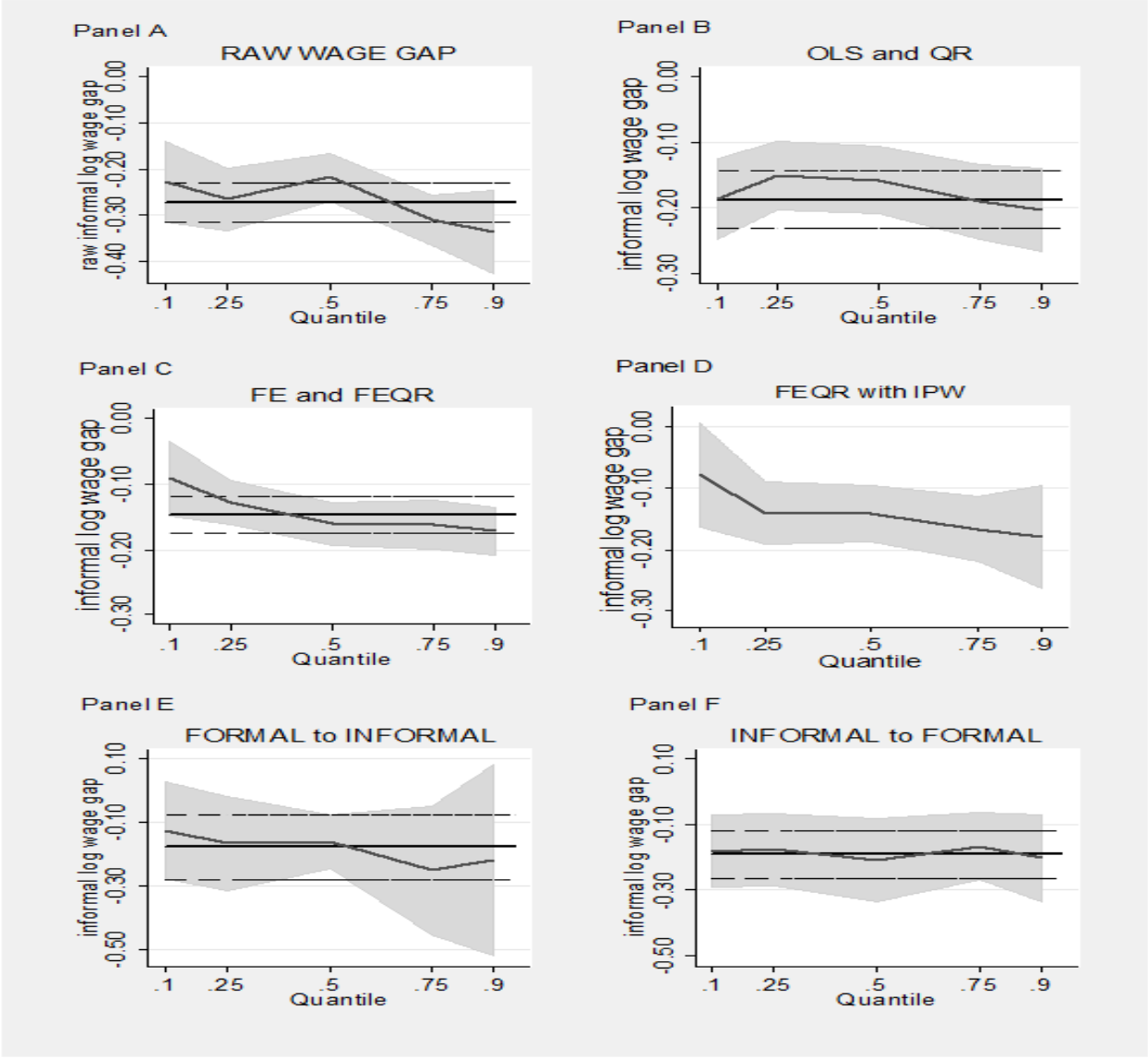
Source: Authors' computations using ELMPS data, 1998, 2006, 2012.

Notes: 1) The descriptive statistics in this table use the weighted observations which take attrition into account.

2) Standard deviations are in parenthesis for the continuous variable.

3) Log hourly wage is in Egyptian pounds real 2012 prices deflated using consumer price index.

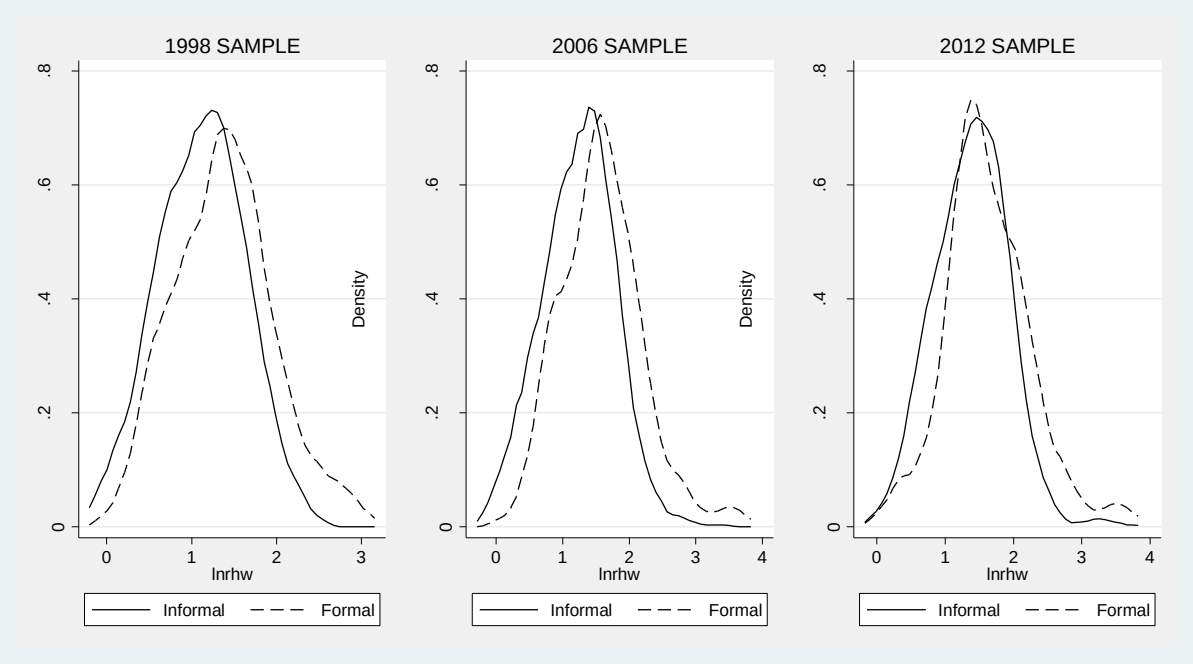
FIGURE 1: Estimates of the Informal Sector Wage Penalty Alternative Estimators, Male Sample, Egypt, 1988-2012



Sources: Authors' computations using ELMPS data, 1998, 2006, 2012.

Notes: 1) Panel A gives the raw informal log wage gap at the mean (solid horizontal line) and at different quantiles (solid curve) and the dashed lines and shaded area show the 95% confidence intervals. Panel B, C and D give informal versus formal wage penalty using OLS and FE estimates (solid horizontal lines) and QR, FEQR and IPW-FEQR estimates (solid horizontal curves) respectively. The dashed horizontal lines indicate robust 95% confidence intervals for the OLS and FE estimates. The shaded areas show the bootstrapped 95% confidence intervals in the case of OR, FEQR and IPW-FEQR estimates.

FIGURE 2: Kernel Density Estimates of Log Hourly Wage in Formal and Informal Sector, Egypt, 1998, 2006 and 2012.



Sources: Authors' computations using ELMPS data, 1998, 2006, 2012.

TABLE 2: SUMMARY OF ESTIMATION RESULTS: INFORMAL EMPLOYMENT WAGE GAP BY GENDER, EGYPT, 1998-2012

	MALE					
	mean	q1	q2	q3	q4	q5
Estimation Method						
RAW WAGE GAP						
Informal Wage Gap	-0.273***	-0.2283***	-0.2668***	-0.2185***	-0.3117***	-0.3373***
OLS and QR						
Informal Wage Gap	-0.180***	-0.1826***	-0.1462***	-0.1408***	-0.1733***	-0.1996***
FE and FEQR						
Informal Wage Gap	-0.147***	-0.0912***	-0.1283***	-0.1604***	-0.1613***	-0.1717***
	FEMALE					
	mean	q1	q2	q3	q4	q5
Estimation Method						
RAW WAGE GAP						
Informal Wage Gap	-0.761***	-0.5754***	-0.7419***	-0.8274***	-0.9808***	-0.5862**
OLS and QR						
Informal Wage Gap	-0.408***	-0.3621***	-0.3397***	-0.4697***	-0.4615**	-0.8455***
FE and FEQR						
Informal Wage Gap	-0.552***	-0.5818***	-0.6052***	-0.5724***	-0.4173***	-0.4180***

Sources: Authors' computations using ELMPS data, 1998, 2006, 2012.

Notes: 1) ***, ** and * indicate significance at 1, 5 and 10 percent levels respectively.

2) OLS indicates ordinary least squares estimates. QR indicates quantile regression estimates. FE is fixed effect estimates. FEQR is the fixed effect quantile regression estimates.

3) Regression coefficient on the table are based on the regressions using the variables reported in Table1 except that firm size is excluded. QR and FEQR regressions also do not include the firm size dummies since time-invariant factors are captured in fixed effects.

TABLE 3: SUMMARY RESULTS BY THE SUBSAMPLES OF TWO TIME PERIODS, AGE AND EDUCATION 1998-2012, EGYPT

		MALE	
SUBSAMPLE		OLS	FE
1998-2006			
	Informal Wage Gap	-0.179***	-0.0989
Observations		1,504	1,505
R-squared		0.222	0.323
2006-2012			
	Informal Wage Gap	-0.241***	-0.188***
Observations		2,069	2,069
R-squared		0.189	0.134
Age<Mean Age			
	Informal Wage Gap	-0.158***	-0.210***
Observations		1,697	1,687
R-squared		0.196	0.263
Age>Mean Age			
	Informal Wage Gap	-0.188***	-0.129*
Observations		1,277	1,276
R-squared		0.152	0.093
Years of Sch< Mean Years of Sch			
	Informal Wage Gap	-0.0332	-0.103
Observations		1,357	1,352
R-squared		0.192	0.161
Years of Sch> Mean Years of Sch			
	Informal Wage Gap	-0.245***	-0.129*
Observations		1,617	1,276
R-squared		0.250	0.093
		FEMALE	
SUBSAMPLE		OLS	FE
1998-2006			
	Informal Wage Gap	-0.329**	-0.636***
Observations		94	94
R-squared		0.538	0.620
2006-2012			
	Informal Wage Gap	-0.528***	-0.608***
Observations		105	105

R-squared		0.587	0.574
Age<Mean Age			
	Informal Wage Gap	-0.540***	-0.848***
Observations		83	82
R-squared		0.602	0.678
Age>Mean Age			
	Informal Wage Gap	-0.355	-0.464
Observations		65	63
R-squared		0.574	0.581
Years of Sch< Mean Years of Sch			
	Informal Wage Gap	-0.422*	-1.179**
Observations		55	54
R-squared		0.412	0.673
Years of Sch> Mean Years of Sch			
	Informal Wage Gap	-0.356**	-0.323**
Observations		93	91
R-squared		0.586	0.663

Source: Authors' computations using ELMPS data, 1998, 2006, 2012.

Notes: 1) ***, ** and * indicate significance at 1, 5 and 10 percent levels respectively.

2) OLS indicates ordinary least squares estimates. FE is fixed effect estimates.

3) The Mean Age for the male sample is 32.3, The Mean Age for the female sample is 33.8. The Mean Years of Schooling for the male sample is 8.62, The Mean Years of Schooling for the female sample is 11.67.

TABLE 4: SUMMARY RESULTS BY QUANTILES FOR THE SUBSAMPLES BY TWO TIME PERIODS, AGE AND EDUCATION 1998-2012, EGYPT

	MALE									
	QR					FEQR				
SUBSAMPLE	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
1998-2006										
Informal Wage Gap	-0.1638***	-0.1031**	-0.1451***	-0.1853***	-0.1976***	-0.1049***	-0.0989***	-0.0989***	-0.0989***	-0.0955***
Observations	1,504	1,504	1,504	1,504	1,504	1,505	1,505	1,505	1,505	1,505
Pseudo R-squared	0.155	0.149	0.123	0.113	0.128	0.604	0.675	0.697	0.599	0.430
2006-2012										
Informal Wage Gap	-0.2545***	-0.2064***	-0.1940***	-0.2284***	-0.2320***	-0.1429***	-0.1690***	-0.1884***	-0.2023***	-0.2072***
Observations	2,069	2,069	2,069	2,069	2,069	2,069	2,069	2,069	2,069	2,069
Pseudo R-squared	0.130	0.129	0.107	0.093	0.106	0.180	0.234	0.290	0.238	0.189
Age<Mean Age										
Informal Wage Gap	-0.1951***	-0.0809**	-0.1068**	-0.1485***	-0.1811***	-0.1694***	-0.2078***	-0.2076***	-0.2114***	-0.2169***
Observations	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697
Pseudo R-squared	0.139	0.131	0.119	0.102	0.092	0.251	0.317	0.380	0.344	0.306
Age>Mean Age										
Informal Wage Gap	-0.1585***	-0.1994***	-0.1674***	-0.1526**	-0.2472***	-0.0999***	-0.1445***	-0.1445***	-0.1442***	-0.1903***
Observations	1,277	1,277	1,277	1,277	1,277	1,278	1,278	1,278	1,278	1,278
Pseudo R-squared	0.124	0.095	0.074	0.083	0.113	0.175	0.196	0.264	0.245	0.220
Years of Sch< Mean Years of Sch										
Informal Wage Gap	-0.0929	-0.0646	-0.0431	0.0061	-0.0336	-0.0780*	-0.1033***	-0.1052***	-0.1000***	-0.0803*
Observations	1,357	1,357	1,357	1,357	1,357	1,357	1,357	1,357	1,357	1,357
Pseudo R-squared	0.150	0.146	0.108	0.085	0.079	0.371	0.398	0.391	0.352	0.325
Years of Sch> Mean Years of Sch										
Informal Wage Gap	-0.2168***	-0.1998***	-0.2054***	-0.1976***	-0.3021***	-0.1074***	-0.1348***	-0.1705***	-0.2030***	-0.1980***
Observations	1,617	1,617	1,617	1,617	1,617	1,618	1,618	1,618	1,618	1,618
Pseudo R-squared	0.143	0.155	0.137	0.147	0.159	0.228	0.255	0.269	0.238	0.217
	FEMALE									

	QR					FEQR				
SUBSAMPLE	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
1998-2006										
Informal Wage Gap	-0.3434*	-0.2516	-0.2083	-0.2962	-0.2385	-0.6391***	-0.6329***	-0.6357***	-0.6386***	-0.6058***
Observations	94	94	94	94	94	94	94	94	94	94
Pseudo R-squared	0.404	0.368	0.384	0.395	0.472	0.947	0.953	0.963	0.964	0.966
2006-2012										
Informal Wage Gap	-0.3434*	-0.2516	-0.2083	-0.2962	-0.2385	-0.5628***	-0.5938***	-0.6053***	-0.5757***	-0.6825***
Observations	94	94	94	94	94	105	105	105	105	105
Pseudo R-squared	0.404	0.368	0.384	0.395	0.472	0.894	0.896	0.885	0.858	0.851
Age<Mean Age										
Informal Wage Gap	-0.3864	-0.5235**	-0.4572*	-0.4711*	-1.0510***	-0.9664***	-0.8648***	-0.8690***	-0.8775***	-0.9762***
Observations	83	83	83	83	83	83	83	83	83	83
Pseudo R-squared		0.406	0.395	0.489	0.524	0.679	0.682	0.697	0.689	0.678
Age>Mean Age										
Informal Wage Gap	-0.4759	-0.6056	-0.3122	-0.1560	-0.4187	-0.4058***	-0.4118***	-0.4132***	-0.4067***	-0.4524***
Observations	65	65	65	65	65	65	65	65	65	65
Pseudo R-squared	0.505	0.452	0.429	0.450	0.526	0.665	0.633	0.645	0.638	0.693
Years of Sch< Mean Years of Sch										
Informal Wage Gap	-0.3256	-0.2397	-0.4056	-0.5836	-0.6647	-0.9431***	-0.5673***	-0.6808***	-0.7320***	-0.7374***
Observations	55	55	55	55	55	55	55	55	55	55
Pseudo R-squared	0.311	0.325	0.263	0.331	0.516	0.912	0.905	0.877	0.877	0.881
Years of Sch> Mean Years of Sch										
Informal Wage Gap	-0.3454	-0.2834	-0.4215*	-0.4232	-0.5021	-0.3887***	-0.3532***	-0.3434***	-0.2937***	-0.2954**
Observations	93	93	93	93	93	93	93	93	93	93
Pseudo R-squared	0.532	0.459	0.423	0.383	0.438	0.646	0.594	0.577	0.641	0.687

Source: Authors' computations using ELMPS data, 1998, 2006, 2012.

Notes: 1) ***, ** and * indicate significance at 1, 5 and 10 percent levels respectively.

2) OLS indicates ordinary least squares estimates. FE is fixed effect estimates. QR is quantile regression estimates. FEQR is fixed effect quantile estimates.

3) The Mean Age for the Male Sample İs 32.3, the Mean Age for the Female Sample is 33.8. The Mean Years of Schooling for the Male Sample is 8.62, the Mean Years of Schooling for the Female Sample is 11.67.

Appendix

TABLE A1: PROBIT ESTIMATION OF PROPENSITY TO BE IN THE INFORMAL SECTOR, BY GENDER, EGYPT, 1998-2012

	MALE	FEMALE
VARIABLES	PROBIT	PROBIT
Age	-0.0247***	-0.0454**
	(0.0054)	(0.0217)
Age2	0.0002***	0.0004
	(0.0001)	(0.0003)
Year of Schooling	-0.0248***	-0.0353***
	(0.0017)	(0.0072)
Married	-0.0873***	-0.0505
	(0.0212)	(0.0936)
Sector		
Construction	0.3385***	0
	(0.0234)	(0)
Trade	0.1536***	0.0918
	(0.0203)	(0.0977)
Transportation	-0.0733***	0
	(0.0214)	(0)
Finance & Services	0.0662***	0.0115
	(0.0232)	(0.0928)
Region		
Alexandria, Sz C.	0.0150***	-0.1297
	(0.0236)	(0.0959)
Urban Lower	0.1519	-0.0658
	(0.0246)	(0.1448)
Urban Upper	0.1166***	0.0387
	(0.0255)	(0.1525)
Rural Lower	0.1016***	0.0968
	(0.0224)	(0.1218)
Rural Upper	0.1144***	0
	(0.0276)	(0)
Year		
2006	0.0311	-0.0553
	(0.0206)	(0.0882)
2012	0.1193***	0.0354
	(0.0218)	(0.0999)
Wald Chi-Sq. (15 and 12)	616.57	50.82
Pseudo R- Square	0.2375	0.2507
Observations	2,974	142

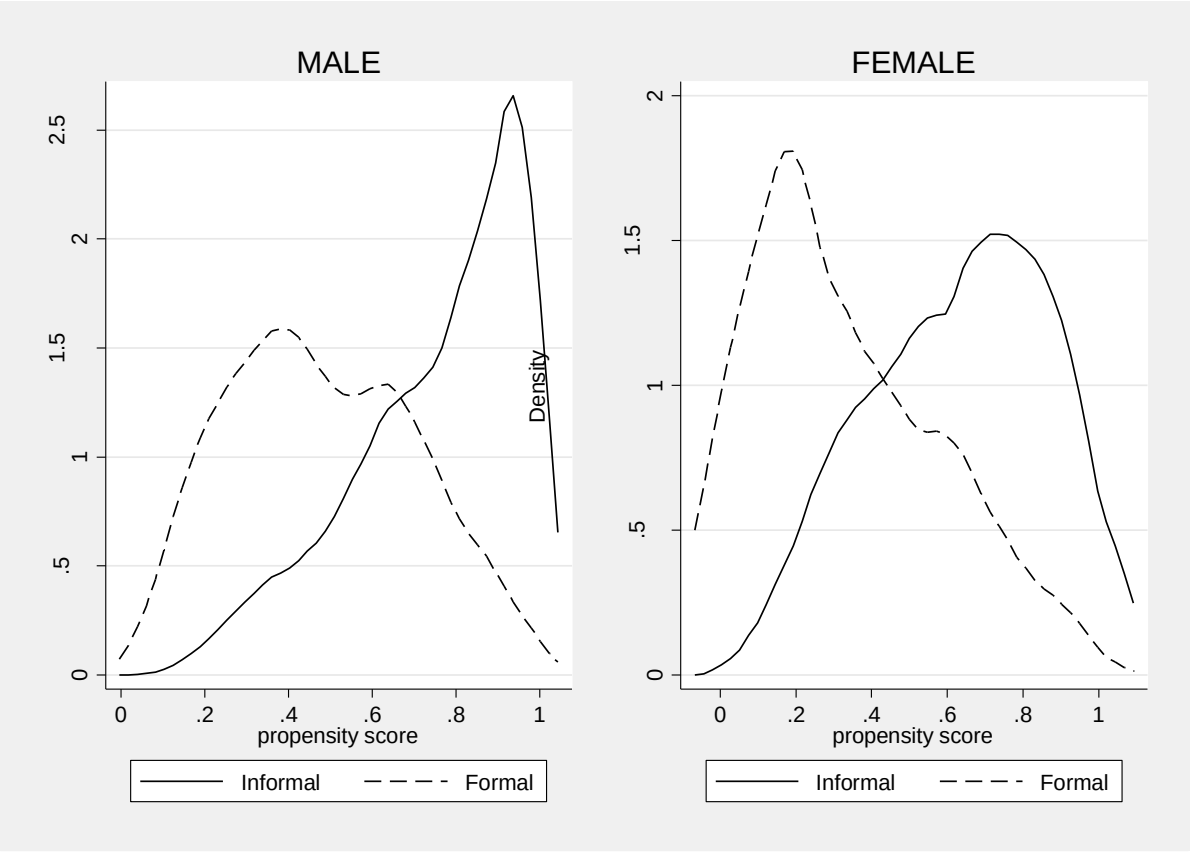
Sources: Authors' computations using ELMPS data, 1998, 2006, 2012.

Notes: 1) ***, ** and * indicate significance at 1, 5 and 10 percent levels respectively.

2) Standart errors are in parenthesis.

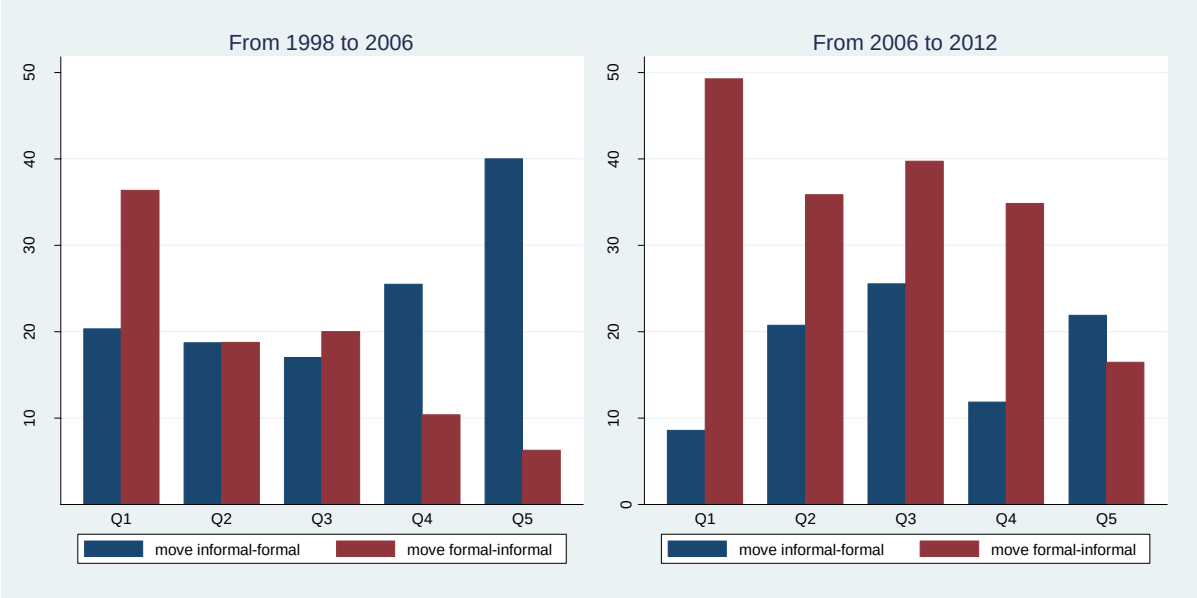
3) The dependent variable takes the value of one if informal sector and zero otherwise.

FIGURE A1: Kernel Density Estimates of the Propensity Scores, by Gender, Egypt, 1998-2012



Sources: Authors' computations using ELMPS data, 1998, 2006, 2012.

FIGURE A2: Distribution of the Proportion of Movers in and out of the Formal and Informal Sectors



Sources: Authors' computations using ELMPS data, 1998, 2006, 2012.

TABLE A2: MINCER EARNINGS EQUATIONS, OLS, FIXED EFFECT AND FIRT DIFFERENCES ESTIMATES, MALE SAMPLE, EGYPT, 1998-2012

VARIABLES	(1) OLS	(2) OLS	(3) OLS	(4) FE	(5) FE	(6) FD
Informal Sector	-0.155***	-0.180***	-0.159***	-0.147***	-0.139***	-0.142***
	(0.0230)	(0.0237)	(0.0265)	(0.0370)	(0.0377)	(0.0361)
Age	0.0435***	0.0313***	0.0310***	0.0472***	0.0467***	0.0502***
	(0.00628)	(0.00695)	(0.00695)	(0.0135)	(0.0136)	(0.0160)
Age2	-0.000428***	-0.000297***	-0.000296***	-0.000520***	-0.000515***	-0.000667***
	(8.74e-05)	(9.24e-05)	(9.25e-05)	(0.000120)	(0.000120)	(0.000152)
Years of Schooling	0.00999***	0.0133***	0.0124***			
	(0.00238)	(0.00232)	(0.00238)			
Married		0.0999***	0.104***	0.138***	0.139***	0.126***
		(0.0281)	(0.0283)	(0.0402)	(0.0405)	(0.0397)
Children		-0.0328	-0.0346	-0.00940	-0.0179	-0.00794
		(0.0235)	(0.0234)	(0.0346)	(0.0347)	(0.0387)
Household Size		-0.00754*	-0.00722*	0.00531	0.00587	0.00292
		(0.00398)	(0.00398)	(0.00644)	(0.00643)	(0.00704)
Firm Size						
5 - 9			0.0102		-0.0194	
			(0.0267)		(0.0333)	
10 - 24			-0.0565*		-0.0468	
			(0.0311)		(0.0413)	
30 - 49			0.0335		-0.0186	
			(0.0498)		(0.0713)	
50 - 99			-0.0454		-0.00849	
			(0.0528)		(0.0664)	
More than 100			0.0684*		0.0572	
			(0.0377)		(0.0551)	
Sector						
Construction		0.274***	0.277***	0.310***	0.307***	0.300***
		(0.0266)	(0.0270)	(0.0576)	(0.0593)	(0.0593)
Trade		-0.159***	-0.154***	-0.0606	-0.0592	-0.0711
		(0.0282)	(0.0293)	(0.0523)	(0.0534)	(0.0518)
Transportation		0.0803***	0.0922***	0.133**	0.135**	0.156**
		(0.0302)	(0.0340)	(0.0609)	(0.0633)	(0.0676)
Finance&Services		-0.0638*	-0.0608*	0.0696	0.0759	0.0827
		(0.0343)	(0.0348)	(0.0529)	(0.0537)	(0.0569)
Region						
Alexandria, Sz. C.	-0.0927***	-0.119***	-0.121***			
	(0.0344)	(0.0335)	(0.0335)			
Urban Lower	-0.102***	-0.117***	-0.119***			
	(0.0333)	(0.0318)	(0.0320)			
Urban Upper	-0.158***	-0.178***	-0.179***			
	(0.0360)	(0.0350)	(0.0352)			
Rural Lower	-0.159***	-0.178***	-0.184***			
	(0.0327)	(0.0318)	(0.0320)			
Rural Upper	-0.00811	-0.0848**	-0.0853**			
	(0.0352)	(0.0363)	(0.0364)			
Year						
2006	0.134***	0.125***	0.129***	0.160**	0.162**	0.226***
	(0.0261)	(0.0259)	(0.0260)	(0.0773)	(0.0780)	(0.0873)
2012	0.162***	0.136***	0.135***	0.187	0.184	0.297*
	(0.0285)	(0.0292)	(0.0292)	(0.138)	(0.140)	(0.157)

Constant	0.443***	0.680***	0.669***	0.205	0.211	
	(0.111)	(0.119)	(0.120)	(0.289)	(0.294)	
Observations	2,975	2,974	2,962	2,975	2,963	1,499
Number of id				1,398	1,398	
R-squared	0.142	0.206	0.209	0.179	0.182	0.165
Log Likelihood	-2352	-2234	-2219	-947.3	-932.1	-1478

Sources: Authors' computations using ELMPS data, 1998, 2006, 2012.

Notes: 1) ***, ** and * indicate significance at 1, 5 and 10 percent levels respectively.

2) Robust standard errors are in parenthesis.

TABLE A3: MINCER EARNINGS EQUATIONS, QUANTILE REGRESSION, MALE SAMPLE, EGYPT, 1998-2012

VARIABLES	(1) q10	(2) q25	(3) q50	(4) q75	(5) q90
Informal Sector	-0.1826***	-0.1462***	-0.1408***	-0.1733***	-0.1996***
	(0.0323)	(0.0336)	(0.0292)	(0.0333)	(0.0483)
Age	0.0450***	0.0313***	0.0386***	0.0243**	0.0296***
	(0.0102)	(0.0087)	(0.0077)	(0.0097)	(0.0107)
Age Square	-0.0005***	-0.0003***	-0.0004***	-0.0002	-0.0002
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Years of Schooling	0.0028	0.0107***	0.0119***	0.0166***	0.0195***
	(0.0030)	(0.0032)	(0.0025)	(0.0036)	(0.0043)
Married	0.0927**	0.1595***	0.1179***	0.0831**	0.0477
	(0.0365)	(0.0296)	(0.0281)	(0.0407)	(0.0496)
Children	0.0169	-0.0215	-0.0450*	-0.0201	-0.0453
	(0.0336)	(0.0263)	(0.0263)	(0.0352)	(0.0356)
Household Size	-0.0022	0.0017	-0.0058	-0.0132**	-0.0135*
	(0.0068)	(0.0056)	(0.0051)	(0.0058)	(0.0070)
Sector					
Construction	0.3951***	0.3487***	0.2704***	0.2216***	0.1458***
	(0.0405)	(0.0382)	(0.0292)	(0.0378)	(0.0479)
Trade	-0.1497***	-0.1713***	-0.1693***	-0.1229***	-0.1510***
	(0.0376)	(0.0363)	(0.0360)	(0.0438)	(0.0512)
Transportation	0.0957*	0.1456***	0.1163***	0.0780*	-0.0104
	(0.0503)	(0.0397)	(0.0329)	(0.0439)	(0.0476)
Finance&Services	-0.0974**	-0.0683*	-0.0999***	-0.0282	0.0234
	(0.0478)	(0.0368)	(0.0380)	(0.0412)	(0.0562)
Region					
Alexandria, Sz. C.	-0.1298***	-0.1257***	-0.0577	-0.0617	-0.0985*
	(0.0476)	(0.0378)	(0.0362)	(0.0444)	(0.0574)
Urban Lower	-0.1307***	-0.1139***	-0.0918**	-0.0941**	-0.0917
	(0.0402)	(0.0358)	(0.0418)	(0.0397)	(0.0588)
Urban Upper	-0.3331***	-0.2081***	-0.1423***	-0.1246***	-0.1202*
	(0.0556)	(0.0456)	(0.0429)	(0.0459)	(0.0656)
Rural Lower	-0.2927***	-0.1841***	-0.1116***	-0.1045**	-0.1228**
	(0.0498)	(0.0441)	(0.0382)	(0.0408)	(0.0552)
Rural Upper	-0.2063***	-0.1193***	-0.0356	-0.0222	-0.0354
	(0.0484)	(0.0366)	(0.0442)	(0.0532)	(0.0576)
Year					
2006	0.1443***	0.1009***	0.1083***	0.1343***	0.1577***
	(0.0353)	(0.0368)	(0.0299)	(0.0354)	(0.0436)
2012	0.1958***	0.1512***	0.0910**	0.1290***	0.1469***
	(0.0426)	(0.0423)	(0.0354)	(0.0395)	(0.0446)
Constant	-0.0530	0.2760*	0.4957***	1.0498***	1.3006***
	(0.1968)	(0.1505)	(0.1308)	(0.1522)	(0.1842)
Pseudo R-Square	0.1343	0.1355	0.1125	0.1051	0.1181
Observations	2,974	2,974	2,974	2,974	2,974

Sources: Authors' computations using ELMPS data, 1998, 2006, 2012.

Notes: 1) ***, ** and * indicate significance at 1, 5 and 10 percent levels respectively.

2) Bootstrap standard errors are in parenthesis (100 replications).

TABLE A4: MINCER EARNINGS EQUATIONS, FIXED EFFECT QUANTILE REGRESSION, MALE SAMPLE, EGYPT, 1998-2012

VARIABLES	(1) q10	(2) q25	(3) q50	(4) q75	(5) q90
Informal Sector	-0.0912***	-0.1283***	-0.1604***	-0.1613***	-0.1717***
	(0.0254)	(0.0192)	(0.0188)	(0.0195)	(0.0217)
Age	0.0442***	0.0445***	0.0481***	0.0511***	0.0523***
	(0.0082)	(0.0050)	(0.0068)	(0.0070)	(0.0076)
Age Square	-0.0005***	-0.0005***	-0.0005***	-0.0006***	-0.0006***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Married	0.1549***	0.2017***	0.1620***	0.1151***	0.0590*
	(0.0339)	(0.0264)	(0.0263)	(0.0252)	(0.0314)
Children	0.0108	0.0042	-0.0220	-0.0417**	0.0035
	(0.0243)	(0.0171)	(0.0167)	(0.0185)	(0.0277)
Household Size	0.0000	0.0062*	0.0056*	0.0056*	0.0066
	(0.0056)	(0.0032)	(0.0030)	(0.0030)	(0.0048)
Sector					
Construction	0.3253***	0.3275***	0.3070***	0.2809***	0.3001***
	(0.0350)	(0.0213)	(0.0211)	(0.0235)	(0.0325)
Trade	-0.0963***	-0.0737***	-0.0546***	-0.0366*	-0.0524*
	(0.0354)	(0.0263)	(0.0202)	(0.0220)	(0.0272)
Transportation	0.1365***	0.1085***	0.1230***	0.1432***	0.1771***
	(0.0312)	(0.0202)	(0.0244)	(0.0292)	(0.0436)
Finance & Services	0.0446	0.0589**	0.0572**	0.0696***	0.1001***
	(0.0367)	(0.0274)	(0.0278)	(0.0254)	(0.0313)
Year					
2006	0.1274***	0.1418***	0.1404***	0.1531***	0.1796***
	(0.0303)	(0.0254)	(0.0218)	(0.0207)	(0.0290)
2012	0.1542***	0.1575***	0.1943***	0.1779***	0.2409***
	(0.0337)	(0.0281)	(0.0274)	(0.0201)	(0.0324)
Constant	-0.1436	0.0212	0.2079**	0.3848***	0.5131***
	(0.1463)	(0.0866)	(0.1012)	(0.1221)	(0.1436)
Pseudo R-Square	0.2184	0.2417	0.2232	0.1948	0.1730
Observations	2,975	2,975	2,975	2,975	2,975

Sources: Authors' computations using ELMPS data, 1998, 2006, 2012.

Notes: 1) ***, ** and * indicate significance at 1, 5 and 10 percent levels respectively.

2) Bootstrap standard errors are in parenthesis (100 replications).

TABLE A5: MINCER EARNINGS EQUATIONS, INVERSE PROBABILITY WEIGHTED FIXED EFFECT QUANTILE REGRESSION, MALE SAMPLE, EGYPT, 1998-2012

VARIABLES	(1) q10	(2) q25	(3) q50	(4) q75	(5) q90
Informal Sector	-0.0778*	-0.1403***	-0.1404***	-0.1662***	-0.1800***
	(0.0431)	(0.0261)	(0.0233)	(0.0268)	(0.0434)
Age	0.0235***	0.0286***	0.0511***	0.0630***	0.0774***
	(0.0088)	(0.0095)	(0.0077)	(0.0082)	(0.0089)
Age Square	-0.0002	-0.0002*	-0.0005***	-0.0006***	-0.0007***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Married	0.1135**	0.1409***	0.0446	0.0137	-0.0582
	(0.0487)	(0.0437)	(0.0434)	(0.0619)	(0.0730)
Children	-0.1255***	-0.1052***	-0.1466***	-0.1481***	-0.1877***
	(0.0435)	(0.0273)	(0.0291)	(0.0368)	(0.0621)
Household Size	0.0269***	0.0222***	0.0120	-0.0043	0.0018
	(0.0095)	(0.0078)	(0.0083)	(0.0097)	(0.0093)
Sector					
Construction	0.1393*	0.0604	0.1034	0.0659	0.1438
	(0.0802)	(0.0838)	(0.0892)	(0.0855)	(0.1016)
Trade	-0.4974***	-0.5594***	-0.5604***	-0.5765***	-0.5517***
	(0.0506)	(0.0276)	(0.0291)	(0.0383)	(0.0573)
Transportation	-0.0642	-0.1049***	-0.0447	-0.0432	-0.1062**
	(0.0581)	(0.0340)	(0.0320)	(0.0329)	(0.0534)
Finance & Services	-0.1675***	-0.1798***	-0.1793***	-0.1489***	-0.1238
	(0.0533)	(0.0298)	(0.0399)	(0.0447)	(0.0892)
Year					
2006	0.5515***	0.6133***	0.4711***	0.5338***	0.5084***
	(0.1118)	(0.1092)	(0.0750)	(0.0725)	(0.0859)
2012	0.5450***	0.6206***	0.4454***	0.4555***	0.4063***
	(0.1196)	(0.1245)	(0.0867)	(0.0726)	(0.0986)
Constant	-0.2808***	-0.0501	0.0712	0.2182**	0.2234*
	(0.1051)	(0.0838)	(0.0834)	(0.1031)	(0.1240)
Pseudo R-Square	0.3738	0.4733	0.5821	0.6901	0.7734
Observations	2,974	2,974	2,974	2,974	2,974

Sources: Authors' computations using ELMPS data, 1998, 2006, 2012.

Notes: 1) ***, ** and * indicate significance at 1, 5 and 10 percent levels respectively.

2) Bootstrap standard errors are in parenthesis (100 replications).