Within Resource Allocation in Egyptian Couples: Do Distribution Factors Matter? *

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Abstract

We estimate a discrete-choice model for female labor supply within a collective framework. The economic model incorporates the possibility of non-participation for females. This represents in fact the working situation of a relatively high proportion of females and specifically married ones since we rely on Egyptian micro data. Alternative women empowerment measures "distribution factors" are tested here. The latest are factors that are quite original to the Egyptian case. They are related to the marriage market, the domestic violence and decision making patterns within households. Preliminary results affirm that most of those bargaining power measures are significantly related to the females' participation decision in the labor market. Our study's policy relevant consists on promoting females bargaining power within the household in order to improve their status in the labor market.

JEL classification: D12, J16, J22

Keywords: Collective models, Distribution factors, Intra household allocations, Identification, Egypt.

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1 Introduction

The standard and basic 'Unitary' approach considers the household as a single decision making unit. That unitary framework is also called 'inefficient household modeling' since the income pooling assumption has largely been rejected by many researchers (Thomas, 1990; Sofer, 1999; Lundberg et al., 1997; Fortin and Lacroix, 1997; Duflo, 2003). Moreover, the latter approach cannot allow for intra-household allocation studies since it completely overlooks all kinds of multi sources of power that could exist between members of a same household. For those reasons, a growing literature on collective models, introduced by Chiappori (1988, 1992) and Apps and Rees (1988), has been progressively applied in microeconomic literature in order to profoundly study intra- household allocations with regards to the plurality of decision makers within the household. Taking those characteristics into account seems necessary in order to better understands of modern households relying on the Pareto- efficiency of the intra- family's decisions (Chiappori, 1988, 1992; Browning and Chiappori, 1998; Dauphin and Fortin, 2001; Vermeulen, 2002a; Chiappori and Ekeland, 2002a; Donni, 2004). In addition to that, testable implications of the collective approach turn out to be less restrictive than those of the unitary one.

The present study aims to estimate an econometrically identifiable collective model of labor supply which incorporates the possibility of non-participation for females. Blundell et al. (2001) also estimated a model introducing both non participation and unobserved heterogeneity. And, other studies (Donni, 2003 and Vermeulen, 2006) considered taxation to their model. But, the novelty of our research is first that we test, for the first time to our best knowledge, the validity of the household collective modeling not only on Egyptian data but on Arab countries data in general aiming to better understand within household allocations in these societies. For this, we test new distribution factors that seem to be original to the Egyptian context. The maim idea here is then to find out factors that would significantly influence the female's bargaining power within her own household. Though, our model suffers from the non incorporation of neither tax schemes nor domestic activities.

In the empirical work, both married females' preferences and their share of total household consumption are completely identified by assuming that their preferences

are egoistic and that only some of their preference parameters are identical to those of single women.

The outline of the paper is as follows: Section 2 presents the collective model framework and the identification procedure. Section 3 discusses the data and our sample selection. Section 4 is devoted to the empirical results. And, section 5 concludes.

2 The Economic Model

2.1 Theoretical Framework

Following Vermeulen (2006), we consider households consisting of two working age individuals; the female and the male (f and m). Males labor supplies are considered to be exogenous and fixed to full time; which is clearly supported by our data since all males in our sample are working around 48 hours per week. Furthermore, the model assumes egoistic preferences. This implies that individuals have preferences only over their own consumption and own leisure (see Chiappori; 1998). As a result, the female's direct utility function can be represented as,

$$u^f = v^f(c^f, l^f, d^f) \tag{1}$$

where c^f is the female's private consumption, l^f is the female's leisure encompassing the female's domestic production and d^f consists on a vector of individual characteristics as the age, the education level and the region of residence. Individuals consumptions, for singles as for married, cannot go beyond the household's gross income; which is the sum of the wage rate and the household non labor income. Budget constraints can then be represented as,

for married females:

$$c^f + c^m \leq Y + w^f l^f + w^m l^m \equiv x \tag{2}$$

for single females:

$$c^f \leq Y + w^f l^f \tag{3}$$

where Y is the household's non labor income, w^f denotes the hourly wage rate of the individual i, l^f is the individual i's labor supply, and c^f represents the individual's private consumption. And, since w^f, l^f and Y are observed, the individual's consumption can simply be calculated for single women. However, for females in couples, only the household consumption $(c^f + c^m)$ can be obtained.

One main reason for calling collective models "efficient models" is that they rely on the famous Pareto efficient intra household allocation's assumption (see Chiappori; 1988, 1992). This is considered as the result of a two stage budgeting process. The first stage consists on distributing the total household expenditure among members of the same household. And, in a second stage, they maximize their utilities subject to the individual budget constraints resulted from the first stage. Hence, this process leads to the following maximization problem,

$$max_{c^f l^f} v^f(c^f, l^f, d^f) \tag{4}$$

subject to:

$$c^f \leq \phi(x, z) \tag{5}$$

where $\phi(.)$ is called "the sharing rule function". It represents the part of the total household expenditure that goes to the woman. And, it directly depends on individual wages, household's non labor income and a vector z of "distribution factors". The latter are factors that directly influence the individual's bargaining outcome without affecting neither the individual's utility function nor the household budget constraint.

In the empirical exercise, we estimate a discrete choice model where the females' labor supply is modeled as a discrete choice between J alternatives; see e.g. Train (2003). Four choices are considered here: Voluntarily unemployed with $l^f = 0$; Employed "part time" with $l^f \in]0, 25]$; Employed "full time" with $l^f \in]25, 35]$ and

over employed with $l^f > 35$. Note that non-participant females' hourly wages are estimated using the Heckman's two-steps procedure (see Appendix B).

Regarding the estimation methodology, we first opt for a random utility model (a conditional logit model) in order to compare the different utility levels associated with each of the labor supply alternatives and then choose the one that yields the highest utility. The utility of alternative j for the individual i can then be represented as,

$$u_{ij}^f = v^f(c_{ij}^f, l_{ij}^f, d_i^f) + \varepsilon_{ij} \tag{6}$$

In other words, the individual i chooses the alternative j only if his utility u_{ij}^f is the maximum among the J alternatives. Hence, the statistical model is driven by the probability that the choice j is made (Greene, 2003),

$$Prob(u_{ij} > u_{ik}) for j \neq k$$

As showed in Equation (6), the females' utility function depends not only on factors that varies across the alternatives as c_{ij}^f and l_{ij}^f but also on individuals specific variables as d_i^f that do not vary across the alternatives J. Accordingly, the model has to allow for individual specific effects. And, one way to do so is to introduce a variable for the choices and to multiply it by this individual specific vector d_i^f in order to allow the coefficient to vary not only across the individuals but also across the alternatives (see Greene, 2003).The individual's utility can then be written as,

$$u_{ij}^f = \beta_l d_i^f l_{ij}^f + \beta_{ll} d_i^f l_{ij}^{f^2} + \beta_c c_{ij}^f + \beta_{cl} l_{ij}^f c_{ij}^f + \varepsilon_{ij} \tag{7}$$

where ε_{ij} represents the error term that are assumed to be independent and identically distributed following the IIA assumption,

$$F(\varepsilon_{ij}) = exp(-e^{-\varepsilon_{ij}}) \tag{8}$$

In a second stage in this paper, this IIA assumption is relaxed in order to allow for effect heterogeneity. As a result, individual heterogeneity is introduced to the

model via the following demographic characteristics' coefficients: $\beta_{ll}(d_i^f)$ and $\beta_l(d_i^f)$,

$$\beta_{ll}(d_i^f) = \beta_{ll0} + \beta_{ll1}^{'} d_i^f + \nu_{lli} \tag{9}$$

$$\beta_l(d_i^f) = \beta_{l0} + \beta_{l1}^{'} d_i^f + \nu_{li} \tag{10}$$

where the error terms are distributed as follows:

$$\begin{pmatrix} \nu_{lli} \\ \nu_{li} \end{pmatrix} \approx N(0, \Sigma)$$

with

$$\Sigma = \begin{pmatrix} \sigma_{\nu ll}^2 & \rho \\ \rho & \sigma_{\nu l}^2 \end{pmatrix} \approx N(0, \Sigma)$$

Which are additional parameters to be estimated using a random coefficient model (mixed logit model). As represented above, individual levels of consumption c_{ij}^f can be calculated for single females. But, for married females, we can only observe their household consumptions. Though, we know that the private consumption of the latter group is also the share of the total household consumption x that is allocated to them via the sharing rule as represented bellow,

$$c_{ij}^f = \phi(x_{ij}, z_i) \tag{11}$$

This implies that the sharing rule can be re written as,

$$\phi(x_{ij}, z_i) = (1 + \kappa_1 + \kappa_2 z_i) x_{ij} \tag{12}$$

where κ_1 and κ_1 represent the sharing rule parameters to be estimated.

2.2 Identification Procedure

The model aims to identify the sharing rule of married females using preferences of single ones. This identification procedure has already been applied in many previous studies. Bamby and Smith (2001) assumed that preferences of individuals in couples are similar to those of singles. However, in the present study as in Ver-

meulen (2006), this assumption is relaxed to allow for leisure coefficients (and hence marginal rates of substitution) to differ from married to single females. Then, only coefficients on consumption terms are the same for both groups. The latter assumption permits to the domestic production to be considered as a part of the female's leisure.

Since our identification procedure consists on using the difference in parameters between single and married females in order to infer something about the sharing rule, we can introduce a dummy term s_i and denote $s_i = s_i^*$ if the female i is married. Thus, by substituting Equation (9) in Equation (8) we can obtain the following budget constraints,

for married females:

$$c_{ij}^f = (1 + \kappa_1 + \kappa_2 z_i) x_{ij} \tag{13}$$

for single females:

$$c_{ij}^f = x_{ij} \tag{14}$$

We then plug equation (10) into the utility function to obtain,

$$\begin{aligned} u_{ij}^f &= \beta_l d_i^f l_{ij}^f + \beta_{ll} d_i^f l_{ij}^{f^2} + \beta_c (1 + \kappa_1 + \kappa_2 z_i) x_{ij} \\ &\quad + \beta_{cl} l_{ij}^f (1 + \kappa_1 + \kappa_2 z_i) x_{ij} + \varepsilon_{ij} \end{aligned} \tag{15}$$

which can be re-written separately for married and single females.

for married females: $s_i = s_i^* = 1$

$$\begin{aligned} u_{ij}^f &= \beta_l d_i^f l_{ij}^f + \beta_{ll} d_i^f l_{ij}^{f^2} + [\beta_c x_{ij} + \beta_{c1}^* s_i^* x_{ij}] \\ &\quad + [\beta_{cl} l_{ij}^f x_{ij} + \beta_{cl1}^* s_i^* l_{ij}^f x_{ij} + \beta_{cl2}^* z_i l_{ij}^f x_{ij}] + \varepsilon_{ij} \end{aligned} \tag{16}$$

for single females: $s_i = 0$

$$u_{ij}^f = \beta_l d_i^f l_{ij}^f + \beta_{ll} d_i^f l_{ij}^{f^2} + \beta_c x_{ij} + \beta_{cl} l_{ij}^f x_{ij} + \varepsilon_{ij} \tag{17}$$

From those equations, we can observe that single and married females may react differently in their labor supply to household consumption x_{ij} as to the interaction term $l_{ij}^f x_{ij}$. The parameters for singles are called β_c; β_{cl} but, those for married women are $\beta_{c1}^* = \beta_c \times \kappa_1$; $\beta_{cl1}^* = \beta_{cl} \times \kappa_1$. In other words, β_{c1}^* represents the difference between how married and single females value a unit of household expenditure. And, since κ_1 should be the same regardless of whether it is calculated via x_{ij} or $l_{ij}^f x_{ij}$, we need to impose the following restrictions:

$$\kappa_1 = \frac{\beta_{cl1}^*}{\beta_{cl}} = \frac{\beta_{c1}^*}{\beta_c}, \tag{18}$$

And,

$$\kappa_2 = \frac{\beta_{cl2}^*}{\beta_{c2}} = \frac{\beta_{c2}^*}{\beta_c}, \tag{19}$$

Finally, while we can easily identify different reactions of single and married females to household consumption, the actual twist of the collective model would be to make use of that information to infer something about the sharing rule. For this, we rely on the idea that married women value less each unit of household consumption since they only get a share of it for their own private consumption. And, how much they value it less is used to identify the sharing rule given the two following additional assumptions:

- Women care only about private consumption and not household consumption;
- Household consumption is split up into two private consumptions.

Moreover, as in the unitary framework, the collective model implies some restrictions on the utility function: the quasi-concavity, monotonically increasing in consumption c^f and monotonically decreasing in labor supply l^f.

3 The Data

3.1 Data Description: ELMPS 2006

Data used in this study are obtained from the Egyptian Labor Market and panel Survey (ELMPS 2006). The latter is a nationally-representative household survey that consists of a total of 8, 349 households distributed as follows: A total of 3, 684 households followed since the 1998 ELMS, 2, 176 new households that split from these households and 2,498 households that were included in order to ensure that the data continue to be nationally-representative after the split of some household that were present in 1998. The 2006 ELMPS questionnaire (Barssoum, 2007) is composed of three main sections: A first section is called "the household questionnaire". The latter contains information on basic demographic characteristics of household members, movement of household members in and out of the household since 1998, ownership of durable goods and assets, and housing conditions. The second section consists on the individual questionnaire that is administered to the individual him or herself. It contains information on parental background, detailed education histories, activity status, job search and unemployment, detailed employment characteristics, a module on women's work, migration histories, job histories, time use, earnings and fertility. Also, a new critical module has been added to the questionnaire in order to allow a more profound study of marriage dynamics in Egypt. The latter contains detailed information on costs of marriage and costs of divorce. And finally, the questionnaire contains a household enterprise and income module that elicits information on all agricultural and non-agricultural enterprises operated by the household as well as all income sources, including remittances and transfers.

3.2 Sample Selection

Two samples are selected for the empirical exercise. The first one consists on married women aged from 16 to 55 years old. And, all males are assumed to be working full time. Students, self employed, unvoluntarily unemployed, couples with a child aged less than 7 and (pre) retired are excluded from the dataset. Females' breadwinners are also excluded here because those women don't work to achieve self

dependence but they are rather enforced due to economic reasons and led to role conflicting (Nassar, 2002). Our second sample study consists on single females that are selected subject to the same sample selection of married females. The sample sizes are 1, 492 and 1, 257 for married and singles respectively. All females can be employed due to the market definition of employment or voluntarily unemployed. Note that employed females can be paid in monetary (for wage employees) or in kind (for unpaid family workers)which represents 28.70 percent of the whole working sample. The sample study is characterized by a high proportion of females non-participation that reach 71.30 percent. And, 93.24 percent of the latter declare not desiring and not ready to work during the reference period. Moreover, those non-participant females' real hourly wages are estimated by means of Heckman's two-step estimation procedure to correct for the selectivity bias.

As represented in table 1, five dummies for education are used in the empirical work. The first dummy represents all females that have never been to school (which represents 24.27 percent of all females). And, the resting 75.73 percent have already been to school in the past and are represented by the four other education dummies. We also properly separate between females enrolled in vocational and general education. The proportions are of 41 and 59 percent respectively. Moreover, we observe that women in couples are, in mean, older than single women. And, we use this information to explain how both groups care about expenditure and leisure. We also find out surprisingly that, in mean, gross wage rates of married females are higher than those of both married males and single females. However, they work less hours, in mean, than these two other groups.

Concerning distribution factors, our data allows us to test new direct measures of married females bargaining power. Contrary to Chiappori et al. (2002), the sex ratio does not seem to be a convenient distribution factor for a developing country as Egypt. And, for that specific reason, we try to find out the main sources of females' power in Arab countries in general and specifically in Egypt. Various factors are tested here. First are factors related the marriage market as the female's contribution to total costs of marriage (see Roushdy, 2004) and the "moakhar" which represents the amount of money that the male will have to pay to his wife in case of divorce. Amin and Al-Bassusi (2003) showed that the average marriage costs in

Table 1: Descriptive statistics (working sample)

	Married couples		Single Females	
Variables	Mean	Std. der.	Mean	Std. der.
Dummy for female labour market participation	0.21	0.41	0.37	0.48
Dummy for male labour market participation	1	0		
Dummy 1 for schooling (female)	0.22	0.41	0.27	0.44
Dummy 2 for schooling (female)	0.25	0.43	0.26	0.44
Dummy 3 for schooling (female)	0.02	0.14	0.01	0.11
Dummy 4 for schooling (female)	0.31	0.46	0.28	0.45
Dummy 5 for schooling (female)	0.20	0.40	0.18	0.39
Dummy 1 for schooling (male)	0.14	0.35		
Dummy 2 for schooling (male)	0.34	0.47		
Dummy 3 for schooling (male)	0.02	0.14		
Dummy 4 for schooling (male)	0.26	0.44		
Dummy 5 for schooling (male)	0.22	0.42		
Dummy 1 for region	0.23	0.42	0.16	0 .37
Dummy 2 for region	0.18	0.39	0.14	0.34
Dummy 3 for region	0.24	0.43	0.29	0.45
Dummy 4 for region	0.34	0.47	0.41	0.49
Age (female)	34.85	10.037	30.74	12.48
Age (male)	39.94	10.50		
Number of years of experience (female)	12.79	9.89	7.93	8.39
Number of years of experience (male)	13.59	9.59		
Hourly gross wage rate (female)	5.18	35.07	2.41	7.02
Hourly gross wage rate (male)	2.14	6.04		
Contractual working hours per week (female)	40.86	12.24	45.29	15.07
Contractual working hours per week (male)	60.07	12.22		
Weekly consumption- based non labor income	13.78	68.25	60.03	98.36

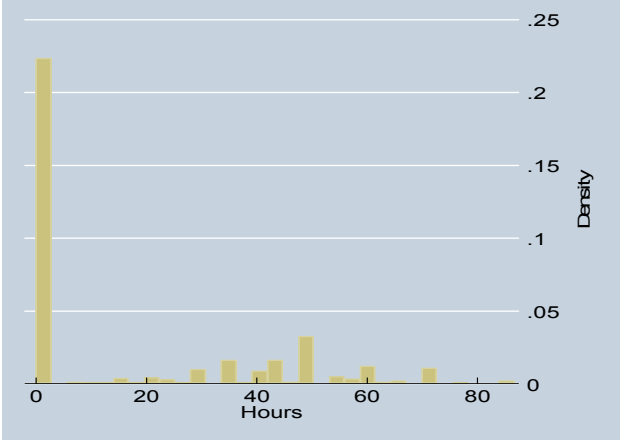
Source: Constructed by the author using the ELMPS 2006, Notes: Dummy for labor market participation: 1= working, Dummy 1 for schooling: 1= Never gone to school, Dummy 2 for schooling: 1= Primary/ Preparatory, Dummy 3 for schooling: 1= General Secondary, Dummy 4 for schooling: 1= 3-5 years of Technical secondary, Dummy 5 for schooling: 1=Above intermediate/ University stages, Dummy 1 for region: 1= Cairo, Dummy 2 for region: 1= Alexandria & Suez Canal, Dummy 3 for region: 1=Urban areas in lower & upper Egypt, Dummy 4 for region: 1= Rural areas in lower & upper Egypt.

Egypt are substantially higher relatively to the rest of the Arab world. In addition to that, the girl's "gehaz" or trousseau is ritualized to make its content public knowledge to benefit the bride by displaying her family's wealth, presumably to enhance her status within her new marital family. The assumption is then that the more assets she brings to her new household, the better will be her bargaining position. Concerning the moakhar, this value is determined before the marriage takes place which assure its exogeneity. Furthermore, we test variables that could mostly be

considered as measures of the female's capacity within her own family. Examples of such variables are: the female's participation in the decision making process, her access to the household financial resources, her mobility and domestic violence against her.

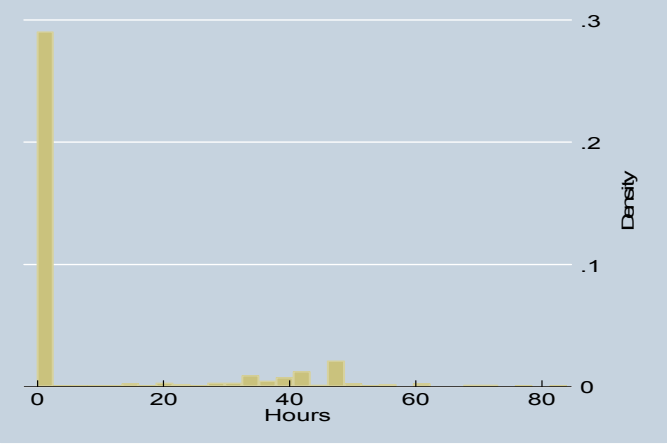
Histograms on weekly contractual hours per week for married couples and single females are represented in Figures 1, 2 and 3. As is observed in Figure 1 and 2, an important proportion of females do not participate in the labor market. But, married females seem to be more concerned by this inactivity situation. In Figure 3, we can observe that all males in our sample are working ≥ 48 hours per week which verify our previous assumption regarding full time jobs for men. Note that the working hours represented here are the sum of hours spent in both primary and secondary jobs.

Figure 1:
Working hours per week for single females



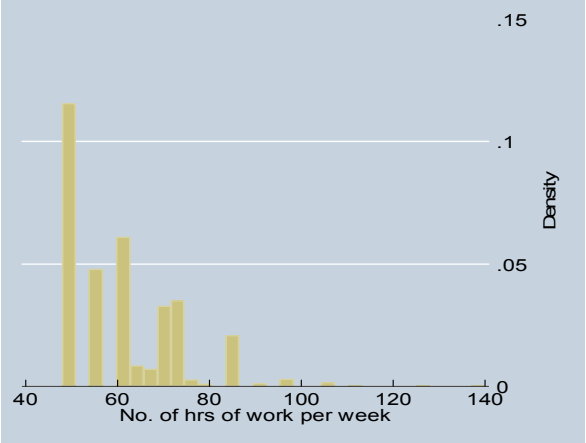
Source: Constructed by the authors using the ELMPS 2006.
Note: This graph represents working hours per week due to the standard market definition of employment.

Figure 2:
Working hours per week for married females



Source: Constructed by the authors using the ELMPS 2006.
Note: This graph represents working hours per week due to the standard market definition of employment.

Figure 3:
Working hours per week for married males



Source: Constructed by the authors using the ELMPS 2006.
Note: This graph represents working hours per week due to the standard market definition of employment.

4 Empirical Results

4.1 Preliminary Results

Tables 2, 3, 4 and 5 represent some preliminary results. Those are results of a generalized method of moments (GMM) which tests the effect of our distribution factors on the participation decisions of married females. In other words, the dependent variable here is a dummy for participation in the labor market. And, in the latter estimations, the females and males labor incomes are instruments by a vector of demographic variables that characterize both the individual and the household.

Table 2 shows the existence of a significantly positive relationship between the level of female's participation in the household's decision making and her participation in market work. Note that it is specifically her participation regarding decisions related to herself as: Buying clothes for herself, Getting medical treatment or advice for herself and her visits to family, friends or relatives that are the most significant. Moreover, if the female have savings, own land, house, jewelry, or other valuables which she can sell or use as she pleases; this increases her participation in market work. Thus, we can assume those factors directly affect the female's bargaining power within her family. And, in consequence, they influence the female's participation in the labor market.

In tables 3 and 4, we can also observe the significant effect of female's mobility, violence and opinions towards gender roles on her market participation. Note that the positive relationship between the violence variable and female's participation can be explained by the female's strength of will to be on the labor market in order to avoid the spouse's domestic violence against her. Likewise, regarding gender role attitudes variables, table 3 shows that the more the female is convinced that (1) A womanŠs place is not only in the household but she should be allowed to work, (2) If the wife has a job outside the house then the husband should help her with the children, (3) If the wife has a job outside the house then the husband should help her in household chores, (4) For a womanŠs financial autonomy, she must work and have earnings and (5) Women should continue to occupy leadership positions in society; this implies the increase of her participation in market activities.

Table 5 shows the influence of marriage market variables on females partici-

pation. First, we can observe a positive and significant relationship between the female's contribution to costs of marriage and her involvement in market activities. This verifies our assumption presented above: The more the women and her family contribute to the to total costs of marriage and the more she has power in her own household.

Then, preliminary results reveal that distribution factors tested here, and for the first time in the collective model literature, can be considered as good measures of Egyptian females bargaining.

Table 2: Labor supply of married women

Women Status Variables	**-1**	**-2**	**-3**	**-4**	**-5**	**-6**	**-7**	**-8**
Decision making (1)	0,924							
Decision making (2)		1,152						
Decision making (3)			**1.847***					
Decision making (4)				**2.227***				
Decision making (5)					**2.468****			
Decision making (6)						**2.278****		
Access to financial resources (1)							0,934	
Access to financial resources (2)								**2.358****
household size	-0,407	-0,345	-0,341	-0,318	-0,356	-0,348	-0,388	-0,37
female's hourly wage (instrumented)	2.644***	2.748***	2.687***	2.715***	2.693***	2.673***	2.702***	2.633***
Male's hourly wage (instrumented)	-0,0545	-0,0628	-0,0759	-0,0828	-0,0839	-0,0777	-0,0689	-0,0645
female's age	1.933***	1.863***	1.844***	1.861***	1.834***	1.853***	1.884***	1.967***
female's age squared	-0.0259***	-0.0250***	-0.0248***	-0.0249***	-0.0246***	-0.0248***	-0.0252***	-0.0262***
Male's age	-1.455**	-1.500**	-1.441**	-1.539**	-1.478**	-1.505**	-1.442**	-1.383**
Male's age squared	0.0161**	0.0167**	0.0161**	0.0171**	0.0165**	0.0169**	0.0159**	0.0151*
Alexandria	-2,114	-1,938	-2,086	-2,133	-2,094	-2,209	-2,127	-2,142
Urban regions	-13.87***	-13.87***	-13.96***	-14.04***	-13.82***	-13.99***	-13.99***	-14.29***
Rural regions	-24.78***	-24.76***	-24.82***	-24.90***	-24.53***	-24.82***	-24.88***	-25.11***
Wealth index	0,753	0,769	0,766	0,799	0,792	0,748	0,75	0,56
Constant	28.41**	29.51**	28.24**	29.31**	28.41**	28.99**	28.68**	26.68*
Observations	**1938**	**1938**	**1938**	**1938**	**1938**	**1938**	**1938**	**1938**

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3: Labor supply of married women

Women Status Variables	**-9**	**-10**	**-11**	**-12**	**-13**	**-14**	**-15**	**-16**	**-17**
Mobility (1)	-0,106								
Mobility (2)		**-1.990***							
Mobility (3)			0,91						
Violence (1)				**3.694*** **					
Violence (2)					1,055				
Violence (3)						-0,391			
Violence (4)							-1,663		
Violence (5)								-0,539	
Fear of men in the hh									1,515
household size	-0,392	-0,38	-0,362	-0,401	-0,419	-0,38	-0,349	-0,378	-0,428
female's hourly wage (instrumented)	2.741***	2.775***	2.716***	2.772***	2.771***	2.727***	2.714***	2.735***	2.732***
Male's hourly wage (instrumented)	-0,0829	-0,1	-0,087	-0,032	-0,0713	-0,093	-0,106	-0,0872	-0,0869
female's age	1.873***	1.906***	1.787***	1.878***	2.000***	1.873***	1.836***	1.857***	1.935***
female's age squared	-0.025***	-0.025***	-0.0236**	-0.025***	-0.027***	-0.0250***	-0.024***	-0.0248***	-0.0259***
Male's age	-1.462**	-1.465**	-1.526**	-1.480**	-1.361**	-1.467**	-1.511**	-1.457**	-1.484**
Male's age squared	0.016**	0.016**	0.0169**	0.016**	0.0150*	0.016**	0.0167**	0.016**	0.0165**
Alexandria	-2,059	-2,111	-2,07	-1,88	-2,09	-2,207	-2,329	-2,153	-2,022
Urban regions	-14.03***	-14.06***	-14.05***	-13.94***	-14.18***	-14.15***	-14.11***	-14.03***	-14.22***
Rural regions	-24.90***	-24.95***	-24.71***	-24.88***	-25.37***	-24.96***	-24.85***	-24.87***	-25.24***
Wealth index	0,811	0,82	0,933	0,839	0,686	0,823	0,831	0,794	0,855
Constant	29.73**	29.56**	31.49**	29.41**	26.30*	29.88**	31.32**	29.93**	28.43**
Observations	**1938**	**1938**	**1938**	**1938**	**1938**	**1938**	**1938**	**1938**	**1938**

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 4: Labor supply of married women

Women Status Variables	**-18**	**-19**	**-20**	**-21**	**-22**	**-23**	**-24**	**-25**	**-26**	**-27**
Gender role attitudes (1)	**3.289*** **									
Gender role attitudes (2)		**1.927** **								
Gender role attitudes (3)			**3.501*** **							
Gender role attitudes (4)				-0,019						
Gender role attitudes (5)					-3,542					
Gender role attitudes (6)						-1,626				
Gender role attitudes (7)							-0,0873			
Gender role attitudes (8)								**1.781** **		
Gender role attitudes (9)									-0,448	
Gender role attitudes (10)										**4.225*** **
household size	-0,317	-0,324	-0,216	-0,417	-0,259	-0,422	-0,37	-0,381	-0,379	-0,391
female's hourly wage (instrumented)	2.634***	2.636***	2.557***	2.745***	2.665***	2.747***	2.731***	2.611***	2.738***	2.698***
Male's hourly wage (instrumented)	-0,046	-0,101	-0,154	-0,0934	-0,0958	-0,0908	-0,0938	-0,0748	-0,0881	-0,0778
female's age	1.835***	1.802***	1.614***	1.951***	1.677***	1.960***	1.858***	1.911***	1.868***	1.904***
female's age squared	-0.024***	-0.0238***	-0.0209**	-0.0263***	-0.0218**	-0.0264***	-0.0248***	-0.0255***	-0.0250***	-0.0255***
Male's age	-1.475**	-1.498**	-1.669**	-1.368**	-1.582**	-1.389**	-1.455**	-1.384**	-1.475**	-1.474**
Male's age squared	0.016**	0.0166**	0.0187**	0.0151*	0.0176**	0.0153*	0.0161**	0.0152*	0.0164**	0.0164**
Alexandria	-2,183	-2,203	-1,877	-2,188	-1,991	-2,15	-2,113	-2,28	-2,089	-2,13
Urban regions	-14.06***	-14.08***	-13.70***	-14.13***	-13.87***	-14.21***	-14.08***	-14.25***	-14.06***	-14.06***
Rural regions	-24.76***	-24.92***	-23.95***	-25.12***	-24.62***	-25.14***	-25.05***	-25.23***	-24.94***	-24.84***
Wealth index	0,805	0,814	1.083*	0,715	0,954	0,755	0,804	0,724	0,828	0,821
Constant	27.27**	29.88**	33.59**	27.34**	34.10**	28.26**	29.90**	26.81**	30.36**	25.32*
Observations	**1938**	**1938**	**1938**	**1938**	**1938**	**1938**	**1938**	**1938**	**1938**	**1938**

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 5: Labor supply of married women

ăWomen status variables	**-28**	**-29**	**-30**	**-31**	**-32**	**-33**	**-34**
Contribution to costs of marriage (1)	**0.000116****						
Contribution to costs of marriage (2)		**0.000291***					
Contribution to costs of marriage (3)			0,00347				
Contribution to costs of marriage (4)				-0,0703			
Contribution to costs of marriage (5)					-0,0221		
Contribution to costs of marriage (6)						-0,0242	
Contribution to costs of marriage (7)							-0,0362
Household size	-1.062***	-1.081***	-0.914***	-0.912***	-0.914***	-0.919***	-0.915***
female's hourly wage (instrumented)	4.113***	3.769***	3.771***	3.774***	3.765***	3.769***	3.753***
Male's hourly wage (instrumented)	0,215	0,327	0,0535	0,0586	0,0546	0,0559	0,0533
female's age	2.390***	2.722***	2.193***	2.220***	2.200***	2.204***	2.198***
female's age squared	-0.0341***	-0.0397***	-0.0304***	-0.0307***	-0.0304***	-0.0305***	-0.0304***
Male's age	-0,816	0,823	-0,968	-1.002*	-0,976	-0,978	-0,978
Male's age squared	0,00902	0,00942	0,0104	0,0108	0,0104	0,0105	0,0104
Alexandria	0,253	-0,779	-2,007	-1,82	-2,016	-1,87	-1,953
Urban regions	-10.84***	-11.89***	-12.63***	-12.79***	-12.92***	-12.68***	-12.86***
Rural regions	-19.43***	-20.47***	-21.89***	-22.03***	-22.29***	-21.92***	-22.21***
Wealth index	-0,538	-0,31	-0,185	-0,179	(0,178)	-0,183	-0,172
Constant	10,1	6,076	17,09	17,42	17.55*	17,16	17.54*
Observations	**1717**	**1361**	**1840**	**1840**	**1840**	**1840**	**1840**

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

4.2 Estimates of the discrete-choice model of labor supply

Results of the random coefficients model, the random utility model and the sharing rule are still in progress.

5 Conclusion and Policy implication

We estimate a discrete-choice model for female labor supply that is cast in the collective setting (Vermeulen, 2006). The novelty of the present research is that, for the first time to our best knowledge, the collective framework is applied on Egyptian micro data in order to analyze intra-household resource allocations. Both Married females' preferences and the sharing rule are completely identified by assuming that some preferences coefficients of the married women are the same as single but leisure coefficients are allowed to differ between the two groups. And, we use this difference in parameters between single and married females to infer something about the sharing rule.

The main objective of this study is to test new distribution factors that are original to the Egyptian context. Preliminary results affirm that the latter influence significantly the female's bargaining power since it affects her participation decisions. More delicate empirical results (in progress) would give a more detailed information about the sharing rule and verify the validity of collective models for the case of Egypt.

6 Appendix A: Descriptive Statistics (Working Sample)

Table 6: Percentages of females in each labor supply alternative by marital status

	Single females	**Married females**
Discrete variable for labor supply		
Not Participating	62.53	78.69
Part time	3.66	2.41
Full time	4.77	3.82
> 35 hrs/week	29.04	15.08
Total	100	100

Source: Constructed by the authors using the ELMPS 2006

In table 3, we observe that the voluntarily unemployment rate is largely higher for married females relatively to single females. On the other side, 29.04 percent of single women are working more than 35 hours per week. One explanation is that Single females work mainly to save money for marriage and once they get married they usually stop working (see e.g. Amin & Al-Bassisi, 2003).

Table 7: Proportions of females in each labor supply alternative by education status

	Never been to school	**Have been to school in the past**	**Total**
Discrete variable for labor supply			
Not Participants	78.56	68.96	71.29
Part time	4.35	2.55	2.98
Full time	6.45	3.56	4.26
> 35 hrs/week	10.64	24.94	21.47
Total	100	100	100

Source: Constructed by the authors using the ELMPS 2006

As represented in table 4, 71.29 percent of all females in our working sample are voluntarily unemployed. And more surprisingly, 73.25 percent of females in this group have already been to school (and having primary or technical education). Hence, we observe that the majority of Egyptian females tend to not participate in market work whether they are educated or not. We can then predict that a similar reality could have negative effects on females' incentives to education.

7 Appendix B: Variables Definition

- **Market definition of employment:**

  This definition considers all persons who furnish the supply of labor for the production of economic goods and services whether for the market or for barter.

- **Household non-labor income:**

  It takes into account transfers (Y1), income from household pensions and assistances (Y2), and compensations (Y3). We have not included taxes because those are generally means tested and directly depending on the labor supply choices. Our empirical approach ignores then the tax and redistribution system. The term Y1 includes all types of transfers that other members living abroad send to their families and sums received from other households. The term Y2 includes retirement pensions, Sadat/Mubarak pensions and all types of social assistances. And, the Y3 term contains disability benefits, ill/injury compensations.

- **Gross hourly wages for non-participating females:**

  In order to obtain wages rates for the whole population, including those not working, we estimate wage equations. For this, we tried different methods: Ordinary least squares (OLS) or the two-steps Heckman procedure. However, when applying the second method, a difficulty arises due to selectivity: a participation model would need to be based on the collective framework, which is difficult. To resolve this problem, we followed Lewbel (2000) who proposes an estimation method for the selection model which does not require the specification of the selection mechanism. We also applied OLS and found no significant

differences between the two methods. Then, we relied on the OLS predictions which seem to be more accurate than those based on the Lewbel estimator.

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