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Abstract

In this paper we determine the feasibility of using data from the Egyptian Labor Market Panel Survey of 2006 and the Jordanian Labor Market Panel Survey of 2010 (ELMPS06 JLMPS10) to estimate the Burdett-Mortensen job search model. The data contains sufficient information on wages, labor force states, durations, and transitions to generate estimates of the model's structural transition parameters which eventually enable us to explain the persistent high unemployment rates in the region. By extracting different 10-year employment panels for Egypt and Jordan from the available cross-sectional datasets, 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. Both countries have extremely low job destruction rates. When comparing the two MENA countries, Egypt's labor market tends to be much more rigid than its Jordanian peer, where extremely higher search frictions force labor market entrants and on-search workers to accept what they are offered. We therefore observe a peculiar high monopsonistic power exerted by the employers. Although, we were able to calculate a firm-specific productivity distribution, we choose to focus on the supply side of the equilibrium job search model. We therefore study labor market differentials across the different educational groups in Egypt and Jordan, 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 youth. Fit analysis tests and policy implications are performed based on the obtained results. The paper is a preliminary endeavor to explore the dynamics of the MENA region's labor markets (particularly Egypt and Jordan) and test for their extent of rigidity.

JEL Classification: D83, J31, J64.

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

ملخص

في هذه الورقة نقوم بتحديد جدوى استخدام بيانات من المسح التتبعى لسوق العمل فى مصر لعام 2006 والمسح التتبعى لسوق العمل فى الأردن لعام 2010 (ELMPS06 JLMPS10) لتقدير نموذج بروديه-مورتنسن للبحث الوظيفي. تحتوي البيانات على معلومات كافية عن الأجور، أوضاع القوى العاملة والمدد، والتحولات لتوليد تقديرات التحول الهيكلي للنموذج والتي تمكننا في نهاية المطاف لشرح معدلات البطالة العالية المستمرة في المنطقة. فعن طريق استخراج لوحات العمل 10 سنة مختلفة عن مصر والأردن من مجموعات البيانات المستعرضة المتاحة، نجد أن النتائج تشير إلى أن معدلات وصول عروض للعمال تكون عموما أعلى عندما يكونون عاطلين عن العمل. عندما يتم توظيف عامل بالفعل، فإن معدلات وصول عروض للعمال المتعلمين تعليما عاليا تميل إلى أن تكون أعلى من أقرانهم غير المتعلمين. ولذلك نجد أنها بالتالي تتحرك بشكل أسرع لصعود سلم الوظائف. كلا البلدين لديهم معدلات منخفضة للغاية للدمار الوظيفي. عند مقارنة بلدان المنطقة ، نجد أن سوق العمل في مصر يميل إلى أن يكون أقل مرونة من نظيرتها الأردنية، حيث توجد الاحتكاكات عالية جدا بين قوة الداخلين لسوق العمل والعمال فى قبول ما يعرض عليهم. ولذلك نلاحظ طاقة احتكارية عالية يبذلها أرباب العمل. وعلى الرغم من اننا قادرين على حساب توزيع الإنتاجية للشركات تحدديدا، لكننا اختارنا التركيز على جانب العرض للعمل فى نموذج البحث المتوازن. ولذلك فنقوم بدراسة فروق سوق العمل عبر مجموعات تعليمية مختلفة في مصر والأردن، وتبين أن هناك تباين واسع في معلمات الانتقال النسبية عبر هذه الجماعات والذى يساعد بدوره على تفسير استمرار البطالة والفوارق في الأجور خاصة في أوساط الشباب الحاصلين على تعليم عالى جدا. هذه الورقة هى مسعى أولي لاستكشاف ديناميات أسواق العمل في منطقة الشرق الأوسط (وخاصة مصر والأردن)، واختبار لمدى صلابتها.

1. Introduction

The picture of the MENA region labor market dynamics and its policy implications remain disturbingly opaque and untouched. With high persistent unemployment rates over the last decade, there has been a rising need to explore these labor markets under the presence of search frictions awaiting to resolve the current paradox, where increasing GDP growth rates do not seem to create enough jobs to absorb new labor market entrants. Following Pissarides (2000), the search equilibrium environment enables us to model an equilibrium in the labor market in the presence of search frictions; we consequently understand any time delay in getting a job by an unemployed worker or, similarly, filling an open vacancy by a firm.

There exist two main ways of modeling search equilibrium on the labor market, which mostly depend on the view of the nature of search frictions and the nature of equilibrium wage setting. The first approach is to view search frictions as incomplete information about the location of the vacancy, which generates a time delay until the unemployed worker and firm with the vacancy are matched. This approach was taken by Diamond (1982), Mortensen (1982) and Pissarides (1985). In this setting the wage is determined through a decentralized Nash bargaining process as long as the application of the Nash solution to the equilibrium wage determination is justified (see Binmore et al. 1986). The second approach to modeling a search equilibrium is to assume that search frictions are the result of workers' incomplete information about offered wages. In this case workers sequentially draw wage offers (one per period) and then accept or reject it before each new draw. This view of search frictions is taken from the early job search models and is integrated into the search equilibrium framework by Diamond (1971), Albrecht and Axell (1984) and Burdett and Mortensen (1998). In view of the take it or leave it nature of the match formation, wage setting in this framework is modeled as a result of wage posting game among employers.

Both approaches have their comparative advantages. As shown by Pissarides (1990), the first one has a richer potential for describing equilibrium flows into and out of unemployment, since the relevant hazards can be functions of labor market tightness, workers' search intensity, etc. At the same time the approach is less informative about on-the-job search and wage offer distributions. Namely no endogenous wage offer distribution can be obtained using this approach, which implies limited possibilities for the empirical applications. In contrast the model with wage posting and on-the-job search solves for the unique wage offer distribution which is a key feature that facilitates the estimation of the model. Moreover, this environment is more suitable for studying heterogeneous workers and firms and therefore interconnections between individual qualities, labor market institutions and market equilibrium outcomes. Since the work presented in this paper is of the empirical, rather than economic-theoretical nature, we concentrate on the second class of models.

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.

In this paper, the Burdett-Mortensen model is used to study labor market structural transitions and wage differentials in Egypt and Jordan. Although quite a good number of researchers have tried to analyze the Egyptian and Jordanian labor markets from various static perspectives, no attempts, to the best of our knowledge, were made to explore reasons behind the persistent unemployment paradoxes using the dynamic aspect of these labor markets; hence use a partial-equilibrium job search model to estimate the structural labor transition parameters between employment and unemployment states. We sample a cross-sectional group of workers from the Egyptian Labor Market Panel Survey of 2006 (ELMPS06) and the Jordanian Labor Market Panel Survey of 2010 (JLMPS10). Retrospective information allowed us to obtain the employment vector of each individual for every year 10 years backwards, to estimate the equilibrium Burdett-Mortensen model using the closed-form solution for the wage offer distribution obtained from the theoretical model. We are able to extract a 10-year employment panel from each of the three available cross-sectional datasets; namely ELMPS06 & JLMPS10.

Instead of focusing on the static evolution of wages and unemployment, as undertaken by earlier literature, we shed some light on the dynamics of the meeting process of workers and firms in the Egyptian and Jordanian labor markets. More precisely, we opt 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 Burdett-Mortensen model. The model can also 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.

The rest of the paper is divided as follows. In the second section, we briefly present the contents of the Egyptian and Jordanian analysis samples in the form of a collection facts about duration data, labor turnover, wage distributions and macroeconomic labor market aggregates such as job destruction and creation rates, as well as unemployment dynamics. The third section provides a description of a simple partial theoretical Burdett-Mortensen job search model that we use to estimate the structural transition parameters for the two countries. The fourth section describes the estimation methods adopt, shows the parameters' estimates and compares the extent and nature of search frictions across the two countries and among the different education groups. Section five is devoted to an analysis of the capacity of the structural model to fit the various aspects of the data and to provide some policy implications. Section six concludes.

2. Stylized Facts about Labor Market Dynamics in Egypt and Jordan

2.1 A brief description of the samples

The analysis sample of this study consists of a cohort of private waged male[1]workers, between 15 and 64 years of age from two countries: Egypt and Jordan. Drawn from ELMPS06[2] and JLMPS10[3], a yearly employment vector has been constructed for each individual over a period of the ten years preceding the year of the survey, i.e 1996-2006 for Egypt and 2000-2010 for Jordan. We therefore rely on the rich retrospective information on

[1]Only male workers are considered to avoid gender wage differentials and labor force participation issues. 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 (see Langot and Yassine 2012).

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

[3]Copyright The Economic Research Forum, Jordan Labor Market Panel Survey 2010 Online Databases.

previous employment characteristics, starting and ending dates of previous statuses as well as characteristics of first jobs. This enables us to extract a longitudinal database showing career trajectories for each individual over time, and hence observe unemployment and job durations with the associated wage distributions to estimate the Burdett-Mortensen model, as done by previous literature.

Using the guidelines of Van den Berg and Ridder (1998), we draw our sample and subsamples from the ELMPS06 and JLMPS10, 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 labor market. This enables us to obtain all employment information for each individual and for each year before 2006 and 2010. Since our observation periods are 1996-2006 and 2000-2010 for Egypt and Jordan respectively, we select our samples from the 1998 and 2000 cross-sections we obtained using the retrospective information. These workers are found to be either unemployed or employed (working, for at least six months[4], in the private sector with nonzero income from work) since the theoretical model is restricted to only these two states of the labor market[5].

We follow those individuals for up to 10 years or until their first change of status in the labor market which can either correspond to a job-to-job transition, a job-to-unemployment or an unemployment-to-job transition. We therefore observe a worker's status (employed or unemployed) at the initial observation date $t = 0$, a (job or unemployment) spell duration, a censoring indicator (if the individual experiences no transition before the end of the 10-year observation window), a transition indicator(which can take on three values, Job-to-job [jtoj], job-to-unemployment [jtou] and unemployment-to-job [utoj]) and the wage distribution associated with these transitions. The Burdett-Mortensen theoretical model 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 heterogeneity, we then apply the model separately to each group of workers, allowing for all parameters to vary freely across the groups[6].To pursue this approach, we stratify a sample of Egyptian and Jordanian male workers by education. We end up with four education groups, namely illiterates, below secondary, secondary & above, and university & above.

All durations are estimated in months[7] and the wages are in monthly local currency rates to match these duration measures. It's worth noting that our sample contains the basic information that can be found in a typical labor force survey. In table 1 we report a quick statistical description of that information for the worker groups among our sample of workers drawn from ELMPS06 and JLMPS10. It's also worth noting that having seen that the monthly wage 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 5% of the wage observations in each subgroup. The implications of that will be discussed in detail in the empirical results section.

[4] A 6-months spell is the definition adopted by the interviewers within the ELMPS06 and JLMPS10 surveys to record an employment or non-employment status.

[5] 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).

[6] Segmenting workers through this approach provides a simple and flexible solution. 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.

[7] Start dates and end dates of job positions are only defined in years within the ELMPS06 survey which definitely questions the accuracy of these estimates; the JLMPS10 estimates are more accurate since a number of respondents report the date of start of a status in both months and years.

2.2 Employment and Unemployment dynamics

In this section, we use, along with the panels constructed from the ELMPS06 and JLMPS10, the official labor force surveys of Egypt and Jordan collected quarterly by the Egyptian Central Agency of Public Mobilization and Statistics (CAPMAS) and the Jordanian Department of Statistics (DOS), namely Labor force Sample Surveys (LFSS) 1995-2004 and Employment & Unemployment Surveys (EUS) 2000-2009 . We use a harmonized dataset over time to plot unemployment rates calculated from stocks of workers each year for both countries. Following Langot & Yassine (2012)[8], we are able to aggregate flows of workers between employment and non-employment states over our reference periods of time in Egypt and Jordan. The panels constructed from the retrospective information in the surveys, as discussed above undergo a problem of backward attrition where the representativeness and randomness of the sample might be questioned. To correct for that, and to equilibrate the age structure of the sample across years, we create a yearly weight for each group of individuals based on the characteristics of the original random sample of the ELMPS06 and JLMPS10. Correcting for the backward attrition, we obtain job creation, job destruction and unemployment rates as shown in figures 1 and 2 from the ELMPS06 and JLMPS10 constructed panels.

Figures 1 and 2 confirm the persistent high unemployment rates associated with remarkable low job destruction rates. This phenomenon, as shall be proven further by our estimated parameters, confirms the rigidity of the Egyptian and Jordanian labor markets and the resistance of employees and employers to search for better matches. The net job creation rate, whilst it slightly increases in Egypt over time from around 8% to 14%, seems to be stagnant for Jordan at a lower level of approximately 5%. Following Mortensen and Pissarides (1994, 1999), we calculate the unemployment rate from flows by dividing the destruction rate (s) over the destruction rate (s) plus the job creation rate (p). In figure 2, we are able to note that the unemployment rates calculated from stocks captures the overall picture of the labor market trends whilst those rates calculated from flows explain the tiny details and fluctuations occurring behind the scenes. This motivates and stresses on the need to study the dynamics and search frictions of these labor markets.

3. The Burdett-Mortensen Model

3.1 The environment

In this section, we provide a description of the equilibrium job search model we estimate, along the lines of Burdett and Mortensen (1998) and Bontemps et al. (2000). 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 heterogeneous 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 (λ_0) is the arrival rate of job offers while unemployed, and (λ_1) when employed. ϕ is the reservation wage when unemployed, whereas the wage earned ω 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.

[8]Langot & Yassine (2012).

When employed, workers earn their wage ω, 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 δ 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.

3.2 Worker behavior

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

$$\rho U = b + \lambda_0 (\int_{\underline{\omega}}^{\overline{\omega}} \max\{V(x),U\} dF(x) - U) = b + \int_{\phi}^{\overline{\omega}} \frac{\lambda_0 \overline{F}(x)}{\rho + \delta + \lambda_1 \overline{F}(x)} dx. \qquad (1)$$

where ρ is the common discount rate, $V(\omega)$ is the lifetime utility that a worker derives from working for a wage of ω, $\overline{\omega}$ 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 ω, solves

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

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

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. ω).The second line uses the fact that $V(.)$ is strictly increasing in ω. Noticing that $V'(\omega) = \dfrac{1}{\rho + \delta + \lambda_1 \overline{F}(\omega)}$, we finally obtain

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

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

$$\phi = b + (\lambda_0 - \lambda_1)(E_{x:F}(\max \int V(x), U) - U) = b + (\lambda_0 - \lambda_1) \int_{\phi}^{\overline{\omega}} V(x) - U dF(x). \qquad (4)$$

Integration by parts allows us to obtain a formal unambiguous definition of ϕ

$$\phi = b + (\lambda_0 - \lambda_1) \int_{\phi}^{\overline{\omega}} [1 - F(x)] dV(x)$$

$$= b + (\lambda_0 - \lambda_1) \int_{\phi}^{\overline{\omega}} \frac{\overline{F}(x)}{\rho + \delta + \lambda_1 \overline{F}(x)} dx. \qquad (5)$$

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

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

This equation defines the reservation wage ϕ 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 ϕ 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, ϕ), even though this causes a utility loss in a short run. When the arrival rate is independent 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.

3.3 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

$$\pi(p, \omega) = (p - \omega) l(\omega) \qquad (7)$$

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 ϕ otherwise it won't be able to attract workers.

3.4 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,

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

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;

$$\frac{\mu}{m} = \frac{\delta}{\delta + \lambda_0} = \frac{1}{1+\kappa_0}, \qquad (9)$$

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 ω 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 ω) and quit their old job. The inflow consists of those workers who are already unemployed and receive an offer greater than ϕ but still less than ω (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:

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

for all ω 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 ω and $\kappa_1 \geq 0$. The discrepancy between the earnings and wage offer distributions depends on κ_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 as a relative measure of competition among firms for workers.

The model therefore provides a theory not only of the wage distribution, but 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 ω given ϕ 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 ϕ 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 ω 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

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

This is the number of workers available to work at the firm offering that particular wage ω . 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 ϕ 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

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

An equilibrium is defined as follows (definition 2 in Burdett and Mortensen 1998): An equilibrium solution to the research and wage posting game is a triple ϕ, F, π such that ϕ satisfies the reservation wage equation, μ satisfies the firm maximization problem and F is such that: $(p-\omega) l(\omega \mid \phi, F) = \pi$ for all ω 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 ϕ 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 ω. From the first order condition it is then possible to determine the firm value of productivity parameter

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

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

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

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, equilibrium is defined as shown below by Definition 3.

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

$$F(\omega) = \int F(\omega/p) d\Gamma(p) \quad (20)$$

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

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

$K_p = \arg\max_{\omega} \{\pi(p, \omega) \phi \leq \omega \leq p\}$ 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) shows that as long as $\underline{\omega} = \phi$ and $\lambda_1 > 0$, then the unique candidate for F for any p is

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

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 arrives instantaneously). This completes the description of the theoretical models.

4 Empirical Analysis and Results

4.1 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 θ.

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 $t = 0$, i.e 1996 for the Egyptian workers' sample and 2000 for the Jordanian workers' sample. A binary variable indicates the state of the agent in 1996 and 2000 in Egypt and Jordan respectively, where unemployed workers take 0 and employed workers take 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 years 1996 and 2000 present the starting point for our analysis. Right-censored observations for those spells in progress beyond the observation period are denoted by the indicator $d_i r$, with $i = 0,1$. For each worker in the sample, we observe paid or accepted wages; denoted by ω. Since wages are not available in the retrospective information obtained from the ELMPS06 and JLMPS10 survey, we use the wages' distributions in 2006 and 2010, in Egypt and Jordan respectively, 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 the initial year $t = 0$, 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 θ (see Lancaster 1990). We can therefore define the appropriate density for the elapsed durations as follows:

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

For unemployed agents the corresponding Poisson rate is just λ_0. For employed ones, the correct Poisson rate is a sum of transition intensities to either unemployment δ 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 the 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 the employed: Equilibrium probability of sampling an agent who earns wage ω 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, $Ł_0$ 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 and zero otherwise, and $d_t = 1$, if there is a job-to-job transition and zero 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 $\Gamma, \lambda_0, \lambda_1, \delta, \phi$. The frictional parameters are identified from the duration data, the productivity distribution is identified from the empirical distribution of wages observed and ϕ 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 $\hat{G}(\omega)$ and $\hat{g}(\omega)$ denote such estimates. Conditional on κ_1, consistent estimates of $\overline{F}$ and f are

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

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

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

Bontemps et al. (2000) show that

$$p = \omega + \frac{\delta + \lambda_1 G(\omega)}{2\lambda_1 g(\omega)} = \omega + \frac{1+\kappa_1 G(\omega)}{2\kappa_1 g(\omega)} \tag{26}$$

$$\gamma(p) = \frac{2\delta\lambda_1(\delta+\lambda_1)g(\omega)^3}{3\lambda_1 g(\omega)^2[\delta+\lambda_1 G(\omega)]^2 - g'(\omega)[1+\lambda_1 G(\omega)]^3} \tag{27}$$

$$= \frac{2\kappa_1(1+\kappa_1)g(\omega)^3}{3\kappa_1 g(\omega)^2[\delta+\kappa_1 G(\omega)]^2 - g'(\omega)[1+\kappa_1 G(\omega)]^3}$$

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.

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 into 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 section, 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 Figures 3 & 4, we verify this prediction with an eyeball test using standard kernel estimation of the empirical accepted earnings distribution and the estimated wage offer distribution. The earnings density is slightly shifted to the right indicating that higher wages are more likely to be earned as one accepts a job offer. We should however bear in mind the differences among the different subgroups which we shall be discussing thoroughly below.

4.2 The extent of search frictions

The following tables 2 and 3 show the results for transition parameters estimated by the model for the concerned sample of Egyptian and Jordanian male workers across different education groups for the periods 1996-2006 in Egypt and 2000-2010 in Jordan. 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 λ_0's estimates for all samples, the total men sample as well as all the other education groups' samples, ranges from 2 to around 7 times smaller than λ_0. According to these results, the estimated average duration of unemployment is equal to 59 and 54 months for Egypt and Jordan respectively. On the other hand, the average duration of an employment relationship terminated by the worker with a quit is equal to 345 months (i.e. 28.75 years) in Egypt, with a slightly shorter duration of 294 months (i.e. 24.5 years) in Jordan. This indicates that on-the-job search activity is extremely low and that job search reveals much more profit when unemployed. In fact, it reveals that once an individual finds a job within these labor markets, he/she would almost spend his working lifetime within that job. This actually confirms beliefs about the very rigid and immobile Egyptian and Jordanian labor markets resulting from previous descriptive statistics. This is even more confirmed by the very low estimated job destruction rates from the model, with an average duration of the job greater than 100 months for both countries. In addition to the transition parameters of the model, Tables 2 and 3 present estimates of the ``summary index of search frictions" $\kappa_1 = \lambda_1/\delta$. This index gives a measure of the speed at which workers climb the wage ladder, as well as the average number of offers received in the time interval before the worker next becomes unemployed, we note that the two labor markets suffer from a very high level of search frictions with Egypt clearly being a less mobile job market. Assuming an equal opportunity of receiving better offers during the year, we obtain 4 and 6 as the average number of offers a random worker can get in this sample in Egypt and Jordan respectively. Moreover, the theoretical model 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 κ_1. It is simply a measure of inter-firm competition on the labor market. If κ_1 tends to zero, this means that λ_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 $F(\omega)$ and the workers tend to accept what they are offered. Conversely, as κ_1 becomes large, the distribution $G(\omega)$ becomes more and more concentrated at high job values. In the limit where κ_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 other words, tending towards a Walrasian labor market. Our results confirm that both countries are more inclined towards the monopsonistic case of the market, with Egypt, undoubtedly, being at the leading edge.

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 to 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. The point estimates in tables 2 and 3 of all parameters are precise enough and vary to some extent across the different education groups and across both countries, thus suggesting that labor market frictions differ in both intensity and nature from one group of workers to the other. 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 λ_0 for both the illiterate and the intermediate education groups (0.01814 and 0.0213 respectively). Educated new entrants however seem to receive a lower number of offers and hence face difficulties in their labor market insertion process. On the other hand, the arrival rates of offers when employed tend to be higher among the high education groups namely university graduates and post-graduates, and also secondary and post-secondary graduates. This implies that those who have attained relatively higher education have better chances of moving up the job ladder than the illiterates and those people who received intermediate education. As for Jordan, on the one hand, the case tends to be similar where higher education speeds up the job ladder escalation. On the other hand, both the very high and the very low educated groups face difficulties in entering the labor market. As for the destruction rates, they are constant among the low education groups. Among higher education groups, they are almost within the same range with a higher rate for the secondary and post-secondary group. This is actually expected since this group includes the youngest group of workers as depicted in table 1 which provides the descriptive statistics of our sample. It is normal that for younger workers, the job destruction rate is higher.

As we plot the probability density functions of both the empirical earnings and the estimated wage offers, we note that the wage distributions have very long right tails and are highly condensed at lower wages. In our analysis, we are therefore forced to first trim the highest and lowest 1 percentiles. Then to accentuate and clarify the dispersion of the wage distributions and the differences between accepted and offered wage density functions, we trim the highest and lowest 5 percentiles of the wage distribution as well as take the log of the monthly wage. We first comment on the differences reported between the educational groups in Egypt. For the low education groups, including illiterates and below secondary, the earnings and offered wage densities seem to confound showing the high extent of search frictions and consequently the low bargaining power the workers possess to negotiate higher wages when accepting an offer. The picture relatively improves as we move to the higher educated groups. The highest negotiating power in obtaining better wages as one accepts an offer appears within the university graduates group, corresponding to a lower level of search frictions as estimated by the κ_1 index (0.5432) and better dispersed higher-wage-peaked distributions. When comparing the Jordanian case to the Egyptian one it seems that among all education groups lower levels of search frictions seem to dominate, leading to better negotiating power; hence higher accepted wages. It is worth noting that the peak of the distributions varies substantially across the different education groups, moving to the right as we increase the education level of the worker. Needless to say, Jordanian university graduates, like Egyptian university graduates, enjoy a better bargaining power than their uneducated peers. Interestingly enough, the wage distributions of Egyptian workers tend to be rigid and concentrated around almost the same average level of wages regardless of the level of education, whilst the Jordanians' wage distributions tend to become more dispersed and with a higher-shifted peak as the education level of the worker improves.

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 and labor search frictions among different education levels of workers.

4.3 Cross-country comparisons

The results above provide relative comparisons between the two countries. However, to know where Egypt and Jordan stand in comparison to other countries, we provide transition parameters estimates from Jolivet et al. (2006) and Sulis (2008) for USA, France and Italy. Table 3 shows that labor market frictions differ in both intensity and nature from one country to another. It reveals that the very static Egyptian and Jordanian labor markets exhibit the lowest values of κ. This results from both the low rate job-to-job transitions as well as the extremely low level of job destruction rates. The closest country to Jordan and Egypt, in nature, would be Italy in terms of difficulties of new entrants' insertion into the labor market, the extremely slow movement up the job ladder and low job destruction rates. The labor markets in these three countries experience extremely high search frictions with Egypt being at the lead. As discussed by Jolivet et al. (2006), the mobility in France is rare and predominantly consists of job-to-job transitions associated with the large values of κ. The nature of this labor market is therefore different from the markets in question where the rigidity in the French labor markets tends to be more accentuated for the unemployed entering the labor market. Still, our Egyptian and Jordanian cases face more obstacles when it comes to inserting unemployed and new labor market entrants into the job market. As for the mobile USA labor market, the transition parameters estimates tend towards the other end of the scale, whether discussing offer arrivals to the unemployed, the employed, or job separation rates.

5. A Fit Analysis, A Quick Policy Brief and Limitations

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 reliable. The model might actually have some problems fitting the data. Fortunately, previous empirical literature has provided us with graphical data fit analysis tests for the model.

Following Jolivet et al. (2006), we choose to use the cumulative distribution function, *cdf* of wages accepted by workers who were just hired from unemployment as a direct estimator $\hat{F}^0(.)$ of the wage offers sampling estimated sampling distribution $F(.)$ This direct estimator confirms the first stochastic dominance of the earnings distribution over the offered wages as discussed above in the theoretical model. We therefore compare the predicted $F(.)$ that we obtained using the maximum likelihood estimate of κ_1, and compare it to the observed $\hat{F}^0(.)$ obtained from the ELMPS06 and JLMPS10 constructed panels.

$$\hat{F}(\omega;\hat{\kappa}_1) = \frac{(1+\hat{\kappa}_1)\hat{G}(\omega)}{1+\hat{\kappa}_1\hat{G}(\omega)} \tag{28}$$

In figure 5, the model predicted wage offer distribution is close to its empirical estimator in both countries. That being said, when running the test for the different educational groups, it is worth mentioning that there were some discrepancies, which one can conveniently describe using the terminology introduced by Christensen et al. (2005). The horizontal distance between the accepted wages distribution G and the wage offers distribution F, referred to as the *employment effect* or the *employment premium* is slightly under-predicted at the highest and lowest quintiles of the distribution. Yet, the overall result shows that the estimated parameters give a preliminary indicator of the rigidity of the two MENA labor markets.

At this point, it is hazardous to draw definite conclusions about the type of policies that should be adopted to spur more mobility into the Jordanian and Egyptian labor market. However, it is obvious that policies should be directed to facilitate the laying-off of workers by employers. A huge component of the high search frictions in both markets resides within the domineering low destruction rates. Moreover, clearly all the unemployed, especially the highly educated portion, face difficulties to enter the job market. Employers in this case seem to exert a monopsonistic power where the wages offered are much lower than the reservation wages set by the workers. Encouraging job-to-job transitions shall also be a priority for policy makers. Workers spending most of their work lifetime as mentioned above in the results might worryingly affect the outcome level of productivities in the economy.

Extending the model to the demand side of the market and mapping wages to productivity levels can help future research understand the extent to which employers tend to dominate the Egyptian and Jordanian labor markets. Since the Egyptian authorities have implemented a labor law in 2004 to facilitate the firing and hiring of workers by employers, it would be interesting to measure the impact of the law on the dynamics of the labor market using a much longer panel; this shall be feasible using the forthcoming ELMPS12[9]. It is also important to differentiate between voluntary and involuntary moves and quits which might add to the understanding of the nature of power exerted by employers and employees. The nature and intensity of search frictions of a labor market can substantially vary when taking into account these variables. It was difficult to distinguish between the voluntary and involuntary transitions within this study because of data restrictions. However, when the forthcoming ELMPS12 becomes available, further research would allow such a distinction[10].

6. Conclusion

In a region known to suffer from high rigidity in wage employment and lots of churning on the self-employment's side, our paper aims at being a preliminary endeavor to explore the labor market dynamics of the MENA region, particularly Egypt and Jordan, and to test for their extent of rigidity. This paper provides an empirical analysis of a rudimentary partial equilibrium search model, where we were able to exploit the Egyptian and Jordanian labor surveys in 2006 & 2010 respectively to create a 10-year period panel. The model is structurally estimated using a three-step procedure as 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 where analyzing the demand side of the labor market would even enable us to measure the monopsonistic power of the firms when setting wages.

This study managed to verify previous beliefs and conclusions about the Egyptian and Jordanians labor market in terms of structure of unemployment, wage distributions and wage differentials, but also explored how the rigid dynamics of these labor markets explain increasing and persistent labor market problems such as unemployment and inequality. Our main findings can be summarized as follows. In general, the arrival rate of employment opportunities when unemployed is higher for workers especially those who have received no or low education. 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. Both countries have extremely low job destruction rates. Consequently, the friction parameter, expressed as the ratio between the arrival rates of offers while employed and the job destruction rate, is relatively low. When comparing the two MENA countries, Egypt's labor market tends to be much more rigid than its Jordanian peer, where extremely higher search frictions force labor market entrants and on-the- job search workers to accept what they are offered. We therefore observe a peculiar high monopsonistic power exerted by the employers. Although, we were able to calculate a firm-specific productivity distribution, we choose to focus on the supply side of the equilibrium job-search model. Stratification by observable worker characteristics also 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 educational levels.

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This analysis is likely to contribute to the new emerging literature dealing with the Egyptian and Jordanian labor markets. To the best of our knowledge, it represents the first attempt to analyze the dynamics of these labor markets in a framework of equilibrium search models. As a consequence, our results can be only compared to those obtained for other countries in other papers. Since many nature-specific aspects, such as informality, awaiting queues for the public sector and non-wage mobility determinants, need to be taken into consideration, it is likely that our estimates may be overestimating rigidity within the wage employment sector of these labor markets. With fair acceptable results being performed by the fit analysis tests to check how our empirical results fit the data, our paper succeeds to invade a disturbingly untouched essential topic in a region undergoing lots of mutations on the political as well as the economic level.

References

Abowd, John M., Francis Kramarz, and David N. Margolis. "High wage workers and high wage firms." *Econometrica* 67.2 (1999): 251-333.

Albrecht, James W., and Bo Axell. "An equilibrium model of search unemployment." *The Journal of Political Economy* (1984): 824-840.

Assaad, R., R. Roushdy, A. Rashed. 2009. "Measuring and Operationalizing Job Quality in Egypt." Gender and Work Working Papers Series, No.1, Population Council WANA, Cairo, Egypt.

Assaad, R. 2011. The structure and evolution of employment in Jordan. ERF Working Paper No. 674. The Economic Research Forum, Cairo, Egypt.

Assaad, R. 2002. *The Egyptian labor market in an era of reform*. Cairo, Egypt: The American University in Cairo Press.

Binmore, Ken, Ariel Rubinstein, and Asher Wolinsky. "The Nash bargaining solution in economic modelling." *The RAND Journal of Economics* (1986): 176-188.

Bontemps, Christian, Jean-Marc Robin, and Gerard J. Van den Berg. "Equilibrium search with continuous productivity dispersion: Theory and nonparametric estimation." *International Economic Review* 41.2 (2000): 305-358.

Bontemps, Christian, Jean-Marc Robin, and Gerard J. Van den Berg. "An empirical equilibrium job search model with search on the job and heterogeneous workers and firms." *International Economic Review* 40.4 (1999): 1039-1074.

Bowlus, Audra J., and Zvi Eckstein. "Discrimination and Skill Differences in an Equilibrium Search Model*." *International Economic Review* 43.4 (2002): 1309-1345.

Bowlus, Audra J., Nicholas M. Kiefer, and George R. Neumann. "Equilibrium search models and the transition from school to work." *International Economic Review* 42.2 (2001): 317-343.

Bowlus, Audra J. "A search interpretation of male-female wage differentials." *Journal of Labor Economics* 15.4 (1997): 625-657.

Bowlus, Audra J., Nicholas M. Kiefer, and George R. Neumann. "Estimation of equilibrium wage distributions with heterogeneity." *Journal of Applied Econometrics* 10.S1 (1995): S119-S131.

Burdett, Kenneth, and Dale T. Mortensen. "Wage differentials, employer size, and unemployment." *International Economic Review* (1998): 257-273.

Christensen, Bent Jesper, et al. "On-the-Job Search and the Wage Distribution." *Journal of Labor Economics* 23.1 (2005): 31-58.

Diamond, Peter A. "Wage determination and efficiency in search equilibrium." *The Review of Economic Studies* 49.2 (1982): 217-227.

Eckstein, Zvi, and Gerard J. Van den Berg. "Empirical labor search: A survey." *Journal of Econometrics* 136.2 (2007): 531-564.

Eckstein, Zvi, and Kenneth I. Wolpin. "Estimating a market equilibrium search model from panel data on individuals." *Econometrica: Journal of the Econometric Society* (1990): 783-808.

ELMPS 2006. *Egypt labor market panel survey of 2006 dataset.* The Economic Research Forum, Cairo, Egypt.

EUS 2000-2010, Employment and Unemployment Surveys. Department of Statistics of Jordan (DOS), Amman, Jordan.

JLMPS 2010. *Jordan labor market panel survey of 2010 dataset.* The Economic Research Forum, Cairo, Egypt.

Jolivet, Gregory, Fabien Postel-Vinay, and Jean-Marc Robin. "The empirical content of the job search model: Labor mobility and wage distributions in Europe and the US." *European Economic Review* 50.4 (2006): 877-907.

Kiefer, Nicholas M., and George R. Neumann. "Wage dispersion with homogeneity: the empirical equilibrium search model." *CONTRIBUTIONS TO ECONOMIC ANALYSIS* 222 (1993): 57-57.

Lancaster, Tony. *The analysis of transition data*. Cambridge University Press, 1990.

Langot, François. and Yassine Chaimaa. “Adjustments to shocks and labor market dynamics in developing countries. The Egyptian and Jordanian cases”. *Mimeo in progress, November 2012.*

LFSS 1995-2005, Labor Force Sample Surveys, The Central Agency for Public Mobilization and Statistics (CAPMAS), Cairo, Egypt.

Mortensen, Dale T. *Wage dispersion: why are similar workers paid differently?*. MIT press, 2005.

Mortensen, Dale T. "The matching process as a noncooperative bargaining game." *The economics of information and uncertainty*. University of Chicago Press, 1982. 233-258.

Mortensen, Dale T., and Christopher A. Pissarides. "Job creation and job destruction in the theory of unemployment." *The review of economic studies* 61.3 (1994): 397-415.

Mortensen, Dale T., and Christopher A. Pissarides. "New developments in models of search in the labor market." *Handbook of labor economics* 3 (1999): 2567-2627.

Pissarides, Christopher. "Equilibrium Unemployment Theory, Basil Black $ well." *Cambridge, MA* (1990).

Pissarides, Christopher A. "Taxes, subsidies and equilibrium unemployment." *The review of economic studies* 52.1 (1985): 121-133.

Pissarides, Christopher A. "Short-run equilibrium dynamics of unemployment, vacancies, and real wages." *The American Economic Review* 75.4 (1985): 676-690.

Postel–Vinay, Fabien, and Jean–Marc Robin. "Equilibrium wage dispersion with worker and employer heterogeneity." *Econometrica* 70.6 (2002): 2295-2350.

Ridder, Geert, and Gerard J. Van den Berg. "Empirical equilibrium search models." *ECONOMETRIC SOCIETY MONOGRAPHS* 28 (1997): 82-127.

Ridder, Geert, and Gerard J. Berg. "Measuring Labor Market Frictions: A Cross-Country Comparison." *Journal of the European Economic Association* 1.1 (2003): 224-244.

Sulis, Giovanni. "Wage dispersion and equilibrium search models: some evidence from Italy." *Labor* 22.4 (2008): 593-627.

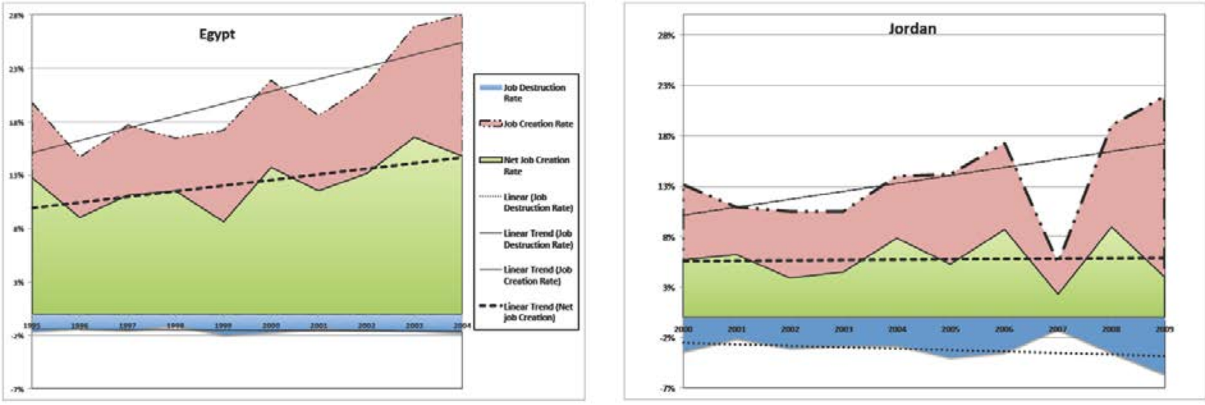
Van den Berg, Gerard J., and Geert Ridder. "An empirical equilibrium search model of the labor market." *Econometrica* (1998): 1183-1221.

Van den Berg, Gerard J., and Geert Ridder. "Estimating an Equilibrium Search Model lW3 from Wage Data." *Research Memorandum* 1993 (1993): 40.

Van Den Berg, Gerard J. "Empirical inference with equilibrium search models of the labour market." *The Economic Journal* 109.456 (1999): 283-306.

Yassine Chaimaa. “Labor Market Structural Transitions and Wage Dispersion: Revisited”. *European Economic Association of Labor Economics 25th Annual Conference, mimeo May 2013* .

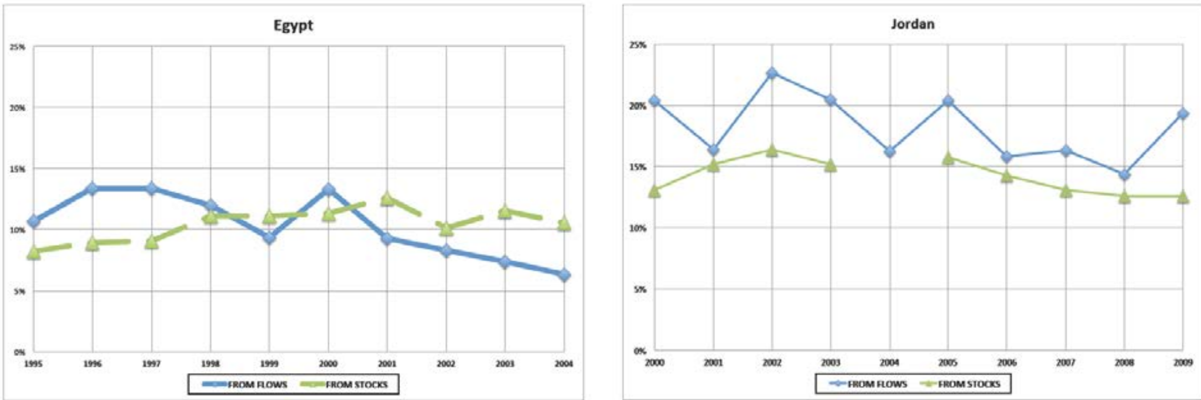
Figure 1: Corrected Job Creation and Destruction Rates in Egypt and Jordan Over Time



Egypt over the period 1995-2004 Jordan over the period 2000-2009

Source: Author's constructions from the Egyptian Labor Market Panel Surveys in 2006 and the Jordanian Labor Market Panel Survey in 2010

Figure 2: Unemployment Rates from Stocks and Flows in Egypt and Jordan

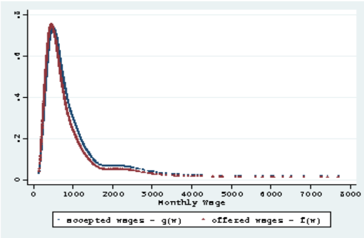


Egypt over the period 1995-2004 Jordan over the period 2000-2009

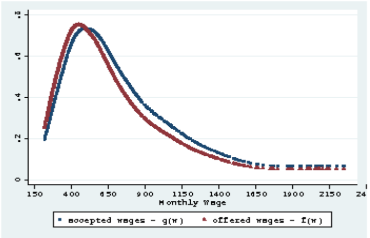
Notes: From Stocks: Fraction of unemployed in year *t* From Flows: *t/t+1* job destruction rate divided by *t/t+1* job destruction rate plus *t/t+1* job finding rate. Rates are computed by comparing the state in year *t+1* to the state in year *t*.

Source: Author's constructions from ELMPS06, JLMPS10, Egypt's Labor Force Sample Surveys (LFSS) and Jordan's Employment and Unemployment Surveys (EUS).

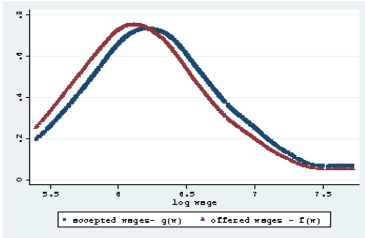
Figure 3: The Steady State F & G Estimates, by Education Group, in Egypt



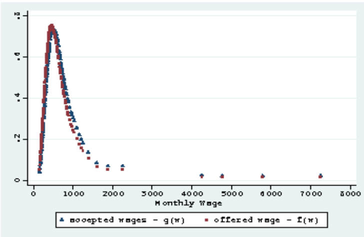
(a) Accepted & offered wage distributions of **ALL** sample in Egypt (Highest and lowest 1% observations trimmed)



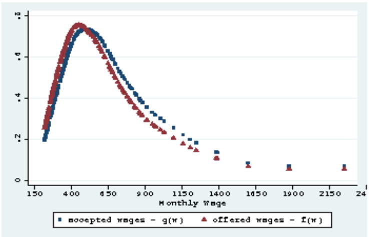
(b) Accepted & offered wage distributions of **ALL** sample in Egypt (Highest and lowest 5% observations trimmed)



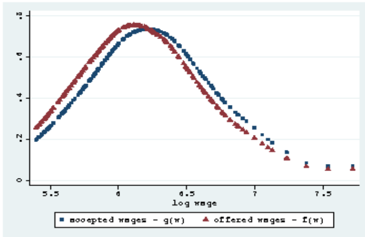
(c) Accepted & offered log-wage distributions of **ALL** sample in Egypt (Highest and lowest 5% observations trimmed)



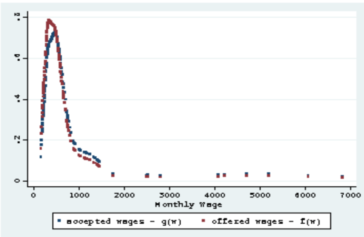
(d) Accepted & offered wage distributions of **Illiterate** workers in Egypt (Highest and lowest 1% observations trimmed)



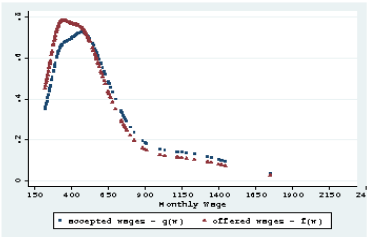
(e) Accepted & offered wage distributions of **Illiterate** workers in Egypt (Highest and lowest 5% observations trimmed)



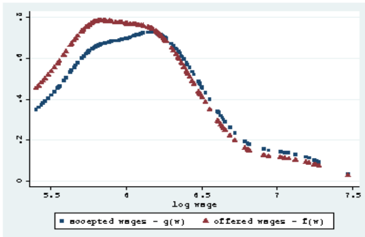
(f) Accepted & offered log-wage distributions of **Illiterate** workers in Egypt (Highest and lowest 5% observations trimmed)



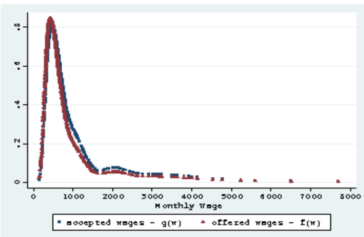
(g) Accepted & offered wage distributions of workers with below **secondary** education in Egypt (Highest and lowest 1% observations trimmed)



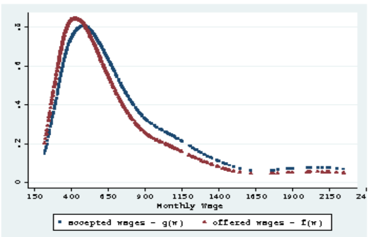
(h) Accepted & offered wage distributions of workers with below **secondary** education in Egypt (Highest and lowest 5% observations trimmed)



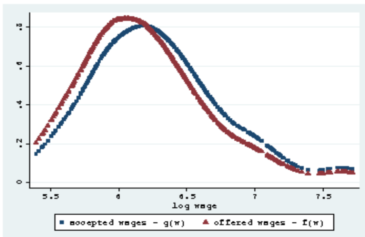
(i) Accepted & offered log-wage distributions of workers with below **secondary** education in Egypt (Highest and lowest 5% observations trimmed)



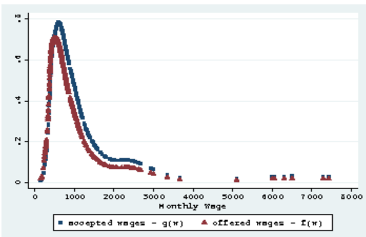
(j) Accepted & offered wage distributions of workers with **sec or above** education in Egypt (Highest and lowest 1% observations trimmed)



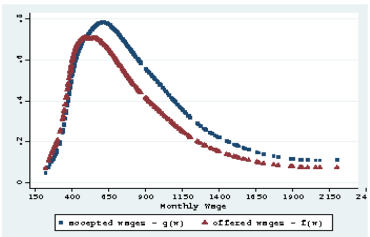
(k) Accepted & offered wage distributions of workers with **sec or above** education in Egypt (Highest and lowest 5% observations trimmed)



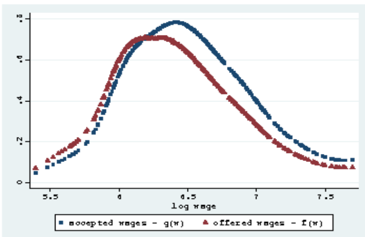
(l) Accepted & offered log-wage distributions of workers with **sec or above** education in Egypt (Highest and lowest 5% observations trimmed)



(m) Accepted & offered wage distributions of workers with **univ or above** education in Egypt (Highest and lowest 1% observations trimmed)

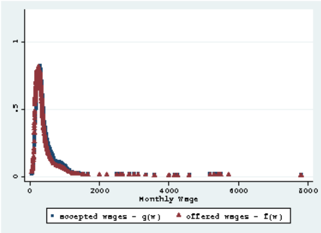


(n) Accepted & offered wage distributions of workers with **univ or above** education in Egypt (Highest and lowest 5% observations trimmed)

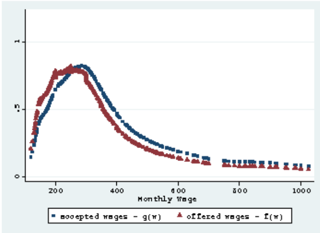


(o) Accepted & offered log-wage distributions of workers with **univ or above** education in Egypt (Highest and lowest 5% observations trimmed)

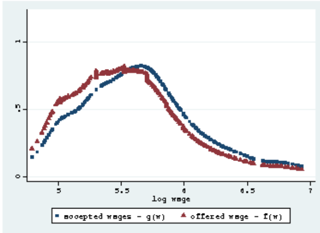
Figure 4: The Steady State F & G estimates, by Education Group, in Jordan



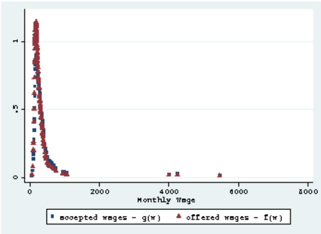
(a) Accepted & offered wage distributions of **ALL** sample in Jordan (Highest and lowest 1% observations trimmed)



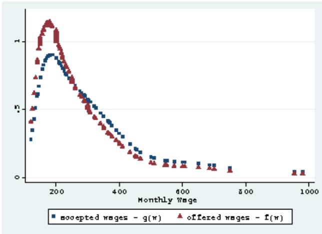
(b) Accepted & offered wage distributions of **ALL** sample in Jordan (Highest and lowest 5% observations trimmed)



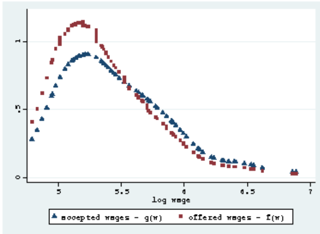
(c) Accepted & offered log-wage distributions of **ALL** sample in Jordan (Highest and lowest 5% observations trimmed)



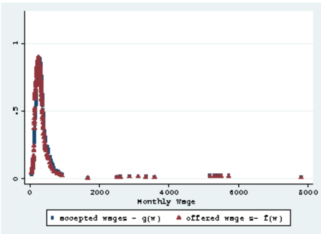
(d) Accepted & offered wage distributions of **Illiterate** workers in Jordan (Highest and lowest 1% observations trimmed)



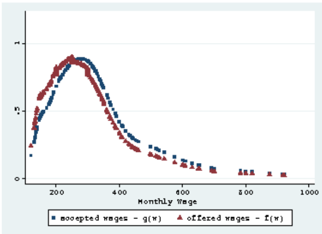
(e) Accepted & offered wage distributions of **Illiterate** workers in Jordan (Highest and lowest 5% observations trimmed)



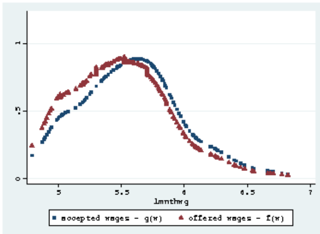
(f) Accepted & offered log-wage distributions of **Illiterate** workers in Jordan (Highest and lowest 5% observations trimmed)



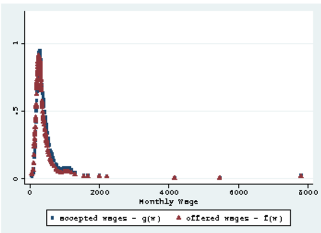
(g) Accepted & offered wage distributions of workers with below **secondary** education in Jordan (Highest and lowest 1% observations trimmed)



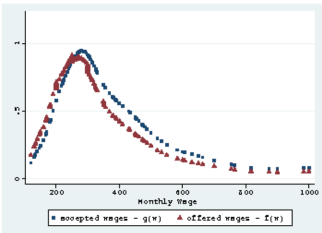
(h) Accepted & offered wage distributions of workers with below **secondary** education in Jordan (Highest and lowest 5% observations trimmed)



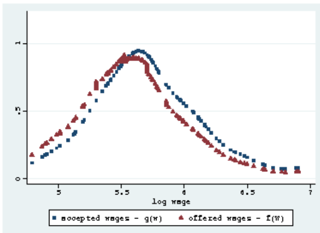
(i) Accepted & offered log-wage distributions of workers with below **secondary** education in Jordan (Highest and lowest 5% observations trimmed)



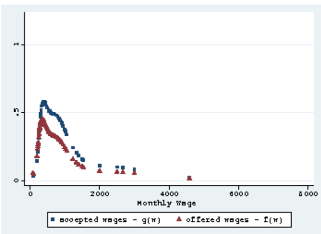
(j) Accepted & offered wage distributions of workers with **sec or above** education in Jordan (Highest and lowest 1% observations trimmed)



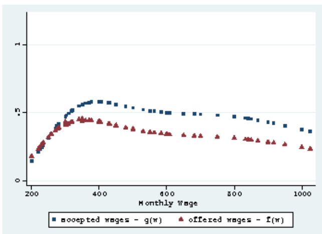
(k) Accepted & offered wage distributions of workers with **sec or above** education in Jordan (Highest and lowest 5% observations trimmed)



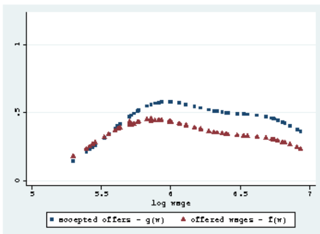
(l) Accepted & offered log-wage distributions of workers with **sec or above** education in Jordan (Highest and lowest 5% observations trimmed)



(m) Accepted & offered wage distributions of workers with **univ or above** education in Jordan (Highest and lowest 1% observations trimmed)

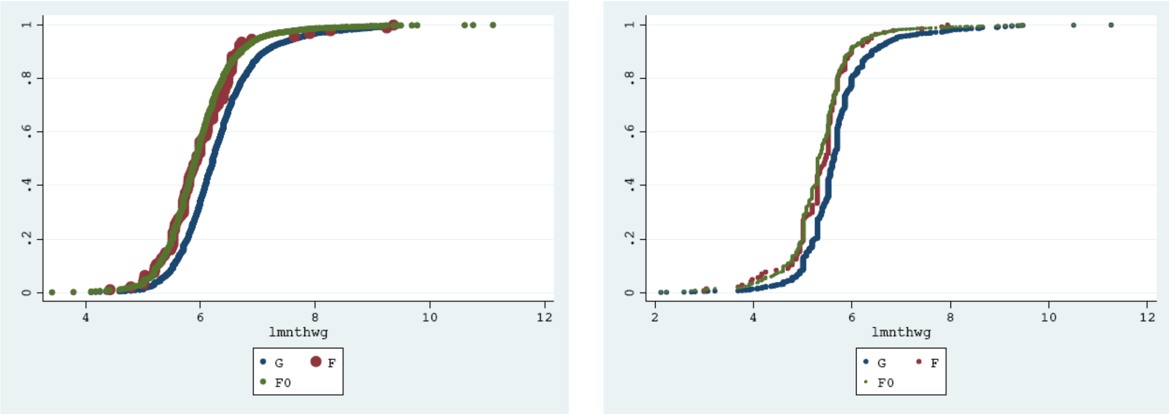


(n) Accepted & offered wage distributions of workers with **univ or above** education in Jordan (Highest and lowest 5% observations trimmed)



(o) Accepted & offered log-wage distributions of workers with **univ or above** education in Jordan (Highest and lowest 5% observations trimmed)

Figure 5: Direct Wages Offer Distribution Estimator $\hat{\dot{F}}^{0}(.)$ Versus Predicted Wages Offer Distribution *F(.)* in Egypt and Jordan



Egypt **Jordan**

Table 1: Descriptive Statistics

	Male Workers		Illiterates/ read&write		Below secondary		Secondary & above		University & above	
	Egypt (96-06)	**Jordan (00-10)**	**Egypt (96-06)**	**Jordan (00-10)**	**Egypt (96-06)**	**Jordan (00-10)**	**Egypt (96-06)**	**Jordan (00-10)**	**Egypt (96-06)**	**Jordan (00-10)**
No. of workers	3290	3211	578	765	450	1185	1268	784	994	477
Unemployed	1005	927	141	230	111	256	379	209	374	232
Employed	2285	2284	437	535	339	929	889	575	620	245
Age-mean	35.0	32.7	44.1	42.7	38.7	28.1	32.2	31.3	31.5	30.5
(std. dev.)	(13.27)	(13.35)	(12.00)	(12.78)	(13.34)	(11.09)	(12.13)	(11.72)	(12.48)	(13.78)
<u>Unemployed</u>										
utoj	813	582	57	38	72	189	333	148	351	207
	80.90%	62.78%	40.43%	16.52%	64.68%	73.83%		70.81%		89.22%
Mean spell	34.61	38.53	39.79	49.71	32.50	33.12	29.23	30.39	39.32	47.25
(std. dev.)	(23.55)	(28.92)	(26.36)	(33.65)	(23.87)	(29.03)	(21.68)	(24.54)	(23.64)	(27.97)
Right censored	192	345	84	192	39	67	46	61	23	25
observations	19.10%	37.22%	59.57%	83.48%	35.14%	26.17%	12.14%	29.19%	6.15%	10.78%
<u>Employed</u>										
jtoj	505	1053	64	189	46	475	186	278	209	111
	22.10%	46.10%	14.65%	35.33%	13.57%	51.13%	20.92%	48.35%	33.71%	45.31%
Mean spell	54.17	53.22	58.31	53.92	59.22	52.64	53.1	56.45	52.77	46.44
(std. dev.)	(28.28)	(34.17)	(31.34)	(35.43)	(28.33)	(34.14)	(27.07)	(33.51)	(28.31)	(33.09)
jtou	377	432	116	161	89	139	97	90	75	42
	16.50%	18.91%	26.54%	30.09%	26.25%	14.96%	10.91%	15.65%	12.10%	17.14%
Mean spell	62.64	63.29	61.55	63.21	61.48	68.71	63.22	54.01	64.96	65.62
(std. dev.)	(32.37)	(33.47)	(32.57)	(34.15)	(30.74)	(33.69)	(32.38)	(32.49)	(34.40)	(28.64)
Right	1403	799	257	185	204	315	606	207	336	92
censored observations	61.40%	34.98%	58.81%	34.58%	60.18%	33.91%	68.17%	36.00%	54.19%	37.55%
<u>Wage distribution</u>										
Min	220	120	220	120	221.18	120	220	120	220	200
Max	2250	1025	2250	980	1750	922	2245	1000	2200	1025
P10	300	150	250	150	279.67	150	300	180	395	276.67
Median	524	270	420	210	450	259.16	513	300	636.67	478.33
P90	1060	520	833.33	400	883.33	455	1045	500	1193.33	900
P90/p10	3.53	3.47	3.33	2.67	3.16	3.03	3.48	2.78	3.02	3.25
Skewness	1.82	1.79	2.29	2.33	1.83	1.76	2.10	1.76	1.41	0.55
Kurtosis	7.10	6.55	11.29	9.97	6.63	7.25	8.43	7.25	5.09	2.05
Mean	617.71	317.07	503.82	260.59	519.91	288.40	606.44	288.40	734.95	538.16
(std dev.)	(342.13)	(169.46)	(282.87)	(139.00)	(273.45)	(131.96)	(342.91)	(131.96)	(359.53)	(236.46)

Notes: Durations are expressed in months, and monetary values are in Egyptian pounds for Egypt and Jordanian dinars for Jordan.
Source: Author's calculations from ELMPS06 and JLMPS10.

Table 2: Estimates of Parameters in Egypt 96-06

	δ	λ_0	λ_1	κ_1
All	0.0084	0.01705	0.0029	0.3452
	[0.0077 0.0093]	[0.0169 0.0184]	[0.026 0.0031]	[0.2836 0.3971]
Illiterates	0.0078	0.01814	0.0026	0.3271
	[0.0069 0.0091]	[0.0179 0.0187]	[0.0021 0.0028]	[0.2272 0.4142]
Below Secondary	0.0078	0.0213	0.0026	0.3356
	[0.0069 0.0090]	[0.0199 0.0024]	[0.0021 0.0029]	[0.2364 0.4262]
Secondary & above	0.0093	0.0095	0.0041	0.4421
	[0.0083 0.0108]	[0.0089 0.0103]	[0.0037 0.0043]	[0.3482 0.5172]
University	0.0085	0.0098	0.0046	0.5432
	[0.0066 0.0113]	[0.0081 0.0092]	[0.0040 0.0049]	[0.3421 0.6803]

Source: Author's calculations from ELMPS06 and JLMPS10.

Table 3: Estimates of Parameters in Jordan 00-10

	δ	λ_0	λ_1	κ_1
All	0.0072	0.0183	0.0034	0.4722
	[0.0066 0.0076]	[0.0179 0.0184]	[0.0028 0.0039]	[0.4457 0.4891]
Illiterates	0.0067	0.0089	0.0036	0.5373
	[0.0063 0.0078]	[0.0083 0.0095]	[0.0027 0.0040]	[0.5127 0.5426]
Below Secondary	0.0062	0.0215	0.0029	0.4677
	[0.0055 0.0068]	[0.0195 0.0231]	[0.0021 0.0032]	[0.4517 0.4734]
Secondary & above	0.0091	0.0223	0.0052	0.5714
	[0.0087 0.0108]	[0.0218 0.0230]	[0.0047 0.0056]	[0.5402 0.5823]
University	0.0081	0.0092	0.0048	0.5926
	[0.0074 0.0094]	[0.0085 0.0099]	[0.0040 0.0054]	[0.5744 0.6061]

Note: Durations are calculated in months. 5% and 95% percentiles of the bootstrap distribution in square brackets.
Source: Author's calculations from ELMPS06 and JLMPS10.

Table 4: Cross-Country Comparison of Estimated Structural Transition Parameters

	Jolivet et al. (2006)	**Jolivet et al. (2006)**	**Sulis (2008)**	**ELMPS**	**JLMPS**
	(USA)	(France)	(Italy)	1998-2006	2000-2010
δ	0.0547	0.0129	0.0128	0.0084	0.0072
λ_0	1.7143	0.5614	0.0431	0.0461	0.0257
λ_1	0.1028	0.0476	0.0064	0.0029	0.0039
κ_1	1.7143	2.0300	0.5039	0.3452	0.5422

Source: Egypt's & Jordan's estimations are the author's calculations from ELMPS06 and JLMPS10. USA's and France's estimates are provided by Jolivet et al. (2006) and Italy's estimates are provided by Sulis (2008).