Marriage and Labor Market Transitions: A Structural Dynamic Model *

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Abstract

This paper estimates a structural dynamic model that aims at analyzing the direct impact of marriage on labor market transitions in Egypt taking into account the endogeneity of marriage. The model is estimated separately for men and women. Though, for men, marriage decisions are assumed to be exogenous to the employment status choice. The model is estimated using Maximum Likelihood. I use data the Egyptian Labor Market Panel Surveys of 1998 and 2006 as well as retrospective information on the same individuals from 1990. Four labor market alternatives are considered in the study. These are the public sector employment, the private sector employment, the informal sector employment and the non-employment. The results show the existence of significant effects of marriage on market participation. Interestingly, the results also show important state dependance for both sexes. And, significant transitions between the different labor market status are also observed.

JEL classification: C14, C33, C35, J21, J88.

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1 Introduction

This paper estimates a structural dynamic model that aims at studying the causal relationship between marriage and labor market transitions. The model is estimated separately for men and women. Though, for men, marriage decisions are assumed to be exogenous to the employment status choice. Four employment status are modeled in the present study. These are the public sector employment, the private sector employment, the informal sector employment and the non-employment. The informal sector employment mainly includes individuals working in subsistence activities. These activities concern, in large part, women rather than men. For the non-employment status, it consists of all unemployed and inactive individuals.

The motivation of this paper is twofold. The first is to determine how personal and household characteristics affect marriage and labor market transitions. On the other hand, I need to know more about the Egyptian labor market dynamics. Note that state dependance and labor market dynamics are important aspects of this chapter.

I estimate a structural dynamic model. A first stage consists in estimating a conditional probit model in which the probability of marriage depends on a set of observed heterogeneity conditional on the marital status at the previous date. At this step, marriage is instrumented by a set of instrumental variables. Following Assaad and Zouari (2003), I use the median age at marriage in the district where the woman lives as well as the number of sisters the woman has. Yet, the latter are far to be convenient since their coefficients are likely to be insignificant. For this, further research would consist of testing new instruments such as the household non-labor income per capita and the mother's age of marriage. In a second stage, a multinomial logit is estimated. The latter is dynamic since the current employment status depends on the individual's employment status at the previous date. Although the two models are estimated simultaneously, the error terms are assumed to be uncorrelated. Research in progress consist in introducing unobserved heterogeneity to the model. This is the first study that is able to analyze directly the impact of marriage on labor market dynamics in Egypt taking into account

the endogeneity of marriage. To estimate the model, I rely on the Egyptian Labor Market Panel Surveys of both 1998 and 2006 as well as on retrospective information from 1990. And, the estimation is done via the Maximum Likelihood method.

The results show the existence of significant effects of marriage on labor market transitions. Interestingly, the results also show important state dependance for both genders. And, significant transitions between different labor market status are also observed.

The paper is organized as follows: Section 2 exhibits some stylized facts on marriage and employment transitions in Egypt. Section 3 shows the data used and the sample selection. Section 4 is devoted to the presentation of the model as well as the estimation method. Section 5 displays the empirical results. And, Section 6 concludes.

2 Some Stylized Facts

Egypt, since the nineteens, adopted the Economic Reform and Structural Adjustment Program (ERSAP). A large part of this Reform program consists in the privatization of public enterprisers. In addition to this, the Egyptian government no longer guarantees a governmental employment for all university graduates as it was the case during the last decade.

Women In Egypt tend to work work in the labor market before they get marriage and to leave it after marriage. One explanation for that is the high costs of marriage in Egypt. Women are then in need to work to be able to afford these costs.

Since public sector's jobs are assumed to better apply family-friendly policies, women working in this sector could have higher probabilities to continue working after marriage. As the private sector generally implies longer working hours, lower levels of flexibilities, women working in it would prefer to stop working after marriage and to move into the inactivity status. The motivation of the present section is to know whether females employed in the private sector have higher probabilities to move into the inactivity state after marriage compared to those working in the public or the informal sector. Such an observation would confirm the hypothesis that the private sector needs to evolute in order

to allow to married women to continue working after marriage. The latter is generally known for its long working hours as well as for its discrimination against women (especially married ones) and the deep shortage of presence of family-friendly policies.

This section analyzes women's labor market transitions and marriage transitions between 1998 and 2006. As noted above, within this period, Egypt has witnessed several vagues of economic reforms, trade liberalization and privatization policies. Table 1 shows the labor market transitions, for all women, between four different status[1] within an eight-year period (from 1998 to 2006). Egyptian women are observed to have important state dependence. 82.74 percent of women working in the public sector in 1998 remain working in the same sector in 2006. Similarly, 48 percent of women working in the private sector are state dependants. However, in Table 1, we observe important transitions from the informal sector to the inactivity state, with 48.15 percent moving from informal jobs to inactivity between 1998 and 2006. Not surprisingly, the large majority of inactive women (75.66 percent) are likely to remain inactive.

[Table 1 about here]

Tables 2 and 3 displays the same information of Table 1 but for single and married women separately. Note that, in these tables, we only observe women who did not change their marital status between the two dates. The same aspects of labor market transitions are observed for both groups of women. Though, only 73.17 percent of singles working in the public sector are state dependents compared to 86.08 percent of their married peers. Larger proportions of married stay in public sector's jobs than singles women. In contrast, singles have larger state dependance for the private employment relative to married.

[Tables 2 and 3 about here]

Turning the analysis to women who changed their marital status. In Table 4, we observe those who got married between 1998 and 2006. Then, these women are observed singles in 1998 and married in 2006. As expected, 82 percent of those working in the public sector before marriage (in 1998) continue working in the same sector after marriage.

[1]These are the public sector employment, the private sector employment, the informal sector employment and the non-employment.

This results proves the better efficiency of the public sector's jobs to reconciliate between family and professional lives. Women working in this sector are then encouraged to remain active after marriage. Interestingly, Table 4 shows that 50 percent of women working in the private sector quite the labor market and transit into inactivity after marriage. This result largely confirms our hypothesis. When women transit into marriage, the state dependance to the private sector, that was observed earlier, completely disappears. The results presented in this table call for better gender equalities and more efficient family-career polices within the private sector.
Also, 62.50 percent of women working in the informal sector's jobs transit into inactivity after they marry. One explanation for this could be the domination of uncertainty and insecurity in this sector.

[Table 4 about here]

Table 5 shows labor market transitions for women who were married in 1998 but became singles in 2006. These women are whether divorced or widowed. Contrarily to the results showed in Table 4, these "newly single" women are high private sector dependents. For instance, 56 percent of those working in the private when they were married continue working in this sector when they become singles. Moreover, 56.58 percent of these women transited from the informal sector to inactivity after changing their marital status.

[Table 5 about here]

3 Data

Data I use come from the Egyptian Labor Market and Panel Surveys of 1998 and 2006. Only the panel sample is used in order to observe the same individuals in both dates. I also use of the retrospective information on the individuals' employment status in 1990. All individuals, whether married or singles, aged between 16 and 50 in 1990 are considered in the estimations. Students, retired, pre-retired, and handicapped persons are excluded from the sample. As explanatory variables, we controls for the individual's level of education, the region of residence, the parental level of education and the individual's age.

In 1990, we do not directly observe these individual characteristics. Nevertheless, relying on some variables such as the date of birth and the year of marriage, it is possible to observe the age and the marital status in 1990. Similarly, the individual levels of education in 1990 can be informed from the available information on the individual's age when completed or dropped out school. And, the parental levels of education are assumed to not vary in time.

Following Assaad and Zouari (2003), to instrument the marriage decision, I use the median age at marriage in the district where the woman lives as well as the number of sisters the woman has. Yet, the latter are far to be convenient since their coefficients are likely to be insignificant. For this, further research would consist of testing new instruments such as the household non-labor income per capita and the mother's age of marriage.

4 Econometric Model

I estimate a structural dynamic model. A first stage consists in modeling the mariage choice. And, in the second stage I estimate the multinomial logit model the labor market choices. The two stages are estimated simultaneously. And, the model is presented with and without unobserved heterogeneity.
The individuals are observed at 3 points of time $t \in 1, 2, 3$. The lag between each t being the same as individuals are questionnaired in 1998 and 2006, and answer a retrospective question about their professional situation in 1990.

4.1 Model Without Unobserved Heterogeneity

The probability of being married is represented as follows,

$$Prob[m_{it} = 1 | x_{it}^{'}; Z_{it}; m_{it-1}] \tag{1}$$

where m_{it} a dummy variable that shows the marital status of individual i at date t. m_{it} equals to one if the individual is currently married and to zero if not. $x_{it}^{'}$ represents a vector of individual characteristics at date t. m_{it-1} is a dummy variable showing the

marital status at $t-1$. Z_{it} is a vector of 'excluded' variables. These variables play the role of 'instrumental' variable since they are affecting the mariage decision but not the employment status choice.

Then, the model can be written as follows,

$$m_{it}^{*} = x_{it}^{'}\beta + \gamma m_{it-1} + \delta Z_{it} + u_{it} \tag{2}$$

where β is the vector of parameters. m_{it-1} indicates the marital status of individual i at $t-1$. And, u_{it} represents the error term of individual i at time t. The latter follows a symmetric distribution of $F(u_{it})$. Note that $F(u_{it}) = \Phi(u_{it})$ follows a normal distribution $N(0,1)$.

The contribution to the individual likelihood function is,

$$\begin{aligned} L(\beta,\gamma,\delta) &= \Pi_{i=1}^{n}\Pi_{t=2}^{3}[(\Phi(x_{it}^{'}\beta + \gamma m_{it-1} + \delta Z_{it}))^{m_{it}} \\ &\quad (1-\Phi(x_{it}^{'}\beta + \gamma m_{it-1} + \delta Z_{it}))^{(1-m_{it})}] \end{aligned} \tag{3}$$

And the log-likelihood is,

$$\begin{aligned} \ln(L(\beta,\gamma,\delta)) &= \Sigma_{i=1}^{n}\Sigma_{t=2}^{3} m_{it}\ln[(\Phi(x_{it}^{'}\beta + \gamma m_{it-1} + \delta Z_{it})) \\ &\quad +(1-m_{it})\ln(1-\Phi(x_{it}^{'}\beta + \gamma m_{it-1} + \delta Z_{it}))] \end{aligned} \tag{4}$$

To study the labor market transitions, I consider four employment states. These are the public sector employment, the private sector employment, the informal employment and the non employment. k_{it} denotes the individual employment state at time t with $k_{it} \in \{1,2,3,4\}$.

A dynamic multinomial logit is estimated,

$$Prob[Y_{ikt} = k | x_{it}^{'}; y_{it-1}; m_{it}] \tag{5}$$

Y_{ikt} denotes the employment state choice k of individual i at time t. This is conditional on the individual characteristics $x_{it}^{'}$, the previous employment state $y_{i(t-1)}$, and on m_{it} that represents the marital status at date t.

Thus, the model is written as follows,

$$Y^*_{ikt} = x'_{it}\beta^\flat + \gamma^\flat y_{i(t-1=k)} + \delta^\flat m_{it} + \nu_{ikt} \quad (6)$$

where Y^*_{ikt} is the utility of individual i of being in state k.
The the reference employment state is the inactivity state. The individual contribution to the likelihood when $y_{ikt} = 4$ can then be represented as,

$$Prob[Y_{ikt} = 4|x'_{it}; y_{it-1}; m_{it}; \beta^\flat_j; \gamma^\flat_j; \delta^\flat_j] = \frac{1}{1 + \sum_{j=1}^{3} exp(x'_{it}\beta^\flat_j + \gamma^\flat_j y_{i(t-1=j)} + \delta^\flat_j m_{it})}$$

And, the contribution to the likelihood for the three other states is as follows,

$$Prob[Y_{ikt} = k|x'_{it}; y_{it-1}; m_{it}; \beta^\flat_k; \gamma^\flat_k; \delta^\flat_k] = \frac{exp(x'_{it}\beta^\flat_k + \gamma^\flat_k y_{i(t-1=k)} + \delta^\flat_k m_{it})}{1 + \sum_{j=1}^{3} exp(x'_{it}\beta^\flat_j + \gamma^\flat_j y_{i(t-1=j)} + \delta^\flat_j m_{it})}$$

Note that, $\gamma^\flat = \{\gamma^\flat_1; \gamma^\flat_2; \gamma^\flat_3\}$ and $y_{i(t-1)} = \{y_{i(t-1=1)}; y_{i(t-1=2)}; y_{i(t-1=3)}\}$.

To put into a nutshell, I estimate simultaneously the mariage and the employment choices taking into consideration the endogenous character of marriage.

4.2 Model With Unobserved Heterogeneity

This section consists in introducing individual unobserved heterogeneity to the model. In the first step, the residual term μ_{it} is then replaced by an individual unobserved heterogeneity α_i and u_{it}. Then, the model can be re-written as follows,

$$m^*_{it} = x'_{it}\beta + \gamma m_{it-1} + \delta Z_{it} + \alpha_i + u_{it} \quad (7)$$

where u_{it} are independent and identically distributed (i.i.d.). Similarly, the individual effects α_i are assumed to be i.i.d. and follow a Normal distribution $N(0, \sigma^2_\alpha)$. And, we assume that the term u_{it} follows a Normal distribution $N(0, 1 - \sigma^2_\alpha)$.
Note that the δ coefficient represent the state dependance ($\delta \neq 0$ implies the existence of state dependence; $\delta > 0$ means that there is a positive state dependence and $\delta < 0$ a negative state dependence).

The contribution to the likelihood function of individual i is represented by,

$$L_i(\theta) = \int_{-\infty}^{+\infty} f(m_{i1}, m_{i2}, m_{i3}|x_i; \alpha_i; \theta) f(\alpha_i; \theta) d\alpha_i \quad (8)$$

$$= \int_{-\infty}^{+\infty} \Pi_{t=2}^{T} f(m_{it}|x_{it}^{'}; m_{it-1}; Z_{it}; \alpha_i; \theta) f(mi1|x_{i1}; \alpha_i; \theta) f(\alpha_i|\theta) d\alpha_i \quad (9)$$

where θ represents the vector of parameters $\theta = (\gamma, \beta, \delta, \sigma_\alpha^2)'$.
Then,

$$f(m_{it}|x_{it}^{'}; m_{it-1}; Z_{it}; \alpha_i; \theta) = \Phi(\frac{x_{it}^{'}\beta + \gamma m_{it-1} + \delta Z_{it} + \alpha_i}{\sqrt{1-\sigma_\alpha^2}}) \quad (10)$$

$$= 1 - \Phi(\frac{x_{it}^{'}\beta + \gamma m_{it-1} + \delta Z_{it} + \alpha_i}{\sqrt{1-\sigma_\alpha^2}}) \quad (11)$$

$\Phi(u)$ being the repartition function and follows a Normal distribution $N(0,1)$.
Otherwise,

$$f(\alpha_i|\theta) = \frac{1}{\sqrt{2\pi\sigma_\alpha}} exp(-\frac{\alpha_i^2}{2\sigma_\alpha^2}) \quad (12)$$

Let us turn our attention now to the initial conditions' issue. Two approaches are proposed in order to model the initial conditions' distribution $f(m_{i1}|x_{i1}; \alpha_i; \theta)$. The first approach consists in considering the initial conditions as exogenous,

$$f(m_{i1}|x_{i1}; \alpha_i; \theta) = f(m_{i1}|x_{i1}; \theta) \quad (13)$$

This can be done if and only if the initial conditions at date $t-1$ is the same for all the individuals. However, in the present study, each individual has a different work status at 1998. Therefore, the endogenous character of the initial conditions needs to be taken into consideration. To do this, two methods can be used. On the one hand, the method proposed by Heckman (1981). On the other hand, the method of Wooldridge (2005). The latter is the one considered in the present research and it consists in considering that the conditional distribution of the individual effects α_i depends on the initial state m_{i1} as well as on a vector of individual characteristics x_i.

The conditional distribution of m_{i1} can then be represented as follows,

$$f(m_{it}|x_{it}^{'}; Z_{it}; m_{i1}; m_{it-1}; \alpha_i) = f(m_{it}|x_{it}^{'}; Z_{it}; m_{it-1}; \alpha_i) \tag{14}$$

The individual effect is therefore,

$$\alpha_i = \alpha_0 + \alpha_1 m_{i1} + x_i \alpha_2 + \xi_i \tag{15}$$

where ξ_i represents the random variable and $\xi_i|m_{i1}, x_i \sim N(0, \sigma_\alpha^2)$.
And, by substituting the equation 3.15 in the initial marriage probability model, we obtain the conditional probit dynamic model taking into account both unobserved heterogeneity and the model of the initial conditions,

$$m_{it}^{*} \quad = \quad x_{it}^{'}\beta + \gamma m_{it-1} + \delta Z_{it} + \alpha_0 + \alpha_1 m_{i1} + x_i \alpha_2 + \xi_i + u_{it} \tag{16}$$

where $u_{it}|(x_i, m_{i1}, ..., m_{it-1}, \xi_i) \sim N(0, 1)$.
Then, the contribution of $(m_{i2}, ..., m_{iT})$ conditional on (x_i, m_{i1}, ξ_i) is as follows,

$$\Pi_{t=2}^{T} \Phi(x_{it}^{'}\beta + \gamma m_{it-1} + \delta Z_{it} + \alpha_0 + \alpha_1 m_{i1} + x_i \alpha_2 + \xi_i)^{m_{it}}$$

$$[1 - \Phi(x_{it}^{'}\beta + \gamma m_{it-1} + \delta Z_{it} + \alpha_0 + \alpha_1 m_{i1} + x_i \alpha_2 + \xi_i)]^{1-m_{it}} \tag{17}$$

By integrating relatively to the density of the $N(0, \sigma_\alpha^2)$, we get the contribution of $(m_{i2}, ..., m_{iT})$ conditional on (x_i, m_{i1}),

$$\int_{-\infty}^{+\infty} \Pi_{t=2}^{T} \Phi(x_{it}^{'}\beta + \gamma m_{it-1} + \delta Z_{it} + \alpha_0 + \alpha_1 m_{i1} + x_i \alpha_2 + \xi_i)^{m_{it}}$$

$$[1 - \Phi(x_{it}^{'}\beta + \gamma m_{it-1} + \delta Z_{it} + \alpha_0 + \alpha_1 m_{i1} + x_i \alpha_2 + \xi_i)]^{1-m_{it}} \frac{1}{\sigma_\alpha} \phi(\frac{\xi_i}{\sigma_\alpha}) d\xi_i \tag{18}$$

where α_2 is a vector of parameters.
And, the parameters $\alpha_0, \beta, \gamma, \delta, \alpha_1, \alpha_2, \sigma_\alpha^2$ are estimated via maximum likelihood.

The second step relies in estimating the labor market choice model. To do that, I start by re-writing the model,

$$Y^*_{ikt} = x'_{it}\beta^\flat + \gamma^\flat y_{i(t-1=k)} + \delta^\flat m_{it} + \alpha_{ik} + \mu_{ikt} \quad (19)$$

The latter represents the dynamic multinomial logit model of labor market choices that I estimate taking into account the unobserved heterogeneity α_{ik}. Then,

$$Prob[Y_{ikt} = k|x'_{it}; y_{it-1}; m_{it}; \beta^\flat_k; \gamma^\flat_k; \delta^\flat_k, \alpha_{ik}] = \frac{exp(x'_{it}\beta^\flat_k + \gamma^\flat_k y_{i(t-1=k)} + \delta^\flat_k m_{it} + \alpha_{ik})}{1 + \sum_{j=1}^{3} exp(x'_{it}\beta^\flat_j + \gamma^\flat_j y_{i(t-1=j)} + \delta^\flat_j m_{it} + \alpha_{ij})}$$

Using the method of Wooldridge (2005) presented above, the individual unobserved term $\alpha_i = (\alpha_{i1}, ..., \alpha_{i4})$ is modeled as follows,

$$\alpha_i|y_{i1} \sim N(\alpha_1 + \Sigma_{k=1}^{K-1}\beta^\flat_k 1_{y_{i1=k}}, \Omega) \quad (20)$$

Consequently,

$$\alpha_{ij} = \alpha_{oj} + \Sigma_{k=1}^{K-1}\beta^\flat_k 1_{y_{i1=k}} + \eta_{ij}, \quad (21)$$

where $\eta_{ij} \sim N(0, \Omega)$.
The individual likelihood contribution is then,

$$Prob[Y_{ikt} = k|x'_{it}; y_{it-1}; m_{it}; \beta^\flat_k; \gamma^\flat_k; \delta^\flat_k; \eta_{ik}] = \frac{exp(x'_{it}\beta^\flat_k + \gamma^\flat_k y_{i(t-1=k)} + \delta^\flat_k m_{it} + \eta_{iy_{it}})}{1 + \sum_{j=1}^{3} exp(x'_{it}\beta^\flat_j + \gamma^\flat_j y_{i(t-1=j)} + \delta^\flat_j m_{it} + \eta_{iy_{it}})}\phi(\eta_i|y_{i0})$$

5 Empirical Results

Tables 6 and 7 display the women's estimation results obtained using maximum likelihood. Results of the first stage show the determinants of marriage. Not surprisingly, being married at date $t-1$ increases the probability of remaining married at date t. Having the 56-63 age group as the reference group, the probability of being married significantly increases with the age. For instance, women aged between 24 and 35 years old at t (in 1998) have a higher marriage probability compared to the reference age group. The probability of being married also increases with the level of education. Having an

above intermediate education increases the probability of marriage of about 178 percent relative to being illiterate.
The parental level of education does not significantly affects the daughters' probability of marriage. However, only mothers having a high level of education such as a university degree or above negatively affect their daughter's marriage probability, the coefficient being of 44 percent.
As instruments for marriage, I use (for the moment) the median age of marriage in the district where the woman lives and the number of sisters she has. Although the latter have been also tested separately, the results did not significantly change. The coefficients of these variables are not significant. For this, research in progress aim at testing other instruments such as the household non-labor income per capita and the mother's age of marriage.

[Table 6 about here]

In the second part of Tables 6 and 7, we observe the results of the multinomial logit. As denoted above, I choose the inactivity state as the reference state.
It turns out that being married at date t decreases the probability of being active, in general, relatively to being inactive. Women living in big cities such as Cairo and Alexandria have significantly higher probabilities to work in the public and in the private sector. This result goes with our expectations as formal employment is likely to be more available in the capital. For instance, living in a rural area decreases the probability of working in the public sector by 22 percent. And, it interestingly decreases the probability of working in the private sector by 64 percent. Living in a rural area significantly increases the probability of having an informal job by 151 percent. Note that the latter includes all subsistence activities, which are more common to find in rural areas.

All the lagged employment status' variables are statistically significant. And we generally observe strong state dependance. Women working in the private sector in the previous period $t-1$ are more likely to move into inactivity rather than to a public sector job. A similar result is observed for the informal sector's employees. The latter have 0.87 percent less chances to move to the public sector relatively to inactivity.

[Table 7 about here]

The private sector as well as the informal sector are also characterized by a large state dependence. Interestingly, the probabilities of transition from a public sector's job to an informal employment are very low. In other words, women working in the public sector are likely to move to inactivity rather than to the informal sector.

Tables 8 and 9 show the multinomial logit estimates for men. Since only one man in our sample is observed to have a subsistence work, I restrict my analysis to three labor market alternatives. These are: the public sector employment, the private sector employment, and inactivity. Contrarily to women, being married increases the probability of being active, whether in the public or private sector, rather than being inactive. For instance, being married increases by 16.67 percent the probability of having a public sector job, and by 13.29 percent the probability of working in the private sector. The employment probability in both sectors also increases with the age and the level of education.

[Table 8 about here]

It turns out that, as for women, state dependance are also significantly important for men. And, as expected, men working in the private sector are likely to move to the public sector rather than to inactivity.
Table 9 displays the same results as Table 8. Only the reference age group differs.

[Table 9 about here]

Results of the model with unobserved heterogeneity are in progress.

6 Summary and Conclusion

In the present paper, I estimate a structural dynamic model that aims at studying the causal relationship between marriage and labor market transitions for women and men separately. For women, four employment alternatives have been modeled and the marriage decision is endogenous. These alternatives are the public sector employment,

the private sector employment, the informal sector employment and the non-employment. The informal employment is defined here as the subsistence work. Since men are rarely concerned by this kind of activities, only three employment alternatives have been modeled for them. And, contrarily to women, marriage is assumed to be exogenous to men's labor market choices.
The novelty of this research is, on the one hand, that it is the first study that is able to analyze directly the impact of marriage on labor market dynamics in Egypt taking into account the endogeneity of marriage. On the other hand, it allows comparaisons between labor market transitions of men and women and, infers new results regarding state dependence in Egypt.

The results show the existence of significant effects of marriage on labor market transitions for both sexes. Interestingly, the results also show important state dependance, and significant transitions between different labor market status.

This study has two main limitations. The first is the choice of instruments and the second is the non-control for individual unobserved heterogeneity. For this, research in progress consists in testing new instruments for marriage such as the household non-labor income per capita and the mother's age of marriage. Moreover, future versions of this study will show the results of the model taking into full consideration the unobserved heterogeneity.

Tables

Descriptive Statistics

Table 1: Females labor market transitions between 1998 and 2006

	State in 2006				
State in 1998	**Public**	**Private**	**Informal**	**Inactivity**	**Total**
Public	484	12	1	88	585
	82.74	2.05	0.17	15.04	100.00
	85.06	2.80	0.16	4.17	15.76
Private	11	125	35	88	259
	4.25	48.26	13.51	33.98	100.00
	1.93	29.21	5.77	4.17	6.98
Informal	9	138	301	416	864
	1.04	15.97	34.84	48.15	100.00
	1.58	32.24	49.59	19.72	23.27
Inactivity	65	153	270	1,517	2,005
	3.24	7.63	13.47	75.66	100.00
	11.42	35.75	44.48	71.93	54.00
Total	569	428	607	2,109	3,713
	15.32	11.53	16.35	56.80	100.00
	100.00	100.00	100.00	100.00	100.00

Source: constructed by the author using the ELMPS of 1998 and 2006

Table 2: Single females labor market transitions between 1998 and 2006

	State in 2006				
State in 1998	**Public**	**Private**	**Informal**	**Inactivity**	**Total**
Public	60	2	0	20	82
	73.17	2.44	0.00	24.39	100.00
	88.24	2.74	0.00	5.03	13.58
Private	2	37	1	29	69
	2.90	53.62	1.45	42.03	100.00
	2.94	50.68	1.54	7.29	11.42
Informal	0	17	35	79	131
	0.00	12.98	26.72	60.31	100.00
	0.00	23.29	53.85	19.85	21.69
Inactivity	6	17	29	270	322
	1.86	5.28	9.01	83.85	100.00
	8.82	23.29	44.62	67.84	53.31
Total	68	73	65	398	604
	11.26	12.09	10.76	65.89	100.00
	100.00	100.00	100.00	100.00	100.00

Note: Constructed only for females who are singles in 1998 and 2006.

Table 3: Married females labor market transitions between 1998 and 2006

	State in 2006				
State in 1998	**Public**	**Private**	**Informal**	**Inactivity**	**Total**
Public	371	7	1	52	431
	86.08	1.62	0.23	12.06	100.00
	85.29	2.40	0.21	3.67	16.43
Private	6	67	26	40	139
	4.32	48.20	18.71	28.78	100.00
	1.38	22.95	5.44	2.82	5.30
Informal	9	107	241	284	641
	1.40	16.69	37.60	44.31	100.00
	2.07	36.64	50.42	20.03	24.44
Inactivity	49	111	210	1,042	1,412
	3.47	7.86	14.87	73.80	100.00
	11.26	38.01	43.93	73.48	53.83
Total	435	292	478	1,418	2,623
	16.58	11.13	18.22	54.06	100.00
	100.00	100.00	100.00	100.00	100.00

Note: Constructed only for females who are married in 1998 and 2006.

Table 4: Females into marriage and labor market transitions

	State in 2006				
State in 1998	**Public**	**Private**	**Informal**	**Inactivity**	**Total**
Public	23	2	0	3	28
	82.14	7.14	0.00	10.71	100.00
	71.88	16.67	0.00	3.80	20.44
Private	2	7	4	13	26
	7.69	26.92	15.38	50.00	100.00
	6.25	58.33	28.57	16.46	18.98
Informal	0	2	4	10	16
	0.00	12.50	25.00	62.50	100.00
	0.00	16.67	28.57	12.66	11.68
Inactivity	7	1	6	53	67
	10.45	1.49	8.96	79.10	100.00
	21.88	8.33	42.86	67.09	48.91
Total	32	12	14	79	137
	23.36	8.76	10.22	57.66	100.00
	100.00	100.00	100.00	100.00	100.00

Note: Constructed only for females singles in 1998 and married in 2006.

Table 5: Females out of marriage and labor market transitions

	State in 2006				
State in 1998	**Public**	**Private**	**Informal**	**Inactivity**	**Total**
Public	30	1	0	13	44
	68.18	2.27	0.00	29.55	100.00
	88.24	1.96	0.00	6.07	12.61
Private	1	14	4	6	25
	4.00	56.00	16.00	24.00	100.00
	2.94	27.45	8.00	2.80	7.16
Informal	0	12	21	43	76
	0.00	15.79	27.63	56.58	100.00
	0.00	23.53	42.00	20.09	21.78
Inactivity	3	24	25	152	204
	1.47	11.76	12.25	74.51	100.00
	8.82	47.06	50.00	71.03	58.45
Total	34	51	50	214	349
	9.74	14.61	14.33	61.32	100.00
	100.00	100.00	100.00	100.00	100.00

Note: Constructed only for females married in 1998 and singles in 2006.

6.1 Empirical Results

Table 6: Structural model's estimates for females

	Multiplicatif*	**Estimate**	**St.d Error**	**t Value**	**Prob>t**
1. Marriage Decision					
Marital Status at t-1	9.5049	2.2518	0.08694	25.90	<.0001
Age 24-35 at t	13.4692	2.6004	0.1917	13.57	<.0001
Age 36-45 at t	3.0846	1.1264	0.08203	13.73	<.0001
Age 46-55 at t	1.7935	0.5842	0.07124	8.20	<.0001
Educ2: LessInterm.	1.0230	0.02273	0.09393	0.24	0.8088
Educ3: Intermediate	1.3131	0.2724	0.09802	2.78	0.0055
Educ4: AboveInterm.	1.7836	0.5787	0.2202	2.63	0.0086
Educ5: UniversityAbove	1.6179	0.4811	0.1439	3.34	0.0008
Father Educ2: LessInterm.	1.0238	0.02350	0.1128	0.21	0.8350
Father Educ3: Intermediate	0.9708	-0.02961	0.1544	-0.19	0.8479
Father Educ4: AboveInterm.	1.1020	0.09716	0.3625	0.27	0.7887
Father Educ5: UniversityAbove	0.9013	-0.1039	0.2199	-0.47	0.6366
Mother Educ2: LessInterm.	0.8475	-0.1655	0.1851	-0.89	0.3713
Mother Educ3: Intermediate	1.7779	0.5754	0.3780	1.52	0.1280
Mother Educ4: AboveInterm.	1.0553	0.05380	0.5051	0.11	0.9152
Mother Educ5: UniversityAbove	0.4411	-0.8186	0.4165	-1.97	0.0495
Urban	1.0023	0.002342	0.07588	0.03	0.9754
Rural	1.0584	0.05676	0.08490	0.67	0.5039
Median age at marriage	1.0071	0.007082	0.03233	0.22	0.8266
Nbr. of Sisters	0.9800	-0.02016	0.01773	-1.14	0.2557
Constant	0.1552	-1.8628	0.6640	-2.81	0.0051
2. Employment State Y: inactivity is the baseline					
$Y = 1$ **: Public Sector**					
Marital Status at t	0.1757	-1.7390	0.2157	-8.06	<.0001
Age 24-35 at t	2.0944	0.7393	0.3240	2.28	0.0226
Age 36-45 at t	3.7131	1.3119	0.2339	5.61	<.0001
Age 46-55 at t	2.0578	0.7216	0.2251	3.21	0.0014
Urban	0.2898	-1.2387	0.1739	-7.12	<.0001
Rural	0.2244	-1.4944	0.2109	-7.09	<.0001
Educ2: LessInterm.	0.1142	-2.1697	0.5461	-3.97	<.0001
Educ3: Intermediate	3.9071	1.3628	0.2376	5.73	<.0001
Educ4: AboveInterm.	3.0162	1.1040	0.3551	3.11	0.0019
Educ5: UniversityAbove	6.1709	1.8198	0.2843	6.40	<.0001
lagged Y 11: State dependance	8.2331	2.1082	0.2531	8.33	<.0001
lagged Y 21: Transition from 2 to 1	0.2023	-1.5982	0.4065	-3.93	<.0001
lagged Y 41: Transition from 4 to 1	0.0876	-2.4346	0.2125	-11.46	<.0001
$Y = 2$**: Private Sector**					
Marital Status at t	0.2403	-1.4258	0.1277	-11.17	<.0001
Age 24-35 at t	1.4873	0.3969	0.2338	1.70	0.0897
Age 36-45 at t	1.9490	0.6673	0.1559	4.28	<.0001
Age 46-55 at t	1.1271	0.1196	0.1457	0.82	0.4116
Urban	0.3693	-0.9962	0.1309	-7.61	<.0001
Rural	0.6442	-0.4398	0.1352	-3.25	0.0012
Educ2: LessInterm.	0.2053	-1.5831	0.1932	-8.19	<.0001
Educ3: Intermediate	0.3158	-1.1528	0.2072	-5.56	<.0001
Educ4: AboveInterm.	0.4082	-0.8959	0.3797	-2.36	0.0184
Educ5: UniversityAbove	0.2638	-1.3324	0.3392	-3.93	<.0001
lagged Y 12: Transition from 1 to 2	1.9627	0.6743	0.3576	1.89	0.0595
lagged Y 22: State dependance	7.1959	1.9735	0.1801	10.96	<.0001
lagged Y 32:Transition from 3 to 2	2.1238	0.7532	0.1402	5.37	<.0001

Note: i. The results' continuation is presented in the following page.

Table 7: Structural model's estimates for females*(Continuation)*

$Y = 3$: **Informal Sector**	**Multiplicatif***	**Estimate**	**St.d Error**	**t Value**	**Prob>t**
Marital Status at t	0.3432	-1.0693	0.1115	-9.59	<.0001
Age 24-35 at t	1.6860	0.5224	0.1847	2.83	0.0047
Age 36-45 at t	1.4108	0.3442	0.1370	2.51	0.0121
Age 46-55 at t	1.0780	0.07512	0.1257	0.60	0.5500
Urban	0.4840	-0.7257	0.1180	-6.15	<.0001
Rural	1.5184	0.4177	0.1135	3.68	0.0002
Educ2: LessInterm.	0.3309	-1.1060	0.1441	-7.67	<.0001
Educ3: Intermediate	0.3294	-1.1106	0.1795	-6.19	<.0001
Educ4: AboveInterm.	0.0918	-2.3878	0.7200	-3.32	0.0009
Educ5: UniversityAbove	0.0868	-2.4436	0.6068	-4.03	<.0001
lagged Y 13: Transition from 1 to 3	0.1345	-2.0062	0.9635	-2.08	0.0374
lagged Y 23: Transition from 2 to 3	1.1973	0.1801	0.2230	0.81	0.4195
lagged Y 33: State dependance	1.9176	0.6510	0.1125	5.79	<.0001
N	3519				
Alpha	0,05				

Notes: i. The model is estimated jointly using Maximum Likelihood.
ii. * Multiplicatif= 1 / exponential (Estimate).
iii. The reference age group is the 56-63. Those are females ages at t (1998). The reference region is Cairo/Alexandria. The reference educational level is Illiterate/Read and write.
Source: Constructed by the author using the panel sample from the ELMPS of 1998 and 2006 and, the retrospective informations of 1990.

Table 8: Multinomial logit estimates for males: Model 1

	Coefficient	Std. Error	t Value	Prob>t
Y (Inactivity is the reference)				
State 1: Public Sector				
Marital status at t	.6865247	.1667505	4.12	0.000
Age 24-35 at t	4.106652	.2147171	19.13	0.000
Age 36-45 at t	3.07779	.1734512	17.74	0.000
Age 46-55 at t	2.572356	.1588683	16.19	0.000
Educ2: LessInterm.	.3870748	.1575882	2.46	0.014
Educ3: Intermediate	.70912	.1547209	4.58	0.000
Educ4: AboveInterm.	1.21199	.2385087	5.08	0.000
Educ5: UniversityAbove	1.398339	.1693215	8.26	0.000
Urban	.4262583	.1278202	3.33	0.001
Rural	.5875358	.1394744	4.21	0.000
Father Educ2: LessInterm.	.0432063	.1873007	0.23	0.818
Father Educ3: Intermediate	-.0266561	.209664	-0.13	0.899
Father Educ4: AboveInterm.	.4316358	.4615697	0.94	0.350
Father Educ5: UniversityAbove	.5061406	.3373347	1.50	0.134
lagged Y 11: State dependence	4.603138	.1847626	24.91	0.000
lagged Y 21: Transition from 2 to 1	.6131912	.1683625	3.64	0.000
constant	-5.635157	.2696764	-20.90	0.000
State 2: Private Sector				
Marital status at t	.3981526	.1329309	3.00	0.003
Age 24-35 at t	2.533887	.1524699	16.62	0.000
Age 36-45 at t	1.465544	.1230752	11.91	0.000
Age 46-55 at t	1.237457	.1214065	10.19	0.000
Educ2: LessInterm.	-.0040079	.1201953	-0.03	0.973
Educ3: Intermediate	-.0225712	.1295721	-0.17	0.862
Educ4: AboveInterm.	-.0158739	.2185089	-0.07	0.942
Educ5: UniversityAbove	-.1106976	.1522561	-0.73	0.467
Urban	.1095484	.1069122	1.02	0.306
Rural	.0333579	.111521	0.30	0.765
Father Educ2: LessInterm.	.1932899	.1616885	1.20	0.232
Father Educ3: Intermediate	-.0324139	.1884584	-0.17	0.863
Father Educ4: AboveInterm.	.3706839	.4414209	0.84	0.401
Father Educ5: UniversityAbove	.5861629	.3098792	1.89	0.059
lagged Y 12: Transition from 1 to 2	.1712948	.1666856	1.03	0.304
lagged Y 22: State dependence	2.419893	.1137564	21.27	0.000
constant	-2.085249	.1799603	-11.59	0.000
N	6312			
Pseudo R2	0.4887			
LR chi2(32)	6332.87			
Prob > chi2	0.0000			

Notes: i. These are the results of the Multinomial Logit estimation.
ii. The reference age group is the 56-63. Those are males ages at t (1998). The reference for regions is Cairo/Alexandria. The reference educational level is Illiterate/ Read and write.
Source: Constructed by the author using the panel sample from the ELMPS of 1998 and 2006 and, the retrospective informations of 1990.

Table 9: Multinomial logit estimates for males: Model 2

	Coefficient	Std. Error	t Value	Prob>t
Y (Inactivity is the reference)				
State 1: Public Sector				
Marital status at t	-.4174076	.1551129	-2.69	0.007
Age 36-45 at t	1.182315	.1466862	8.06	0.000
Age 46-55 at t	.9964985	.1504237	6.62	0.000
Age 56-63 at t	-.5435463	.1542788	-3.52	0.000
Educ2: LessInterm.	.6077143	.1470298	4.13	0.000
Educ3: Intermediate	1.220086	.143663	8.49	0.000
Educ4: AboveInterm.	1.66861	.222302	7.51	0.000
Educ5: UniversityAbove	1.663799	.1591162	10.46	0.000
Urban	.5517552	.1195969	4.61	0.000
Rural	.8693391	.1290189	6.74	0.000
Father Educ2: LessInterm.	.1141863	.1734907	0.66	0.510
Father Educ3: Intermediate	.0710356	.1997332	0.36	0.722
Father Educ4: AboveInterm.	.6239353	.4437183	1.41	0.160
Father Educ5: UniversityAbove	.4909304	.3168062	1.55	0.121
lagged Y 11: State dependence	3.234876	.1386472	23.33	0.000
lagged Y 21: Transition from 2 to 1	.0227465	.1552333	0.15	0.884
constant	-2.431382	.1881049	-12.93	0.000
State 2: Private Sector				
Marital status at t	-.3163936	.1206441	-2.62	0.009
Age 36-45 at t	.2452997	.1215518	2.02	0.044
Age 46-55 at t	.1460001	.1260113	1.16	0.247
Age 56-63 at t	-.9037189	.1263618	-7.15	0.000
Educ2: LessInterm.	.1982149	.1149886	1.72	0.085
Educ3: Intermediate	.3577741	.122378	2.92	0.003
Educ4: AboveInterm.	.2870892	.2093277	1.37	0.170
Educ5: UniversityAbove	.1255438	.1464791	0.86	0.391
Urban	.226954	.1022451	2.22	0.026
Rural	.2329098	.1064924	2.19	0.029
Father Educ2: LessInterm.	.2072224	.1535161	1.35	0.177
Father Educ3: Intermediate	.0122412	.1819755	0.07	0.946
Father Educ4: AboveInterm.	.479321	.4249441	1.13	0.259
Father Educ5: UniversityAbove	.556491	.2999719	1.86	0.064
lagged Y 12: Transition from 1 to 2	-.543345	.1549101	-3.51	0.000
lagged Y 22: State dependence	2.176209	.1047164	20.78	0.000
constant	-.2369581	.1428738	-1.66	0.097
N	6312			
Pseudo R2	0.4470			
LR chi2(32)	5791.43			
Prob > chi2	0.0000			

Notes: i. These are the results of the Multinomial Logit estimation.
ii. The reference age group is the 24-35. Those are males ages at t (1998). The reference for regions is Cairo/Alexandria. The reference educational level is Illiterate/ Read and write.
Source: Constructed by the author using the panel sample from the ELMPS of 1998 and 2006 and, the retrospective informations of 1990.

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