CORRUPTION AND ECONOMIC DEVELOPMENT
ERF 18th ANNUAL CONFERENCE
March 25-27, 2012 | Cairo Marriott Hotel, Cairo, Egypt
2012

# Structural Labor Market Transitions and Wage Dispersion in Egypt

*Chaimaa Yassine*

ECONOMIC RESEARCH FORUM
منتدى البحوث الاقتصادية

# Structural Labor Market Transitions and Wage Dispersion in Egypt *

Chaimaa YASSINE†

Novembre, 2011
Incomplete and Preliminary Draft

**Abstract**

In this paper we determine the feasibility of using data from the Egyptian Labor Market Panel Survey (ELMPS2006) to estimate the Burdett-Mortensen job search model. The data contain sufficient information on wages, labor force states, durations, and transitions to generate estimates of the model's structural parameters. Results indicate that arrival rates of offers for workers are generally higher when unemployed than when employed. When a worker is already employed, the arrival rates of offers for highly educated workers tend to be higher than their uneducated peers. We therefore find that they consequently move faster up the job ladder. Although, we were able to calculate a firm-specific productivity distribution, we choose to rather focus on the supply side of the equilibrium job search model. We therefore study labor market differentials across the different educational groups in Egypt, showing that the wide Variation in frictional transition parameters across these groups helps to explain persistent unemployment and wage differentials especially among the very high educated. Formal Tests and policy implications are performed based on the obtained results.

JEL classification: D83, J31, J64.

Keywords: Equilibrium Search Models, Wage dispersion, Search Frictions, Wage Posting, On-the-job Search.

*This paper is mainly based on my Masters thesis at the University of Paris 1 Panthéon-Sorbonne. I would like to thank my supervisor Fabien Postel-Vinay for all the help and guidance. Microeconomics seminar Participants at the ETE masters program also provided valuable remarks. Comments and suggestions from my professor and director Ragui Assaad, my current supervisor François Langot as well as my mentor during my masters Nicolas Jacquemet, are gratefully acknowledged.

†University of Paris1 Panthéon-Sorbonne, Paris School of Economics (PSE) & Economic Research Forum (ERF) , 21 El Sad El Aali St., Dokki, Cairo, Egypt - P.O. Box: 12311. E.mail: cyassine@erf.org.eg

# 1 Introduction

During recent years, some important theoretical contributions established wage dispersion as the equilibrium outcome of a wage-posting game among a group of homogenous workers and firms in an environment with labor search frictions (Burdett and Mortensen, 1998). The obtained equilibrium distribution of wages comes in closed-form solution allowing for an empirical estimation of such models. It is no surprise that these research efforts have been accompanied by a growing empirical literature dealing with the structural estimation of equilibrium search models to study persistent wage and unemployment differentials. Among these, one should include Eckstein and Van den Berg (2007) and Van den Berg (1999) who survey the literature and discuss most applications. Bowlus (1997) studies gender wage differentials, Bontemps et al. (2000) discuss evidence of sectorial wage differences, Bowlus et al. (2001) analyze the transition from school to work for young workers, Bowlus and Eckstein (2002) include discrimination and skill differentials. Finally, Ridder and Van den Berg (2003) and Jolivet et al. (2006) provide cross-country comparisons of estimates from equilibrium search models. Important work by Bontemps et al. (2000) and Mortensen (2003) has demonstrated that both heterogeneity in firms. productivity and search frictions are necessary to fit the wage distribution. We adopt in our analysis their estimation methods. Yet, it's worth noting that not all attempts succeeded to fit the wage and productivity distributions estimated by the model to the empirical data. As a matter of fact, there exists quite a huge debate in the literature about the merits and disadvantages of such models in explaining wage dispersion and the labor market imperfections. We shall discuss at the end of this paper the limitations of the model in question and the possible extensions that were either considered by modern literature or to be considered in the future.

In this paper, the BM model is used to study wage differentials in Egypt among different education groups. Although quite a good number of researchers have tried to analyze the Egyptian labor market from various perspectives, no attempts, to the best of our knowledge, were made to estimate an equilibrium search model and replicate it using the Egyptian labor market data. We sample a cross-sectional group of workers from the ELMPS 2006. Retrospective information allowed us to obtain the employment vector of each individual between 1998-2006 (the panel we used) to estimate the equilibrium BM model using the closed-form solution for the wage offer distribution obtained from the theoretical model.

Instead of focusing on the dynamic evolution of wages and unemployment, as done earlier by other Egyptian researchers, we shed some light on the meeting process of workers and firms in the Egyptian labor market. More precisely, we tend to focus on the labor market imperfections and provide a quantitative measure of the importance of frictions across different educational groups by using maximum-likelihood techniques. The model delivers interesting empirical results, explaining wages, wage dispersion, unemployment and wage differentials among different groups and subgroups. Our estimations and conclusions were made from a rudimentary partial BM model. The model can however be used to estimate the monopsony power of firms when setting their wages if one extends his work to the demand side of the labor market as well.

According to official statistics calculated by the Egyptian Central Authority of Public Mobilization and Statistics (CAPMAS), the unemployment rate in Egypt has been persistently high over the last decade, with the problem being most acute among the better educated youth. There is also wide evidence of under-employment in the formal sector. These facts are used in our paper to relate reality to our conclusions and estimations.

The rest of the paper is divided as follows. In the first section, we briefly survey previous literature about the job search models. The second section provides a complete detailed description of the theoretical BM model in case of identical agents and when heterogeneity in terms of productivity is also introduced among firms. We then move to the empirical application of the model on the Egyptian labor market data. In a first part, we describe the Egyptian labor market data and the selection of the sample used to estimate the model. Some summary and descriptive statistics are also provided. Empirical specifications and estimation results are then given in the second part. We finally conclude with some formal tests and policy implications and discuss further research issues.

# 2 Literature Survey

A fundamental motivation of labor economics as a research field is explaining wage differentials . both across individuals (wage inequality) and over time (wage dynamics). Although Mincer equations succeeded in the 70s and 80s to reveal wage differentials across education and experience groups, further analysis using panel data sets on wages showed that a large part of wage dispersion (more than 50%) resulted from unobserved heterogeneity in individual ability and complex accumulation of idiosyncratic shocks. At this point, the only available interpretation was that wages reflect individual productivity.

The recent advent of matched employer-employee data at the end of the 90.s has made it possible to develop and estimate wage equations with two-sided unobserved heterogeneity; both worker and firm effects. Even though, Abowd et al. (1999) managed to reveal systematic wage differentials both across individuals as well as employers, a significant fraction of wage dispersion still remained unexplained. The percentage of log wage variance explained by the error component model equation was around 70-80%. Since this empirical evidence was hard to rationalize within a perfect information Walrasian framework, this model began to gain ground among labor economists, who now switched their interests toward equilibrium models with imperfect information.

In general, economists struggled to generate equilibrium models that could overcome the critiques that were directed to Partial search models. The latter took the wage offer distribution $F(\omega)$ and the arrival rate of offers $\lambda$ as given. For instance, the McCall model suffered two early critiques known as the Rothschild and Diamond paradoxes. Rothschild (1973) showed that in the McCall model when all workers are homogenous and firms post prices, the only equilibrium will be all firms offering the reservation wage. Diamond (1971) showed that in equilibrium this unique reservation wage would in fact be zero.

Early equilibrium models that yielded wage dispersion were typically predicated on worker or firm heterogeneity. A popular model was that of Albrecht and Axell (1984) which relies upon discrete heterogeneity in workers. value of leisure. This model was subsequently estimated using panel data in a well-known paper by Eckstein and Wolpin (1990), which used finite mixtures to proxy for the different types of workers. Because the model also implied that each type of worker was paid their reservation wage, they found that the fit to real wage data was quite poor.

The first wage posting model to yield wage dispersion among homogenous workers and firms was the Burdett-Mortensen model (1998). The key insight of this model is that workers not only search from unemployment but also on the job. Consequently, firms that post very low wages will have high attrition rates (turnover) and a small size. These differences in firm size are balanced by the savings in cost per worker to yield a continuum of possible wages in equilibrium with equal profit. The BM model is described more in details below. Although the model offered a closed-form solution (Burdett and Mortensen, 1998; Mortensen, 1990) for the possibility of a wage distribution as an equilibrium outcome, in its basic form, it implies that both densities for the distribution of wages offered and the distribution of wages actually paid to employees i.e. the earnings distribution are strictly increasing and left-skewed with the wages concentrated near the competitive equilibrium. In reality however empirical earnings densities have a long decreasing right tail.

The first attempts to structurally estimate the relevant parameters of the pure homogeneous Burdett and Mortensen (1998) model give unsatisfactory results, given that they were not able to fit the empirical wage distribution (see Van den Berg and Ridder, 1993a, 1993b; and Kiefer and Neumann, 1993). To fit the right tail of the distribution, it is essential to introduce some kind of heterogeneity across worker/firms' productivities or measurement error. Heterogeneity can be modeled along various dimensions. Allowing it to vary across different segments of the labor market, as defined by occupation, education or age categories, permits a reasonable fit to the data. Van den Berg and Ridder (1998) and Ridder and Van den Berg (1997) allow for this kind of between-markets observable heterogeneity. On the other hand, Bowlus et al. (1995, 2001), and Bontemps et al. (1999, 2000) estimate equilibrium search models assuming that firms differ in their productivity level within the same market. The former approach allows for a discrete distribution of productivity types, whereas the latter fits the data assuming a continuous distribution of productivities as well as worker heterogeneity. Yet, because of the theoretical complexity, an analytical solution in their case could only be derived under the assumption of equal arrival rates of job offers to unemployed and employed agents. This is definitely a very strong assumption.

To overcome the restriction to arrival rates equality and at the same time keep the model tractable, Postel-Vinay and Robin (2002) suggest somewhat different assumptions on the wage setting process. Their estimation procedure is a further extension to the non-parametric method offered by Bontemps et al. (2000). In a unified search equilibrium framework, they represent workers. heterogeneity with respect to opportunity costs of employment as well as offer a possibility to study the dependence of workers. search behavior on their observed characteristics. This new mechanism of wage setting that implies tenure-increasing wage trajectories for any worker within the firm. Job-to-job transitions with an initial wage cut expecting a higher payment in the future become possible. This novelty was actually implemented through the introduction of a new transition parameter ($\lambda_2$) in the model developed by Jolivet et al. (2005) making it consistent with data containing job-to-job movers who experience wage cuts while changing their jobs.

Having reviewed the literature on the estimation of the equilibrium search model with wage posting, one can therefore notice that the assumption of the continuous productivity dispersion and subsequent nonparametric procedures become standard because of their relative simplicity[1] and a 'perfect' fit. We therefore adopt these estimation methods in our empirical application.

# 3 The Burdett-Mortensen Model

In this section, we provide a complete description of the equilibrium search theory along the lines of Burdett and Mortensen (1998) and Bontemps et al. (2000). We begin with a pure search model in which all jobs are equally productive and all workers are identical, then we introduce employer heterogeneity in the model. Yet, we always retain the assumption of homogeneity of the worker population throughout the paper.

The supply side is populated by a continuum of *exante* identical workers whose behavior is characterized by the standard job search model with on-the-job search. These workers are risk-neutral agents who maximize their expected present value of future income stream with infinite horizon; $m$ is the large number of these homogenous workers in the economy. On the other hand, the demand side is composed by a large number of

[1] The nonparametric estimate of the observed earnings distribution directly substitutes the theoretical earnings distribution in the likelihood function.

identical firms whose measure is normalized to 1. It is assumed that the worker can be in one of two states, employed or unemployed and $u$ is the number of unemployed. Workers are assumed to search for jobs both when employed and when unemployed. In both cases the probability of receiving an offer is distributed according to a standard Poisson process where $(\lambda_0)$ is the arrival rate of job offers while unemployed, and $(\lambda_1)$ when employed. $\phi$ is the reservation wage when unemployed, whereas the wage earned $\omega$ is the reservation wage when employed. When unemployed a worker has utility flow given by $b$; this is assumed equal among workers and can be interpreted as the value of leisure (or non-market time) or the level of unemployment benefit per period net of search costs.

When employed, workers earn their wage $\omega$ and $p$ is the flow revenue generated per employed worker; a firm earns $p - \omega$ when the job is filled. There is no endogenous job destruction deriving from productivity shocks, but $\delta$ is the exogenous probability that a job is destroyed at every moment in time. Define $\kappa_0 = \lambda_0/\delta$ and $\kappa_1 = \lambda_1/\delta$. Finally, let $F(\omega)$ represent the distribution of wages offered to workers and $G(\omega)$ the distribution of wages actually paid to employed workers. The latter is the earnings distribution.

## 3.1 Worker behavior

Given this framework, the present value of being unemployed, $U$, solves the continuous asset pricing equation

$$\begin{aligned} \rho U &= b + \lambda_0 \left( \int_{\underline{\omega}}^{\overline{\omega}} \max\{V(x), U\} dF(x) - U \right) \\ &= b + \int_{\phi}^{\overline{\omega}} \frac{\lambda_0 \overline{F}(x)}{\rho + \delta + \lambda_1 \overline{F}(x)} dx. \end{aligned} \quad (1)$$

where $\rho$ is the common discount rate, $V(\omega)$ is the lifetime utility that a worker derives from working for a wage of $\omega$, $\overline{\omega}$ is the upper bound of the support of $F$ and $\underline{\omega}$ is the lowest posted wage (the lower support of F ) ;$\underline{\omega} = \max\{\phi, \omega_m in\}$ , where $\omega_m in$ is any institutional wage floor . This equation simply states that the opportunity cost of unemployment, the left-hand side of (1), is equal to the sum of the value of non-market time and the expected gain of finding an acceptable job, the right-hand side of (1). Analogously, the present value of being employed at wage $\omega$, solves

$$\rho V(\omega) = \omega + \delta(U - V(\omega)) + \lambda_1(\int_{\underline{\omega}}^{\overline{\omega}} \max\{V(x), V(\omega)\} dF(x) - V(\omega)) \tag{2}$$

$$\Longleftrightarrow \quad (\rho + \delta + \lambda_1 \overline{F}(x))V(\omega) = \omega + \delta U + \lambda_1 \int_{\omega}^{\overline{\omega}} V(x) dF(x).$$

which consists of the current wage, the likelihood and value of becoming unemployed (getting laid off) and the likelihood and value of receiving an alternative job offer. It is obvious that the utility flow of the employed worker is assumed to be equal to his current wage (i.e. $\omega$).The second line uses the fact that $V(.)$ is strictly increasing in $\omega$. Noticing that $V'(\omega) = \frac{1}{\rho+\delta+\lambda_1\overline{F}(\omega)}$, we finally obtain

$$(\rho + \delta)V(\omega) = \omega + \delta U + \int_{\omega}^{\overline{\omega}} \frac{\lambda_1 \overline{F}(x)}{\rho + \delta + \lambda_1 \overline{F}(x)} dx. \tag{3}$$

Since $V(\omega)$ increases with $\omega$ and $U$ is independant of it, there exists a reservation wage $\phi$ such that the indifference condition $V(\omega) = U$. By Virtue of (1) and (2), it then holds that

$$\begin{aligned} \phi &= b + (\lambda_0 - \lambda_1)(E_{x\sim F}(\max \int V(x), U) - U) \\ &= b + (\lambda_0 - \lambda_1) \int_{\phi}^{\overline{\omega}} V(x) - U dF(x). \end{aligned} \tag{4}$$

Integration by parts allows us to obtain a formal unambiguous definition of $\phi$

$$\begin{aligned} \phi &= b + (\lambda_0 - \lambda_1) \int_{\phi}^{\overline{\omega}} [1 - F(x)] dV(x) \\ &= b + (\lambda_0 - \lambda_1) \int_{\phi}^{\overline{\omega}} \frac{\overline{F}(x)}{\rho + \delta + \lambda_1 \overline{F}(x)} dx. \end{aligned} \tag{5}$$

Following Burdett and Mortensen (1998), we focus on the limiting case of zero discounting and set $\rho = 0$. This allows to rewrite (5) in the simpler form:

$$\phi = b + (\kappa_0 - \kappa_1) \int_{\phi}^{\overline{\omega}} \frac{\overline{F}(x)}{1 + \kappa_1 \overline{F}(x)} dx \tag{6}$$

This equation defines the reservation wage $\phi$ as a function of the structural parameters of the model.

From (6), one can see how the possibility of on-the-job search affects the optimal search strategy of an unemployed worker. If wage offers arrive more frequently when unemployed than when employed ($\lambda_0 > \lambda_1$), the reservation wage $\phi$ exceeds the value of non-market time $b$. In that case it is more rewarding to search while unemployed and the worker rejects wage offers in the interval $(b, \phi)$, even though this causes a utility loss in a short run. When the arrival rate is independant of employment status ($\lambda_0 = \lambda_1$), the worker is indifferent between searching while employed and while unemployed. Any job that compensates for the foregone value of non-market time is acceptable in this case and thus $\phi = b$. If on-the-job search is not possible ($\lambda_1 = 0$), the expression in (6) reduces to the standard optimality condition.

## 3.2 Firm behavior

It's important to note that $p$ is assumed to be independent of the size of the workforce and we refer to $p$ as the marginal product of labor of the firm. When a firm sets its wage, it seeks to maximize the steady-state profit flow taking into consideration the optimal search behavior of workers as well as wages set by other firms (i.e. other firms' behavior). To attract workers the firm posts wage offers, among which workers randomly search using a uniform sampling scheme. Contrary to the competitive setting, the presence of search frictions in the labor market generates dynamic monopsony power for wage-setting firms. As workers cannot find a higher-paying job instantaneously, firms can offer wages strictly smaller than marginal labor productivity. The steady-state profit flow of a firm paying wage is given by

$$\pi(p, \omega) = (p - \omega)l(\omega) \tag{7}$$

where $l(\omega)$ is the size of the steady-state workforce (associated with a given $F$). The firm would employ as many workers as possible to maximize its profit flow as long as $p > \omega$ . Since the current wage serves as the reservation wage for employed workers, the number of workers available to the firm in equilibrium increases with the wage offered, i.e. the firm faces an upward-sloping labor supply curve. Obviously, a firm will never set a wage above $p$ as its profits will be negative, nor it offers a wage less than $\phi$ otherwise it won't be able to attract workers.

### 3.3 Steady-state outcomes

The equation of motion of unemployment in this economy is given by the difference between the inflow and the outflow of the stock. It therefore follows that in steady state,

$$\delta(m-\mu) = \lambda_0[1-F(\phi)]\mu \tag{8}$$

As mentioned above, no worker accepts a wage lower than the reservation wage, $F(\phi)$ is therefore equal to zero. This implies using further manipulations that the equilibrium unemployment rate is as follows;

$$\frac{\mu}{m} = \frac{\delta}{\delta+\lambda_0} = \frac{1}{1+\kappa_0}, \tag{9}$$

Using an analogous argument we can derive the steady-state earnings distribution $G$, the cross-section wage distribution of currently employed workers, associated with a given wage offer distribution $F$. Given the initial allocation of workers to firms, the number of workers employed receiving a wage no greater than $\omega$ is given by $G(\omega)(m-\mu)$ ; the evolution of this stock over time is given by

$$\frac{dG(\omega)(m-\mu)}{dt} = \lambda_0 F(\omega)\mu - \{\delta + \lambda_1[1-F(\omega)]\}G(\omega)(m-\mu), \tag{10}$$

The outflow (second part on the right-hand side) is simply equal to the sum of workers previously holding a job that has been destroyed (i.e. laid off, losing their job due to a demand shock) and those who find a better opportunity (receiving an offer greater than $\omega$) and quit their old job. The inflow consists of those workers who are already unemployed and receive an offer greater than $\phi$ but still less than $\omega$ (the first part on the right-hand side). In a steady state, these flows should be equal. We therefore derive the following structural relationship between the distribution of wages actually paid to employed workers and the distribution of wages offered:

$$
\begin{aligned}
G(\omega] &= \frac{F(\omega)}{\delta + \lambda_1[1 - F(\omega)]} \cdot \frac{\lambda_0 \mu}{m - \mu} \\
&= \frac{F(\omega)}{1 + \kappa_1[1 - F(\omega)]}
\end{aligned}
\tag{11}
$$

for all $\omega$ on the common support of $F$ and $G$. Since workers tend to move up the wage range over time, the earnings distribution lies to the right of the wage offer distribution, or more formally, $G$ first-order stochastically dominates $F$ as $F(\omega) - G(\omega) \geq 0$ for all $\omega$ and $kappa_1 \geq 0$. The discrepancy between the earnings and wage offer distributions depends on $\kappa_1$ which is equal to the expected number of wage offers during a spell of employment (which may consist of several consecutive job spells) and can be thought of a relative measure of competition among firms for workers.

The model therefore provides a theory not only of the wage distribution, but of that of firm sizes as well.

$$
1 - F(\omega) = \frac{1 - G(\omega)}{1 + \kappa_1 G(\omega)} \tag{12}
$$

Therefore, $l(\omega|\phi, F)$, the measure of workers per firm earning a wage $\omega$ given $\phi$ and $F$ which specifies the steady state number of workers available to a firm offering a particular wage conditional on the wage offered by other firms, represented by $F$ , and the workers' reservation wage $\phi$ can be written as

$$
l(\omega|\phi, F) = \frac{g(\omega)}{f(\omega)}(m - \mu) \tag{13}
$$

where $g(\omega)$ and $f(\omega)$ are the densities of the corresponding distributions. This expression is increasing in $\omega$ and continuous on the support of the distribution $F$. In what follows it is also useful to recall again the structural relationships between the earnings and offer distribution. This is given by the following expression

$$f(\omega) = \frac{1+\kappa_1}{[1+\kappa_1 G(\omega)]^2} g(\omega) \tag{14}$$

Using 14, we substitute again the expression for $l(\omega)$. The latter can be rewritten as

$$l(\omega|\phi, F) = \frac{[1+\kappa_1 G(\omega)]^2}{1+\kappa_1}(m-\mu) \tag{15}$$

This is the number of workers available to work at the firm offering that particular wage $\omega$ . Let's now look at the firm's productivity. First the case with homogenous firms is analyzed; the model is then extended to allow for heterogeneity in firms' productivities.

**Homogeneous Firms** Firms post wages to maximize their steady state profit flow, given $\phi$ and $F$. $p$ is the common flow revenue generated by an employed worker, with $b < p < \infty$. When a worker and a firm meet they do not bargain over the wage but divide the surplus deriving from their match getting $\omega - b$ and $p - \omega$ respectively. Notice that the wage has been previously fixed by the firm to maximize the steady state flow of profits. Firms solve the following problem

$$\pi(\omega|\phi, F) = \max_{\omega}(p-\omega) l(\omega|\phi, F) \tag{16}$$

An equilibrium is defined as follows Definition 2 (Burdett and Mortensen, 1998): *An equilibrium solution to the research and wage posting game is a triple $\phi, F, \pi$ such that $\phi$ satisfies the reservation wage equation, $\mu$ satisfies the firm maximization problem and $F$ is such that: $(p-\omega)l(\omega|\phi, F) = \pi$ for all $\omega$ in support of $F$,$(p-\omega)l(\phi, F) \leq \pi$ otherwise.*

Burdett and Mortensen (1998) demonstrate that the equilibrium solution exists, is unique and the wage offer distribution is continuous and not degenerate with support $[\phi, \overline{\omega}]$. Any employer offering a wage less than $\phi$ in equilibrium would have no employee indeed. On the other hand, any employer offering a wage $\underline{\omega}$ will have a positive workforce and profits.

Heterogeneous Firms Assume now that firms are heterogeneous with respect to their labor productivity parameter $p$. Let $\Gamma(p)$ denote the continuous distribution of productivity with support $[\overline{p}, \underline{p}]$ . Under this assumption, the optimal; strategy for the firm is to post a wage in the set of profit maximizing wages. Let the function $\omega = K(p$ denotes the mapping from productivity to wages. Notice that given continuity of this function, the mapping from productivity to offered wages determines a continuous distribution for $F(\omega)$. Firms maximize 7 with respect to $\omega$. From the first order condition it is then possible to determine the firm value of productivity parameter

$$p = \omega + \frac{1 + \kappa_1 G(\omega)}{2kappa_1 g(\omega)} \tag{17}$$

Bontemps et al. (2000) also drive a closed form solution for the density of the productivity of firms that are active in the market equilibrium. This can be written as

$$\gamma(p) = \frac{2kappa_1(1 + kappa_1)g(\omega)^3}{3\kappa_1 g(\omega)^2[1 + \kappa_1 G(\omega)]^2 - g^1(\omega)[1 + \kappa_1 G(\omega)]^3} \tag{18}$$

Finally, the wage offer $\omega = K(p)$ of a firm with productivity $p$ is equal to

$$\omega = K(p) = p - [1 - \kappa_1 \overline{\Gamma(p)}]^2 \int_{\underline{omega}}^{p} \frac{dx}{[1 = \kappa_1 \overline{\Gamma}(x)]^2} \tag{19}$$

This is the central equation of the model (Bontemps et al., 2000). In this economy, an equilibrium is defined as follows

Definition 3 (Bontemps et al., 2000) A market equilibrium is a triple $(\phi, F(\omega), K_p)$ such that

The distribution of wage offers in the economy is

$$F(\omega) = \int F(\omega/p) d\Gamma(p) \tag{20}$$

where $\Gamma(p)$ is the distribution of firms active in the market, $\phi$ is the worker's best strategy to firms' behavior and satisfies

$$\phi - b = [\kappa_0 - \kappa_1] \int_{\phi}^{\infty} \frac{1 - F(x)}{1 + \kappa_1 [1 - F(x)]} dx. \tag{21}$$

$K_p = \arg\max_{\omega} \{\pi(p, \omega) \phi \leq \omega \leq p\}$ is a set of profit maximizing wages of type $p$ firms with $\pi(p, \omega)$ defined in (7) and $K_p$ defined in 19. For the homogenous case, Burdett and Mortensen (1998) show that as long as $\underline{\omega} = \phi$ and $\lambda_1 > 0$, then the unique candidate for $F$ for any $p$ is

$$F(\omega|p) = [\frac{(1 + \kappa_1)}{\kappa_1}][1 - (\frac{p - \omega}{p - \phi})^{\frac{1}{2}}] \forall \omega \in [\phi, \overline{\omega}] \tag{22}$$

Notice that in the standard basic Burdett and Mortensen (1998) model, the monopsonistic solution is avoided allowing the employed workers to compare at every moment in time the wage earned and the new job offer arrival. Extreme solutions can be obtained as limiting cases: If $\kappa_1 \to 0 \Rightarrow \overline{\omega} \to \phi \Rightarrow \phi \to b$, and the Diamond solution is obtained; on the other hand, if $\kappa_1 \to \infty \Rightarrow G(\omega) \to p$ this is the case when frictions vanish; finally, as $\kappa_0 \to \infty$ as well, then the competitive equilibrium results (the offer arrive instantaneously). This completes the description of the theoretical models.

# 4 Empirical Analysis

## 4.1 Data

Previous literature showed that the BM model can be estimated from the data on individual labor market histories where at least some of the workers are observed with both unemployment duration and job duration with the associated wage. The empirical analysis of this study is based on a sample of individuals drawn from the worker data of the Egyptian labor Market Panel Survey 2006 (ELMPS06)[2].

The ELMPS 06 is designed as a panel survey in the sense that it follows the same households and individuals that were interviewed in the Egypt Labor Market Survey of

[2]Copyright Economic Research Forum, Egypt Labor Market Panel Survey 2006 Online Databases

1998 and re-interviews them. It is the first full-fledged panel survey of its scale in Egypt, acting as one of the main reasons behind the boom in the Egyptian labor Economics research. It was carried out from January to March 2006. Individuals who split from the original 1998 households (Egypt Labor Market Survey1998) in the intervening period are also tracked and interviewed together with their entire household.

Our current analysis makes use of the cross-section of workers. datasets 2006 provided by the ELMPS06 survey. We mainly rely on the rich retrospective information on previous employment characteristics (required to track the workers. job spells durations, unemployment durations, etc.) as well as data on the characteristics of first jobs. This enables us to exploit the longitudinal nature of the data for workers' labor market transitions between the years 1998 and 2006.

Using the guidelines of van den Berg and Ridder (1998), we draw our sample and subsamples from the ELMPS06, and restore labor market histories of all sampled individuals. To restore the employment history we track every individual backward until the date of his/her entry into the the labor market. This enables us to obtain all employment information for each individual and for each year before 2006. Since our observation period is 1998-2006, we choose our sample from the 1998 cross-section we obtained using the retrospective information. Individuals are chosen between the ages of 15 and 64. They are either unemployed or employed since the theoretical model is restricted to only these two states of the labor market[3]. We limit our analysis to male wage workers in the private non-agriculture sector.[4]

The BM theoretical model as we discussed earlier is concerned with the population of homogenous workers. In practice however, this is not the case. We cannot allow for the parameters to be different for each individual, otherwise the model tends to be useless. We therefore assume that the labor market consists of a large number of segments, each of which forms a single market of its own. These segments are assumed to differ from each other according to observed characteristics of workers. To deal with this type of

[3]It is believed that individuals who fall into the rest of the groups (such as on study, retired and others) have incentives different from the agents described by the model. Therefore common practices leave them out (Van den Berg and Ridder, 1993, 1998).

[4]Only male workers are considered to avoid gender wage differentials' questions. The theoretical model also restricts the labor market in question to the private sector (The model is currently extended to include the public as well as the informal sectors by an on-progress paper by F. Langot and C.Yassine, Paris School of Economics 2011).

heterogeneity, we then apply the model separately to each group of workers, allowing for all parameters to vary freely across the groups[5].To pursue this approach, we stratify a sample of Egyptian male workers by education[6].We end up with four education groups, namely illiterates, intermediates, secondary and post-secondary and university and postgraduates.

For each worker we observe the elapsed duration in the state (employment or unemployment), the wage currently earned and the employment status that succeeded his/her status in 1998. As mentioned earlier, the model mainly relies on the Poisson process where all random events (job finding, job loss, outside offers) are symmetrical Poisson occurrences. It is also worth noting that there is no left censoring in our data since our starting dates of all the jobs and the unemployment durations are known (1998).Censoring in our analysis occurs due to the spell continuing beyond the observation period (1998-2006) or the individual being out of the labor force before being employed or unemployed.

All durations are estimated in months [7] and the wages are in monthly rates to match these duration measures. In Table 2 we report some descriptive statistics for the workers' groups among our sample of workers drawn from the ELMPS06.

It's worth noting that having seen that the monthly wages distributions have very long tails and since some of the estimation procedures used are sensitive to outliers in the wage data, we are forced to trim the lowest and the highest 3% of the wage observations in each subgroup.

## 4.2 The Likelihood Function

The backbone process of the model is Poisson, so the waiting time between any two adjacent events is exponentially distributed with parameter $\theta$ .

In our analysis sample, individuals are sampled from the stock of unemployed and employed workers, rather than the flow. The contribution of an individual's spell to the likelihood function therefore depends on the state he is in at the year 1998. A binary

[5]Segmenting workers through this approach provides a simple and flexible soluion. Yet,a possible limitation would be the fact that workers do not move from one segment to another and firms in different segments do not compete.

[6]The available data does not allow sample stratification by age due to the few number of workers available in such groups.

[7]start dates and end dates of job positions ara only defined in years within the ELMPS06 survey which definitely questions the accuracy of these estimates

Table 1: Descriptive Statistics(2006)

| | **Men Sample** | **Illiterate** | **Intermediate** | **Sec.and Post-Sec** | **Univ. and above** |
|---|---|---|---|---|---|
| **Number of workers** | 3924 | 567 | 1017 | 1688 | 652 |
| **Unemployed** | 507 | 28 | 49 | 252 | 178 |
| **Employed** | 3417 | 539 | 968 | 1436 | 474 |
| **Age: mean** | 31.08 | 35.03 | 32.48 | 28.91 | 31.07 |
| **(std dev.)** | (10.33) | (12.62) | (11.28) | (8.73) | (8.94) |
| **Unemployed** | 507 | 28 | 49 | 252 | 178 |
| **u to j** | 145 | 26 | 40 | 53 | 26 |
| **spell between the 2 states** | 18.33 | 7.43 | 12.52 | 24.82 | 24.93 |
| **(std. dev.)** | (22.12) | (13.78) | (19.41) | (22.97) | (25.13) |
| | | | | | |
| **Right censored obs.** | 362 | 2 | 9 | 199 | 152 |
| **Mean Duration** | 29.58 | 11.54 | 16.37 | 32.91 | 31.35 |
| **(std dev.)** | (30.83) | (20.09) | (20.74) | (34.57) | (26.93) |
| **Employed** | 3417 | 539 | 968 | 1436 | 474 |
| **j to j** | 2022(59.17%) | 217(40.26%) | 477 (49.28%) | 980 (68.25%) | 348 (73.41%) |
| **j to u** | 27 (0.79%) | 3 (0.56%) | 7 (0.72%) | 15 (1.04%) | 2 (0.42%) |
| **Right censored observations** | 1368 (40%) | 319(59.2%) | 484 (50%) | 441 (30.71%) | 124 (26.16%) |
| **Duration (not censored)** | | | | | |
| **Mean (std dev.)** | 61.53 | 64.96 | 65.18 | 60.06 | 58.49 |
| | (26.58) | (26.67) | (27.25) | (26.74) | (26.38) |
| **j to j** | 61.44 | 64.48 | 65.01 | 60.09 | 58.48 |
| | (26.87) | (26.52) | (27.28) | (26.7) | (26.39) |
| **j to u** | 68 (29.58) | 100(6.93) | 77.14(23.86) | 58.4 (30.38) | 60 (33.94) |
| **Wage distribution** | | | | | |
| **Min** | 0 | 50 | 0 | 0 | 0 |
| **Max** | 2400 | 2600 | 1733.33 | 1690 | 4833.33 |
| **P10** | 53.01 | 200 | 216.67 | 0 | 0 |
| **Median** | 433.33 | 455 | 450 | 390 | 500 |
| **P90** | 910 | 866.67 | 830 | 825 | 1500 |
| **P90/p10** | 17.17 | 4.33 | 3.83 | - | - |
| **Skewness** | 1.48 | 1.87 | 1.2 | 0.86 | 2.27 |
| **Kurtosis** | 6.78 | 10.3 | 5.16 | 4.04 | 10.21 |
| **Mean (std dev.)** | 486.21(357.55) | 502.05(295.45) | 492.76(264.55) | 432.20(303.40) | 653.12(740.44) |

Source:Author's calculations

variable indicates the state of the agent in 1998, where unemployed workers take 0 and employed 1. We define the elapsed spell duration, denoted by $t_i$ with $i = 0, 1$. There is no left censoring in our model, since the year 1998 presents the starting point for our analysis. Right-censored observations for those spells in progress beyond 2006 are denoted by the indicator $d_ir$, with $i = 0, 1$. For each worker in the sample, we observe paid or accepted wages; denoted by $\omega$.Since wages are not available in the retrospective information obtained from the ELMPS2006 survey, we use the wages' distributions in 2006 as a proxy for all wages' purposes in our model.

About the distribution of the elapsed duration, it is known that certain time $t_i$ after 1998, there was a renewal of states (a transition) and since then an individual spent $t_j$ in a new state. Renewal probability for $Poi(\theta)$ is shown to be equal to $\theta$ (see Lancaster 1990). We can therefore define the appropriate density for the elapsed durations as follows:

$$f(t_i) = \theta e^{-\theta t_i} \tag{23}$$

For unemployed agents the corresponding Poisson rate is just $\lambda_0$. For employed ones,the correct Poisson rate is a sum of transition intensities to either unemployment $\delta$ or a better-paid job $\lambda_1 \overline{F}(\omega)$ ,i.e. $\theta = \delta + \lambda_1 \overline{F}(\omega)$.

To complete the formulation of the individual contributions to the likelihood we notice that:

- **For Unemployed**: Equilibrium probability of sampling an unemployed agent is given by $\frac{u}{m} = \frac{\delta}{\delta+\lambda} = \frac{1}{1+\kappa_0}$.In case the antecedent job transition is observed, we know the offered wage and can record the value of the wage offer density $f(\omega)$.

- **For Employed**: Equilibrium probability of sampling an agent who earns wage $\omega$ is $(\omega)\lambda_0/(\delta + \lambda_0)$. In case the agents' transition to the preceding state is observed, we record the antecedent state. The model allows for two states prior to employment: unemployment and direct job-to-job transition. The probabilities of renewal from unemployment and from another job are $Pr(j \to u) = \delta/(\delta + \lambda_1 \overline{F}(\omega))$ and $Pr(j \to j) = \lambda_1 \overline{F}(\omega)/(\delta + \lambda_1 \overline{F}(\omega))$ respectively. Taking an account of incompletely observed elapsed durations is relatively straight forward. In case of right censoring, we drop the renewal probabilities and change the density with the survivor function.

With this, $_0$ and $L_1$ individuals become

$$L_0 = \frac{\delta}{\delta+\lambda_0}\lambda_0^{1-d_{0r}}\exp\{-\lambda_0\times t_0\}f(\omega)^{1-d_{0r}}$$
$$= \frac{\lambda_0^{1-d_{0r}}}{1+\kappa_0}\exp\{-\lambda_0\times t_0\}f(\omega)^{1-d_{0r}} \quad (24)$$

$$L_1 = \frac{g(\omega)\lambda_0}{\delta+\lambda_0}[\delta+\lambda_1\overline{F}(\omega)]^{1-d_{1r}}\exp\{-[\delta+\lambda_1\overline{F}(\omega)](t_1)\}\times[\frac{\lambda_1\overline{F}(\omega)}{\delta+\lambda_1\overline{F}(\omega}]^{d_t}\cdot[\frac{\delta}{\delta+\lambda_1\overline{F}(\omega)}]^{1-d_t}$$
$$= \frac{\kappa_0}{1+\kappa_0}g(\omega)[\delta+\lambda\overline{F}(\omega)]^{1-1r}\exp-[\delta+\lambda_1\overline{F}(\omega)](t_1)\times[\frac{\lambda_1\overline{F}(\omega)}{\delta+\lambda_1\overline{F}(\omega)}]^{d_t}\cdot[\frac{\delta}{\delta+\lambda_1\overline{F}(\omega)}]^{1-d_t} \quad (25)$$

where $d_{ir} = 1$, if a spell is right-censored, 0 otherwise, and $d_t = 1$, if there is a job-to-job transition, 0 otherwise. It's obvious that both (24) and (25) involve the unknown theoretical wage offer distribution and density functions. No analytical solution for $F(\omega)$ is available. In view of this Bontemps et al. (2000) suggest the following "nonparametric three-step procedure" for the estimation of the structural parameters. The model is fully characterized by the five unknown parameters $\Gamma, \lambda_0, \lambda_1, \delta and \phi$. The frictional parameters are identified from the duration data, the productivity distribution is identified from the empirical distribution of wages observed and $\phi$ is identified as the lowest wage observed in the sample.

1. On the first step, we compute the non-parametric estimates of $G(\omega)$ and $g(\omega)$. We use a gaussian kernel estimator for the density $g(\omega)$ and the empirical cumulative distribution for $G(\omega)$. Let $\widehat{G}(\omega)$ and $\widehat{g}(\omega)$ denote such estimates. Conditional on $\kappa_1$, consistent estimates of $\overline{F}$ and $f$ are

$$\widehat{\overline{F}} = \frac{1-\widehat{G}(\omega)}{1+\kappa_1\widehat{G}(\omega)} And \widehat{f}(\omega) = \frac{1+\kappa_1}{[1+\kappa_1\widehat{G}(\omega)]^2}\widehat{g}(\omega)$$

2. We replace $\overline{F}$ and $f$ in the likelihood function by the preceding expressions, and maximize the likelihood with respect to $\kappa_0, \kappa_1 and \delta$.

3. We use $\{\widehat{\lambda}_0, \widehat{\lambda}_1, \widehat{\delta}\}, \widehat{g}(\omega) and \widehat{G}(\omega)$ to calculate the unknown productivity levels $p = K^{-1}(\omega)$ and $\gamma(p)$.

Bontemps et al. (2000) show that

$$\begin{aligned} p &= \omega + \frac{\delta + \lambda_1 G(\omega)}{2\lambda_1 g(\omega)} = \omega + \frac{1 + \kappa_1 G(\omega)}{2\kappa_1 g(\omega)} && (26) \\ \gamma(p) &= \frac{2\delta\lambda_1(\delta + \lambda_1) g(\omega)^3}{3\lambda_1 g(\omega)^2[\delta + \lambda_1 G(\omega)]^2 - g'(\omega)[1 + \lambda_1 G(\omega)]^3} && (27) \\ &= \frac{2\kappa_1(1 + \kappa_1) g(\omega)^3}{3\kappa_1 g(\omega)^2[\delta + \kappa_1 G(\omega)]^2 - g'(\omega)[1 + \kappa_1 G(\omega)]^3} \end{aligned}$$

Where $p$ represents a firm-specific constant value of productivity, $\gamma(p)$ denotes the density of the productivity distribution and $g'(\omega)$ is obtained by the differentiation of the earnings density.

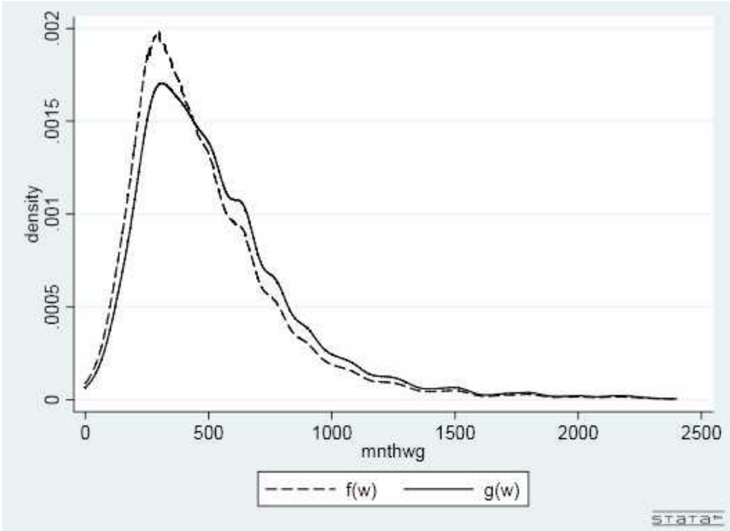
It is important to recognize that the procedure can be decomposed in two separate parts. The first two steps basically analyze only worker behavior and do not look at the firms, while the third exploits information recovered from previous steps to get the distribution of productivity, which is obtained without assuming any parametric form.

# 5 Results

As mentioned earlier, standard wage regressions only succeed to explain at most 50% of wage variation across individuals. The remaining variation in wages is imputed to standard measurement error and other unobservable factors. Equilibrium search models try to decompose wage variation in two main components, variation due to differences in productivity across firms and variation due to search frictions. Moreover, equilibrium search models make specific predictions about the shape of earnings and accepted wages. In the previous theoretical chapter, this relationship has been characterized in steady-state equilibrium. In general, the expected empirical relationship is that of first order stochastic dominance of the earnings distribution on the wage offer. In Figure 1, we verify this prediction with an eyeball test using standard kernel estimations of the two densities. The Earnings density is slightly shifted to the right and the distribution of accepted wages after unemployment is obviously more concentrated at lower wages.

The following Table 2 shows the results for transition parameters estimated by the model for the concerned sample of Egyptian male workers across different education groups

Figure 1: Kernel Density Estimates of Earnings and Wage Offers




Source: Constructed by the Author.

at the year 2006. A first interesting result that strikes us having given a quick scan of the table, is that the arrival rate of acceptable wage offers when employed is much lower than when unemployed; that is $\lambda_0$'s estimates for all samples, the total men sample as well as all the other education groups. samples, ranges from 8 (in the University and Postgrads group) to around 27(in the intermediate group) times larger than $\lambda_0$. According to these results, the estimated average duration of unemployment is equal to 22 months. On the other hand, the average duration of an employment relationship terminated by the worker with a quit is equal to 345 months. This indicates that on-the-job search activity is extremely low and that job search reveals much more profitable when unemployed. This actually confirms beliefs about the very immobile Egyptian labor market resulting from previous descriptive studies. On the other hand, the job destruction rate is estimated close to 0.084, with an average duration of the job of 119 months. Finally, $\kappa_1 = \lambda_1/\delta$ gives a measure of the speed at which workers climb the wage ladder. It can also be interpreted as the average number of offers received in the time interval before the worker next becomes unemployed. Assuming an equal opportunity of receiving better offers during the year, the average number of offer is equal to six for a random worker in this sample. It's crucial to note here that $\kappa_1$ in the empirical job search literature is simply an "index of labor market frictions" (Ridder and Ven den Berg, 2003). Moreover, the theoretical model

Table 2: Estimates of Transition Parameters

| | $\delta$ | | $\lambda_0$ | | $\lambda_1$ | | $\kappa_1$ | |
|---|---|---|---|---|---|---|---|---|
| All men | 0.0084 | | 0.0461 | | 0.0029 | | 0.3452 | |
| | [0.0077 | 0.0093] | [0.0423 | 0.0514] | [0.0031 | 0.026] | [0.2836 | 0.3971] |
| Illiterates | 0.0078 | | 0.0476 | | 0.0026 | | 0.3271 | |
| | [0.0069 | 0.0091] | [0.0419 | 0.0523] | [0.0021 | 0.0028] | [0.2272 | 0.4142] |
| Less than intermediate | 0.0078 | | 0.0693 | | 0.0026 | | 0.3356 | |
| | [0.0069 | 0.0090] | [0.0352 | 0.0723] | [0.0021 | 0.0029] | [0.2364 | 0.4262] |
| Secondary and Post-Secondary | 0.0093 | | 0.0394 | | 0.0041 | | 0.4421 | |
| | [0.0083 | 0.0108] | [0.0342 | 0.0463] | [0.0037 | 0.0043] | [0.3482 | 0.5172] |
| University and Post-grads | 0.0085 | | 0.0357 | | 0.0046 | | 0.5432 | |
| | [0.0066 | 0.0113] | [0.0315 | 0.0419] | [0.0040 | 0.0049] | [0.3421 | 0.6803] |

Source:Author's calculations

showed us that the distribution of earned wages $G(\omega)$ first-order stochastically dominates $F(\omega)$. The extent to which this is so depends positively on $\kappa_1$. It's simply a measure of inter-firm competition on the labor market. If $\kappa_1$ tends to zero, this means that $\lambda_1$ tends to zero, meaning that employed workers never get higher job values than what firms are offering them. In simple words, it means that once a worker draws from $F(\omega)$ (i.e. accepts a job), he actually gets stuck there since it's very unlikely to find a better job with a better offer. $G(\omega)$ becomes confounded then with $F(\omega)$. Conversely, as $\kappa_1$ becomes large, the distribution $G(\omega)$ becomes more and more concentrated at high job values. In the limit where $\kappa_1$ tends to infinity, employed workers tend to move immediately to the most valuable job or firm in the market (simply the best job with the best offer). In this case the labor market is moving towards the Walrasian model.

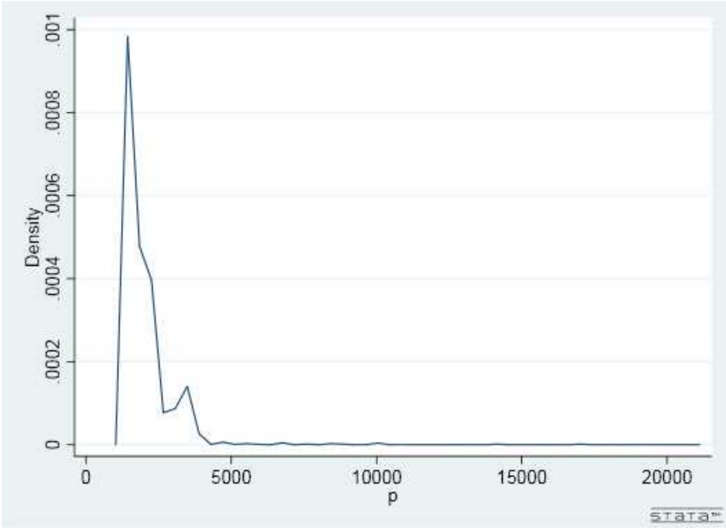
We therefore understand that the theory predicts that the transition parameters provide a measure of the importance of search frictions in the labor market. However, workers differ according to some observable and unobservable characteristics that affect their labor market outcomes. Stratification of the sample according to worker characteristics, according the education level in our analysis, gives some indication of the difference in the degree of search frictions that workers face when looking for a job. Results in Table 2 indicate interesting differences among the different education groups. As expected from the nature of the Egyptian labor market, lower education groups tend to have a higher arrival rate of offers when unemployed since these people usually are the poor ones and consequently cannot afford staying long out of employment. We can clearly notice a relatively high $\lambda_0$ for both the Illiterate and the intermediate education groups; 0.048 and 0.069 respectively.

On the other hand, the arrival rates of offers when employed tend to be higher among the high education groups namely University & Postgrads and Secondary & Post-Secondary. This implies that those who are relatively of high education have got better chances to move up the job ladder than the illiterates and those people who received intermediate education. University graduates and those who have got post grad degrees receive for instance, when employed offers at a rate equal to 0.0046 with an average number of offers per month greater than 6. As for the destruction rates, they are constant among the low education groups. Among higher education groups, they're almost within the same range with a higher rate for the Secondary and Post Secondary group. This is actually expected since, clearly obvious from Table 1 of the descriptive statistics of our sample, this group tend to include the youngest group of workers. It is therefore intuitive that for younger workers, the job destruction rate is higher. Even though these transition parameters provide interesting results about the degree of search frictions in the labor market and fully characterize the distribution of wages in equilibrium search models. However, as previously discussed, the model in its pure form is not able to fit the wage distribution. We need to introduce some kind of heterogeneity among the firms' productivities to get satisfactory results. Having adopted the estimation method suggested by Bontemps et al. (2000) we.re able to recover an estimate of the productivity parameter for each firm and consequently look at the characteristics of the productivity distribution in the economy.

In Figure 2 the estimated productivity distribution is reported using a standard kernel method. The graph indicates that most of the firms are concentrated in the lower and higher percentiles of the distribution and that the density in the very long tail of the distribution tends to zero, as predicted by the model.

Having estimated the productivity specific to each firm as well as the productivity distribution, one shall be able to extend this onto mapping productivity to wages and measuring the degree of exploitation of labor market frictions by firms when setting their wages through the Monopsony power index- MPI (Sulis G. , 2008). Since our current analysis focuses mainly on the workers side of the market, we shall not plow our way through the productivity analysis and shall now turn to an overview of the results of the estimates of the wage offers distribution among the different education groups. Nevertheless, it's worth mention over here that the productivity analysis can provide promising

Figure 2: Kernel Density Estimate of the Productivity Distribution

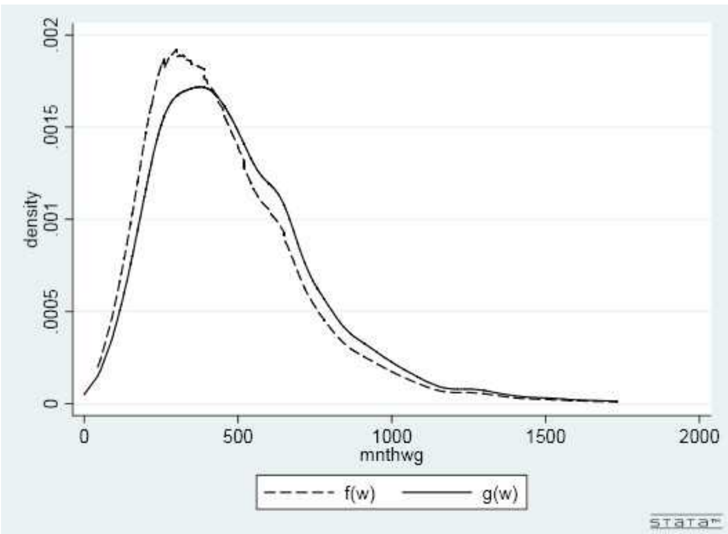



Source: Constructed by the Author.

results when considered for further research, since it might help policy makers within the Egyptian labor market precise the exact source of one of the main problems that Egypt faces namely job creation and related job offers.

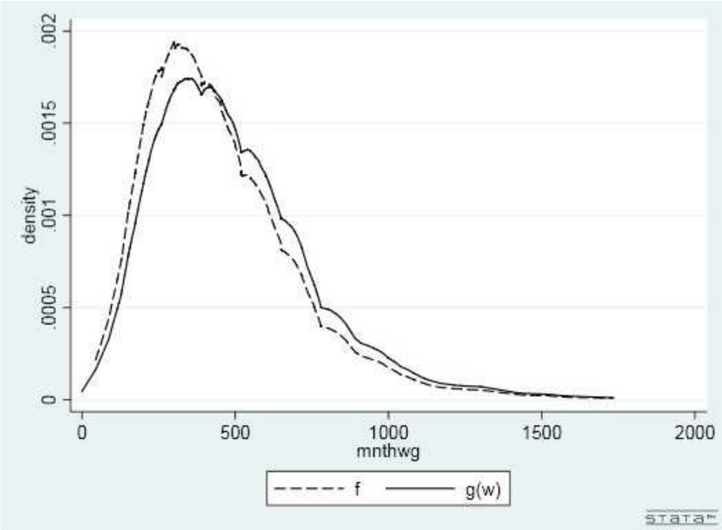
The following Figures 3 to 6 provide the kernel estimates of earnings and offered wages for our different education groups. The predicted stochastic dominance relationship between the earnings and offer distribution is confirmed for the four groups.

Figure 3: Earnings and Wage offers distributions for illiterates



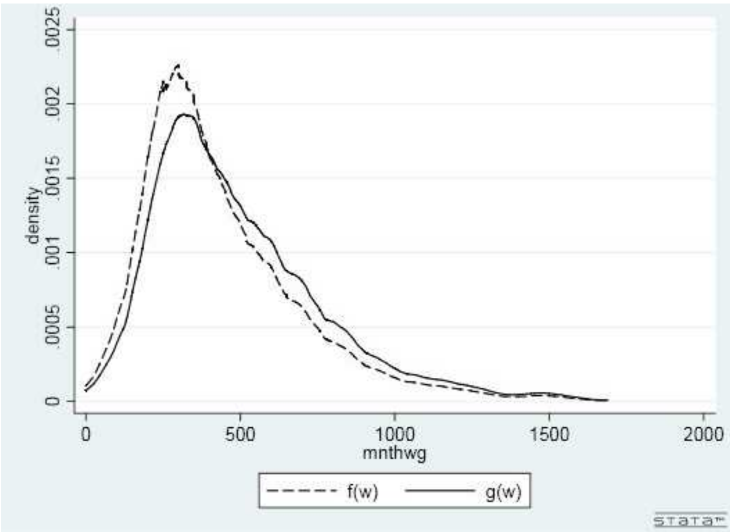

Source: Constructed by the Author.

Figure 4: Earnings and Wage offers distributions for Intermediates




Source: Constructed by the Author.

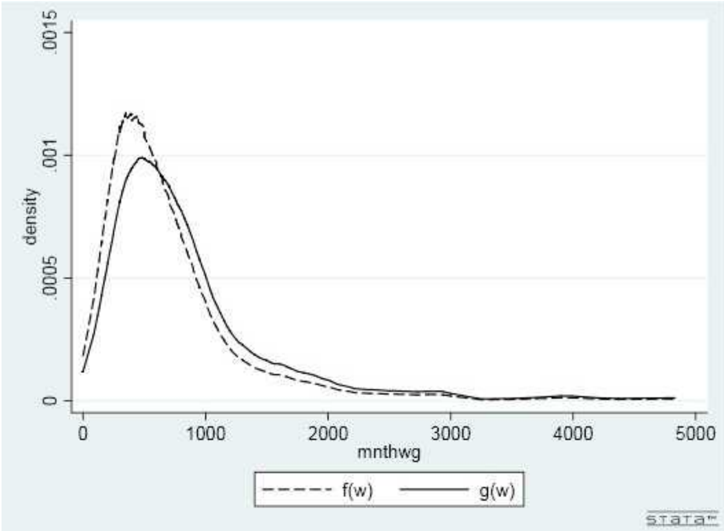
Figure 5: Earnings and Wage offers distributions for Secondary and Post-Secondary




Source: Constructed by the Author.

It's striking how for high education groups, the wage distributions tend to be concentrated at lower levels of wages. For University graduates and Workers holding Post-grad certificates, the wage inequality within the group tends to be very obvious. The distribution has a very long right tail, since the range of wages is quite wide. This was already clear from Table 2, where the descriptive statistics were being discussed; the kurtosis of the wage distribution of the University and Post-grads group was much higher than the

Figure 6: Earnings and Wage offers distributions for University and Post-grads




Source: Constructed by the Author.

other groups. Overall, it seems from the previous analysis that just one parameter does the whole job and goes a long way into capturing the observed difference between the distribution of wages among different education levels of workers. Although the model delivers interesting and plausible results for the transition parameters and the underlying distribution of productivity, one needs to be sure that these estimations are quite reliable. The model might actually have some problems fitting the data. Previous empirical literature has provided us with a good list of both graphical and formal tests of fit for the model which shall be discussed in the following section[8].

# 6 Formal tests and Policy Implications

..To Be Continued

# 7 Conclusion

This paper provides an empirical analysis of a rudimentary partial equilibrium search model with heterogeneity in firms' productivities. The model is able to exploit one of the two sources of wage variation as advocated by equilibrium search models: on-the-

[8]Jolivet et al.(2005) is one of the rich empirical papers treating the issue of tests and specification.

job search. The model is structurally estimated using a "three steps" procedure as recently proposed by Bontemps et al. (2000). First, the earnings distribution is estimated non-parametrically; then these estimates are used to recover frictional parameters using maximum likelihood methods. Conditional on the previous steps, in the third stage, an estimate of the productivity distribution is provided. The results obtained in the third step provide a baseline for further analysis that could follow this study. It's important to note that according to previous literature heterogeneous firms' productivities are required for a good fit of the wage distribution. Analyzing the demand side of the labor market would even enable us to measure the monopsony power of the firms when setting wages. This paper verified previous beliefs and conclusions about the Egyptian labor market in terms of structure of unemployment, wage distributions and wage differentials. Our main findings can be identified as follows. In general, the arrival rate of employment opportunities when unemployed is higher for Egyptian workers especially those who have received no or low education levels. On the other hand, when employed, highly educated workers tend to receive job offers at a higher rate than others. In general, the very low level of on-the-job search negatively affects the speed at which workers climb the job ladder. Consequently, the friction parameter, expressed as the ratio between the arrival rates of offers while employed and the job destruction rate, is relatively low. The estimates distribution of productivity in the economy has a Pareto shape indicating how this distribution is much more dispersed and polarized at very low and high levels than the corresponding wage distribution. Stratification by observable worker characteristics indicated interesting differences among the groups in terms of parameters, as we just mentioned, as well as in terms of interesting patterns in wage differentials at different education levels. Wage distributions are found to be more dispersed for the low education groups, while for high education ones, the distribution tends to be more concentrated at low wages (less dispersion) with long right tails. This implies high wage inequality among highly educated workers. This analysis is likely to contribute to the new emerging literature dealing with the Egyptian labor market. To the best of my knowledge, it represents the first attempt to analyze the Egyptian labor market in a framework of equilibrium search models. As a consequence, my results can be only compared to those obtained for other countries in other papers. Having concentrated in our analysis on the workers' side of the market, the estimation of the rudimentary equilibrium search model can be extended in a framework such as that suggested by Jolivet et al. (2005). Following each individual throughout a panel model, they were able to examine the tight correspondence between the determinants of labor turnover and individual wage dynamics on one hand, and the determinants of wage dispersion on the other. Again, in order to be able to do this, using the samples available from the Egyptian labor market data, we capture information about the individuals' spells and movements from retrospective data. This is definitely possible since following in a backward sense individuals job statuses' trajectories till we reach their entry into the labor market. Finally, it's also worth noting that for further , one shall make research, it's planned to make use of the unconditional inference approach that was suggested by Ridder and Van den Berg (2003) to obtain robust estimates of the transition parameters $\delta, \lambda_0 and \lambda_1$ . The meaning of robust is that those estimates ought to be unaffected by possible misspesification of the job values. The natural route would be to treat the job value, which will be the wage in case of wage posting, as an unobserved variable and integrate it out of the likelihood function, to come up with quasi-closed form ąřunconditionaląś likelihood functions (Jolivet et al. (2005)). In fact, this would be a solution on how to treat the poor data about wages throughout the Egyptian labor market panel survey.

# References


[1] Abowd J.M., Kramaz F.,Margolis D.(1999)'High Wage Workers and High Wage Firms', Econometrica 67.

[2] Assaad R., Rania R., Rashed A. (2009)'Measuring and operationalizing job quality in Egypt', Population Council, Gender and work in the MENA region working paper series : job quality and labor market dynamics 1.

[3] Assaad R. (2011) 'The Structure and Evolution of Employment in Jordan', Economic Research Forum, Forthcoming.

[4] Assaad R. (2006)'Employment and Unemployment Dynamics', The Egyptian Center for Economic Studies (ECES), Unpublished manuscript.

[5] Assaad R. (2002)'The Egyptian Labor Market in an Era of Reform', The American University in Cairo Press.

[6] Bontemps C., Robin J.-M. and Berg G. (2000)'Equilibrium Search with Continuous Productivity Dispersion: Theory and Non-parametric Estimation', International Economic Review 41(2).

[7] Bontemps C., Robin J. and Van den Berg G.J. (1999)'An empirical equilibrium job search model with search on the job heterogenous workers and firms', International Economic Review 40 (4).

[8] Bowlus A. (1997)'A Search Interpretation of Male-Female Wage Differentials', Journal of Labor Economics 15(4).

[9] Bowlus A. and Eckstein Z. (2002)'Discrimination and Skill Differences in an Equilibrium Search Model', International Economic Review 43(2).

[10] Bowlus A., Kiefer N. and Neumann G. (1995)'Estimation of Equilibrium Wage Distributions with Heterogeneity', Journal of Applied Econometrics 10.

[11] Bowlus A., Kiefer N. and Neumann G. (2001)'Equilibrium Search Models and the Transition from School to Work', International Economic Review 42(2).

[12] Burdett K. and Mortensen D. (1998)'Wage Differentials, Employer Size, and Unemployment', International Economic Review 39(2).

[13] Central Authority for Public Mobilization and Statistics (CAPMAS), Labor Force Sample Surveys, Various years.

[14] Christensen B., Lentz R., Mortensen D., Neumann G. and Werwatz A. (2005) 'On-the-job Search and the Wage Distribution', Journal of LaborEconomics 23(1).

[15] Diamond, P.A., (1971)'A Model of Price Adjustment', Journal of Economy Theory, 3 (2).

[16] Eckstein Z. and Van den Berg G. (2007)'Empirical Labor Search: A Survey', Journal of Econometrics 136(2).

[17] Eckstein Z. and Wolpin K. (1990)‘Estimating a Market Equilibrium Search Model from Panel Data on Individuals’, Econometrica 58(5).

[18] Jolivet G., Postel-Vinay F. and Robin J.-M. (2006)‘The Empirical Content of the Job Search Model: Labor Mobility and Wage Distributions in Europe and the US’, European Economic Review 50.

[19] Kiefer N. and Neumann G. (1993)‘Wage Dispersion with Homogeneity: The Empirical Equilibrium Search Model’ in Bunzel H., Jensen P. and Westergård-Nielsen N. (eds.) Panel Data and Labor Market Dynamics, Amsterdam: North Holland: 57-73.

[20] Mortensen,D.T. (1990)‘Equilibrium wage distributions: a synthesis’, in (J.Hartog et al., eds) Panel Data and Labour Market Studies, Amesterdam: North Holland.

[21] Mortensen D. (2003) ‘Wage Dispersion. Why Are Similar Workers Paid Differently?’ Cambridge: MIT Press.

[22] Postel-Vinay F. and Robin J.-M. (2002)‘Equilibrium Wage Dispersion with Worker and Employer Heterogeneity’, Econometrica 70(6).

[23] Ridder G. and Van den Berg G. (1997)‘Empirical Equilibrium Search Models’ in Kreps D. and Wallis K. (eds.) Advances in Economics and Econometrics: Theory and Applications, 7th World Congress, vol. 3, Cambridge: Cambridge University Press.

[24] Ridder G. and Van den Berg G. (2003)‘Measuring Labor Market Frictions: A Cross-country Comparison’, Journal of the European Economic Association 1.

[25] Rothschild M, (1973)‘Models of Market Organization with Imperfect Information: A survey’, Journal of Political Economy, 81(6).

[26] Sulis G. (2008)‘Wage dispersion and equilibrium search Models : some evidence from Italy’, Labour 22(4).

[27] Van den Berg, G.J. and Ridder, G. (1993a)‘On the estimation of equilibrium search models from panel data’, in (J.C. van Ours et al., eds) Lobor Demand and Equilibrium Wage Formation, Amesterdam ,Noth Holland.

[28] Van den Berg , G.J. and Ridder, G. (1993b)'Estimating an equilibrium search model from wage data', in ( H. Bunzel et al., eds), Panel Data and Labor Market Analysis, Amesterdam, North Holland.

[29] Van den Berg G.J., and Ridder,G. (1998)'An empirical equilibrium search model of the labor market', Econometrica 66.

[30] Van den Berg G.J.(1999)'Empirical inference with equilibrium search models of the labor market', Economic Journal 109.

[31] Wahba, J. and Zenou, (2005)'Density, social networks and job search methods: Theory and application to Egypt', Journal of Development Economics 78(2).