Spanish Mothers' Labour Supply and Child Care Demand: A Structural Model

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ABSTRACT

In this paper we present a structural utility discrete choice model to estimate mothers' labour supply and child care demand in Spain. The mothers are assumed to make choices from a finite set of job possibilities and childcare options. Based on data from the Spanish Time Use Survey, we have estimated a mixed logit model. Our results indicate that Spanish mothers show clear preferences for income and pure leisure. Also, in average, mothers present a relative dislike for non-parental modes of care compared to maternal care. Finally, the child's age is a significant source of preference heterogeneity.

1. Introduction

The influence of costs and availability of child care on mothers' employment decisions has long been of interest to both researchers and politicians. In fact, the European Council of Barcelona (March 2002) stated that member States, in order to remove disincentives to female employment, should provide childcare to at least 33% of children under 3 years of age by 2010.

Previous studies have focused primarily on the impact of child care costs on mother's labour force participation (Heckman, 1974; Blau and Hagy, 1988; Powell, 1997). Lately employment and child care type decisions have been modelled jointly (Blau and Hagy, 1998, Powell, 2002,…). More recently, the use of structural utility models has prevailed as the analytical framework (Ribar, 1995, Chone et al., 2003, Kornstad and Thoresen, 2006, Wrohlich, 2006). Interestingly, to date this methodology has not been applied to Spanish data.

In this paper we present a structural utility discrete choice model to estimate mothers' labour supply and child care demand in Spain. The model will be estimated using the Spanish Time-Use Survey data.

The contribution of the paper is twofold. First, it adapts the structural utility methodological framework to the Spanish institutional setting. And second, it contributes empirical findings on the effects of wages and child care costs on child care and employment choices of Spanish mothers.

The rest of the paper is organized as follows. Section 2 provides a brief literature review. Section 3 presents the institutional setting from which Spanish families make their choices and develops the theoretical model. Section 4 outlines the econometric model and estimation procedure issues. Section 5 discusses the data and summary statistics. Section 6 presents empirical results. And finally, Section 7 concludes with a discussion of the interpretation of the results and policy implications.

2. Literature review

Many issues have occupied the attention of scholars and policy makers interested in employment and child care. Some studies have examined the influence of child care prices on labour force participation decisions. Anderson and Levine (1999) summarize the state of the art.[1] These investigations have found that child care costs have a significant negative impact on the mother's labour supply.

A separate set of research has explored the factors affecting parent's choice of type of care. These studies analyse the impact of price, quality and household characteristics on the choice of type of care, assuming that the employment decision is exogenous. Most of them (Hofferth and Wissoker (1992, 1996), Johansen, Liebowitz, and Waite (1996) Hofferth and Chaplin, 1998) confine their analysis to employed mothers.[2] They have found the demand for care, in particular centre care, to be price sensitive.

More recently, Blau and Hagy (1998), Powell (2002) or Davis and Connelly (2005) have modelled child care choices of working and nonworking mothers, accounting for the endogeneity of female labour decisions. The first two papers consider different joint participation-care type choices which are treated as multinomial models, while Davis and Connelly's (2005) paper provides a relatively simple way of accounting for the potential endogeneity of the employment decision by including predicted employment status as a regressor in their demand model.

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[1] The seminal work of Heckman (1974) and several articles such us Blau and Robbins (1988), Ribbar (1995), Powell (1997) or Del Bocca, Locatelli and Vuri (2005) could also be examined.
[2] Hotz and Kilburn (1991) analyse working and nonworking mothers.

Nonetheless, lately, the use of structural utility models has prevailed as the analytical framework. This kind of models considers not only labour participation and care choices, but also selection of hours of work.[3] Except for that of Lokshin (2004), these models (Ribar, 1995, Chone et al. (2003), Kornstad and Thoresen, 2006, Wrohlich, 2006,…) follow a discretized approach, by which families are assumed to make choices from a finite number of combinations of hours of work and care options.

3. Institutional setting and theoretical issues

For the last two decades, Spain has witnessed a progressive accession of women to the labour market. Its female labour participation rates have risen about fifteen percentage points to reach almost 58% in 2004, as shown in table 1. Nevertheless, the figure is still weak compared to that of Northern European countries or United States that show participation rates of 70%, approximately. Female employment levels are also low, around 49%. Moreover, Spanish women have mostly full-time jobs. As table 1 reveals, most part time jobs in Spain are held by women, as in all other countries. However, in Spain, part time employments account for only 8% of total employments, and except for Greece, no other country shows a part time rate lower than that.

TABLE 1. SPANISH WOMEN'S LABOUR MARKET				
Source: OECD Employment Outlook 2005.				
COUNTRY_NAME	Female Labour Participation (2004)	Female Employment (2004)	Part Time Employment (2004)	Female Share of Part Time Employ. (2004)
Belgium	57,7	53,0	18,3	80,6
Denmark	76,1	72,0	17,5	64,5
Finland	72,0	65,5	11,3	63,5
France	63,7	56,9	13,4	80,6
Germany	66,1	59,9	20,1	82,8
Greece	54,1	45,5	6,0	68,6
Ireland	58,0	55,8	18,7	78,8
Italy	50,6	45,2	14,9	76,1
Luxembourg	54,3	50,6	14,6	93,0
Netherlands	69,2	65,7	35,0	76,0
Portugal	67,0	61,7	9,6	67,0
Spain	57,7	49,0	8,3	81,0
Sweden	76,6	71,8	14,4	69,5
United Kingdom	69,6	66,6	24,1	77,8
United States	69,2	65,4	13,2	68,3

Simultaneously, an increase in the demand for non-parental care of preschoolers has taken place. Comparable data is difficult to obtain: mostly, because we wish to compare

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[3] Some also model hours of care. See Lokshin (2004) and Wrolich (2006).

utilization rates for both formal and informal services and also because these rates vary considerably with the age of the child. Table 2 presents information from INECSE (2004), the Spanish Institute for the Evaluation of the Educational System, relative to the proportion of three-year-old children in formal care. It also shows utilization rates of formal or informal care for children of less than 3 years, from the European Community Household Panel of 1998 (González López, 2003).

TABLE 2. PROPORTION OF YOUNG CHILDREN IN NON-PARENTAL CARE.		
Source: INECSE (2004) and González López (2003).		
	Proportion of children in formal care 3-year-old children	Proportion of children in formal or informal care less than 3 years old
Belgium	99,5	63,2
Denmark	77,1	80,7
Finland	34,4	
France	100,0	56,9
Germany	55.1	27,3
Greece		37,5
Ireland	3,0	38,3
Italy	95,2	37,4
Luxembourg	44,5	
Netherlands	0,1	49,4
Portugal	60,5	44,1
Spain	88,3	36,5
Sweden	70,6	63,1
United Kingdom	55,2	41,0

As can be inferred from the second column, the situation for three-year-olds differs a great deal from one country to another. A partial explanation to this can be found in the different education laws. In Spain, at three, children start what is called Infant Education which precedes Primary School. And even if it is not mandatory, public and private schools generally offer this cycle (3 to 5 years). The picture is not the same for children under three. As the third column shows, in 1998, in Spain, as in many other European countries, only 36% of these children was cared for by someone different from their parents. The situation may have changed slightly since then, as our own findings will reveal (table 3), but there remains the lack of an adequate public provision of care services for children under three.

In this paper we will therefore study the employment-childcare options of Spanish families with children from 0 to 3 years old, that is, children not eligible for Infant Education.

Table 3 provides an overview of the distribution of different child-care arrangements in Spain: day care centres, care by relatives, schools and baby-sitters, in this order of importance.

Day care centres are run by firms, local public authorities, private organizations, … Relatively strict regulations apply to child-staff ratio, facilities or staff qualifications. Some centres receive public subsidies which are dependent on the income of the family of the child. For the majority, parental fees are the most important source of financing.

The second care arrangement in order of importance is care by relatives, usually grandparents. This form of care is generally unpaid, but requires able and motivated grandparents living nearby.

Some schools also offer kindergarten services for children under three. Even if this type of care has common features with day care centres, usually hours of care are less flexible.

Finally, still some other families rely on baby-sitting services. As in other European countries, this paid option lacks any source of public control. In fact many carers do not report incomes to the tax authorities and that creates an informal market. In Spain, in many cases, these childminders also do some light housework.

TABLE 3. CHILD-CARE MODE BY EMPLOYMENT STATUS OF MOTHERS (Weighted Percentage)					
	NOT WORKING[4]	PART-TIME	FULL-TIME		TOTAL
PARENTAL CARE	27.81	1.76	0.41		33.68
RELATIVE CARE	6.12	3.73	7.63		17.48
BABY-SITTER	0.79	0.84	5.08		6.70
DAY-CARE CENTRE	9.44	5.85	14.02		29.31
SCHOOL	7.36	1.95	3.52		12.83
TOTAL	51.53	14.13	34.34		100
Source: Spanish Time-Use Survey, INE 2002/2003					

Table 3 also shows the primary child-care mode by mother's employment status. Two features require recognition. First, many children are in non-parental care even if their mothers are not working. About 45% of non-working mothers rely on non-parental care for their youngest children. In fact a non-negligible 36% of all children in child care belong to a non-working mother. This fact has also been mentioned by Del Boca and Vuri (2006) or Wrohlich (2006) and it implies that a model, such as those of Powell (2002) or Lokshin (2004), that does not explicitly allow non-working mothers to purchase childcare, is not appropriate for Spain.

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[4] This category includes unemployed and temporarily absent from work mothers.

And second, not all working mothers use non-parental care. Approximately 1.2% of full-time working mothers and 12.5% of part-time working mothers rely exclusively on parental care. Thus, a model such as that of Kornstad and Thoresen (2006), that assumes a fixed link between hours of work and hours of non-parental care, would not be appropriate for our country either.

Ours is a family decision model that jointly estimates labour supply and childcare demand. Following Blau and Hagy (1998) we make two simplifying assumptions. First, employment decisions of family members other than the mother of the child are taken as given. And second, the family uses only one child care arrangement. These assumptions do not affect the main implications of the analysis.

Furthermore, similar to Kornstad and Thoresen (2006) we argue that mothers' choice of labour supply and childcare can be genuinely treated as a discrete choice problem[5]. In our model, the choice set from which mothers make their choices consists of 15 categories. Apart from non-participation, a mother can choose to work part-time or full-time. For each working-hours category, we consider five modes of care: 1) parental care; 2) care by relatives; 3) baby-sitter services; 4) day-care centre; and 5) pre-schools.[6] It is assumed that families wish to maximize utility. Following Ribar (1995) and Wrohlich(2006)[7], families have preferences over consumption goods/disposable income Y, the quality of care extended to their children, Q, and the mothers' pure leisure time, L. Formally, this direct utility is:

$$U=U(Y,Q,L) \tag{1.}$$

Denote the mother's hours spent working in the market by H. Non-market hours include maternal child care, M and leisure, L. Since a child has to be cared for over the whole day, hours of maternal care, M, hours in other types of care C_2, C_3, C_4, C_5, and hours in informal care, I, must add up to T, which is the total time per week available.

$$T=H+M+L=M+C^2+C^3+C^4+C^5+I \tag{2.}$$

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[5] As Kornstad and Thoresen (2006) state, in many jobs, non-pecuniary features and working hours are given, and, if the worker wants to adjust these attributes, an entirely new job is often required. Similarly, if a family seeks to change hours of non-parental care or to increase its quality, a change of provider is sometimes needed.

[6] We construct the variable considering the primary arrangement, that is, the type of regular non-parental care used for the greatest amount of time. When no such regular non-parental service is recorded, parental care is considered the primary arrangement (Blau and Hagy, 1998).

[7] Our theoretical model relies heavily on Wrohlich's (2006) work.

As Wrohlich (2006), we assume that informal care does not exceed working hours of the mother. In other words, informal care is the residual in the case that working hours of the mother exceed hours of formal care:

$$I = max\ [H-(C^2 + C^3 + C^4 + C^5), 0] \qquad (3.)$$

Child care quality is produced with inputs of maternal child care time, M, non-parental child care time C_2, C_3, C_4, C_5 and informal childcare time, I. Our model implies that quality increases with maternal care and decreases with informal care. In fact we will have to test whether the marginal utility of the paid modes of care is greater than that of unpaid forms of care, informal care included. Otherwise the use of paid modes could not be explained when it is assumed that all households have access to unpaid modes.

$$Q = Q(M,\ C^2,\ C^3,\ C^4,\ C^5,\ I) \qquad (4.)$$

The household budget constraint can be formally written as:

$$Y = N + WH - P_3\ C^3 - P_4\ C^4 - P_5\ C^5 \qquad (5.)$$

where N denotes non-labour income, W is mother's available hourly wage rate and P_j is the cost per hour of child-care service j.

Let the choice variables be H and C^j. Substituting equations (2), (4) and (5) into the utility specification, the optimization problem becomes:

$$\underset{H,C_j}{Max}\ U = U\left[N + WH - P_3 C^3 - P_4 C^4 - P_5 C^5, T - H - M, Q(M, C^2, C^3, C^4, C^5, I)\right] (6.)$$

4. Econometric model

The structural econometric model is based on direct utility comparisons over the 15 different care-utilization and labour-supply alternatives. The objective function in (6) can be written as a function of income, working hours, maternal care, other types of non-parental care and informal care. We express the utility index of mother i for a particular working hours/childcare category k as:

$$U_{ik} = X'_{ik}\beta_i + \varepsilon_{ik} \qquad (7.)$$

with $X_{ik} = (Y_{ik}, Y_{ik}^2, H_{ik}, M_{ik}, C_{ik}^2, C_{ik}^3, C_{ik}^4, C_{ik}^5, I_{ik})'$.

We assume a mixed logit model whereby X_{ik} are observed variables, β_i is a vector of coefficients of these variables for person i representing that persons' tastes and ε_{ik} is a random term that is iid extreme value (Train, 2003, p.141).

The jth component of β_i can be decomposed as

$$\beta_{ij} = \gamma_{1j} + \delta'_j \omega_i + \sigma_j \eta_{ij} \tag{8.}$$

if the coefficient is random, or simply $\beta_{ij} = \gamma_{2j}$, if the coefficient is non-random (Hensher and Greene, 2003). Here γ_{1j} and γ_{2j} represent average response in the population for the associated variable; ω_i is a vector of choice invariant characteristics that generates individual heterogeneity in the means of random coefficients and η_{ij} is the white noise, the source of random taste variation. Thus coefficients vary over decision makers with density $f(\beta|\theta)$ where $\theta = (\gamma, \delta, \sigma)$. This specification is the same as for standard logit except that β varies over decision makers rather than being fixed. Formally, the unconditional probability of choosing option k becomes:

$$P_{ik} = \int \left(\frac{e^{\beta' X_{ik}}}{\sum_n e^{\beta' X_{in}}} \right) f(\beta) d\beta \tag{9.}$$

In our model we will consider β to be normally distributed, $\beta_j \approx N(\gamma_j + \delta'_j \omega_i, \sigma_j^2)$ and we will estimate the parameters γ, δ and σ by simulation methods, as described in Train (2003, p.148).

Nevertheless, before we can estimate the coefficients in equation (9), a supporting equation for the variable wage needs to be estimated. This is required in order to produce a wage measure for all women regardless of labour force participation status. Following Powell (1997) the wage equation is specified as follows:

$$\ln W = \gamma'_w x_w + \upsilon \tag{10.}$$

Where x_w represents a vector of observed determinants and v represents unobserved variation. In the estimation of equation (10) standard techniques are used to correct for selection bias as first suggested by Heckman (1976). The inverse Mills ratio is calculated from the results of a reduced form labour force participation probit.

5. Data and variable construction

The study uses data from the Spanish Time-Use Survey (INE, 2003a). Basically the survey offers data on the primary and secondary activities realized considering hours and minutes as basic units of measurement (INE, 2003b). Technically it is a nationally representative sample of the population, obtained by two-step stratified sampling.

For our study, 1,967 households were initially selected – out of the 20,603 sample total – in which the youngest child was less than four years old and non-eligible for Infant Education. In order to make choices relatively homogeneous for all families, we excluded those observations with mothers in maternal leave; and also couples in which the father did not work. Additional data cleaning produced a final database of 1,660 observations.

Even if it is not specifically intended to study child-care matters, the survey provides interesting information on child care arrangements by households. Particularly, families are asked whether each of their children under ten are taken care of by different alternatives and for how long (in weekly hours) this caring takes place. The survey also offers information on the labour status of adult household members, including the mother. All this allows the construction of our dependent variable, mode of primary child care arrangement by employment status, as described in table 3.

Additionally, the Spanish Time-Use Survey contains detailed information on the income, labour market activities and socio-demographic characteristics of the household and its members, particularly the infant and her mother. Table 4 defines and states the dimension of the relevant variables.

TABLE 4. DEFINITION AND BASIC STATISTICS OF DEMOGRAPHIC AND SOCIOECONOMIC VARIABLES. WEIGHTED MEANS			
	UNITS	DEFINITION	MEAN
AGE	years	Age of the child in years	1.479 (0.03)
CHILDREN	number	Number of children under 10 living in the household	1.768 (0.02)
ADULTS	number	Number of adults living in the household	2.087 (0.01)
ONEPA	0/1	Dichotomous variable which takes value 1 if it is a one-parent family	0.016 0(.00)
AGEMOTH	Years	Age of the mother	33.354 (0.13)
UNINCOME	Thou.eu/ month	Aggregated monthly earnings of household members less mother's labour income	1.467 (0.02)
EDUCATION1	0/1	Dichotomous variable which takes value 1 if the mother's education level is primary school or less	0.392 (0.01)
EDUCATION2	0/1	Dichotomous variable which takes value 1 if the mother's education level is secondary school	0.336 (0.01)
EDUCATION3	0/1	Dichotomous variable which takes value 1 if the mother's education level is high school diploma	0.271 (0.01)
MARRIED	0/1	Dichotomous variable which takes value 1 if the mother is married	0.898 (0.01)
FOREIGNER	0/1	Dichotomous variable which takes value 1 if the mother is a foreign person	0.064 (0.01)
Source: Spanish Time-Use Survey, INE 2002/2003			

Likewise we can count on information relative to the autonomous region and municipality size of the city of residence of the family. In Spain there are seventeen autonomous regions plus two autonomous cities. That accounts for 18 additional dummy variables. The survey offers six locality size sections, the first of which corresponds to capitols and the last, to rural towns of less than ten thousand inhabitants. These two sets of variables may constitute adequate indicators of the different availabilities of child care types for different municipality sizes in different regions.

Unfortunately the Spanish Time-Use Survey does not provide information on the expenditure involved in child care activities, and thus prices of the services can not be computed. Thus information from other sources has had to be collected. Concretely we have used the Spanish Household Budget Survey (INE, 2005) for the same years (2002-2003). We have information on regions and municipal sizes to calculate average expenditures incurred by families in three headings of seven digits' COICOP/HBS.[8] Concretely we have used information on Domestic Service Expenditures (0562104-COICOP/HBS) to calculate baby sitting outlays; information on Kindergarten Expenditures (1231208-COICOP-HBS) to calculate day-care centres' expenses; and information on Pre-primary Education Expenditures (1011110-COICOP/HBS) to calculate schooling costs. Average expenditures by region and size of municipality have been calculated and have then been confronted with average hours of care also by region and municipality size to obtain average fares for the tree kinds of paid services of care: baby-sitter, day-care centre and school. Table 5 offers some descriptive statistics of the three prices used.

TABLE 5. DEFINITION AND BASIC STATISTICS OF PRICE VARIABLES. WEIGHTED MEANS			
	UNITS	DEFINITION	MEAN
PBABYSIT	Eu/hour	Price of babysitting services	2.741 (0.03)
PDAYCA	Eu/hour	Price of kindergarten services	1.029 (0.01)
PSCHOOL	Eu/hour	Price of schooling services	1.243 (0.02)
Source: Spanish Household Budget Survey and Spanish Time-Use Survey, INE 2002/2003			

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[8] Classification of Individual Consumption by Purpose Adapted to the Needs of Household Budget Surveys. (INE, 2005).

Estimation of the income variable requires prior prediction of wages for both working and non-working mothers. Table A1 in the appendix presents the results from the reduced form labour force participation probit and the log wage regression.

Disposable income Y is then calculated for each household and each choice alternative, as described in equation (5), by adding up unearned and market incomes and subtracting child-care costs, if any. Hours of maternal care, M, pure leisure L and informal care, I, are also obtained for each category from equation (2), given hours of work H and hours of care by different modes C^j. Table 6 provides an overview of these variables for the 15 states, together with the implied values of maternal care and pure leisure when total time available is normalized to 80 (Van Soest, 1995).

TABLE 6. VALUES OF DISPOSABLE INCOME, MARKET WORK AND HOURS OF CARE BY CHOICE CATEGORY									
STATE	Weekly Income	Working hours	Relative care	Baby-sitting time	Day-care time	School time	Informal care	Maternal care	Pure leisure
1. No work/ Parental care	319.2	0	0	0	0	0	0	80	0
2. No work/ Relative care	311.3	0	14.4	0	0	0	0	65.6	14.4
3. No work/ Babysitting care	683.5	0	0	28.2	0	0	0	51.8	28.2
4. No work/ Day-care	354.4	0	0	0	26.0	0	0	53.9	26.0
5. No work/ School	348.8	0	0	0	0	27.9	0	52.1	27.9
6. Part-time/ Parental care	298.6	22	0	0	0	0	22	58	0
7. Part-time/ Relative care	275.7	22	20.9	0	0	0	1.1	58	0
8. Part-time/ Babysitting care	620.5	22	0	32.3	0	0	0	47.7	10.3
9. Part-time/ Day-care	329.5	22	0	0	27.6	0	0	52.4	5.6
10 Part-time/ School	348.3	22	0	0	0	30.4	0	49.6	8.4
11 Full-time/ Parental care	268.4	39	0	0	0	0	39	41	0
12 Full-time/ Relative care	293.5	39	34.1	0	0	0	4.9	41	0
13 Full-time/ Babysitting care	468.6	39	0	29.7	0	0	9.3	41	0
14 Full-time/ Day-care	358.3	39	0	0	30.8	0	8.2	41	0
15 Full-time/ School	341.8	39	0	0	0	31.0	8.0	41	0

6. Empirical results

Table 7 presents estimation results for three different interpretations of the model implied by equation (6). The first, column 2, is the conditional logit model estimated by maximum likelihood. In terms of section 4, this model assumes that all the parameters are non-random. Most of the parameters appear to be significant at the 1% level and overall fit of the model, as reflected by adjusted pseudo R^2, seems acceptable.

The coefficients of the linear terms of income and pure leisure have a positive sign, thus indicating that, ceteris paribus, utility of the mother increases with disposable income and leisure. In contrast, the coefficients of the different modes of care are all negative. This can be interpreted as a negative influence in the mother's utility compared to maternal care, which is the omitted category.

Interpretation of the effect of changes in individual characteristics is not readily obvious. An increase in the age of the child increases the preference for hours of care by relatives, day-care centres or schools. Mother's aversion for work increase with the number of children. And mother's preference for using informal hours of care increase with the number of adults living in the house.

Finally, with respect to interaction terms, a rise in disposable income increases the probability of using baby-sitting services, and, to a lesser extent, day-care centres.

The third column in table 7 presents the results for a mixed model in which we allow the coefficients of income, leisure and all care modes considered to be random with normal distribution. Nonetheless, no individual characteristics are considered in equation (8) (that is the δ's are zero) and therefore no heterogeneity in mean is considered.

As can be observed, differences with results of the conditional logit model are minor. In fact, the estimates for the standard deviations of the random preference terms seem rather inaccurate and the adjusted pseudo R^2 does not increase.

The final column in table 7 reports the estimates of the parameters in the utility function when random coefficients with heterogeneity in mean are allowed. The individual characteristic influencing heterogeneity is the age of the child.

As the table shows, the age of the child is a significant source of preference heterogeneity with respect to leisure, relative time, day-care time, school time and to a lesser extent, informal care. Apparently as the child grows, preferences for all non-

maternal modes of care, but babysitting, increase, thus allowing for relatively more leisure.

Once more, the estimates for the standard deviations of the random parameters are non-significant, but, in this case, the value of adjusted pseudo R^2 improves.

TABLE 7. ESTIMATION RESULTS FROM STRUCTURAL MODELS						
	CONDITIONAL LOGIT		MIXED LOGIT I		MIXED LOGIT II	
VARIABLE	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
	Non-random Parameters		Random Parameters		Random Parameters	
INCOME	2,47E-02***	14.716	2,47E-02***	17.074	2,40E-02***	11.867
PURLEISURE	5,34E-02*	2.443	5,34E-02***	2.741	4,64E-02**	2.266
RELATIVE HOURS	-0,1592***	-16.197	-0,1592***	-18.447	-0,1585***	-14.375
BABY-SIT HOURS	-0,2184***	-19.463	-0,2184***	-18.683	-0,2159***	-15.200
DAY-CARE HOURS	-0,1454***	-18.307	-0,1454***	-18.908	-0,1442***	-14.999
SCHOOL HOURS	-0,2717***	-18.578	-0,2717***	-22.491	-0,2704***	-19.864
INFORM. HOURS	-0,2148***	-11.098	-0,2148***	-12.225	-0,2231***	-11.571
			Non-random Parameters		Non-random Parameters	
INCOME2	-5,4E-06***	-6.682	-5,40E-06***	-7.451	-5,39E-06**	-7.403
PURLEIS_AGE	2,14E-02***	6.621	2,14E-02***	7.001		
PURLEIS_CHILDRE	7,97E-03**	2.278	7,96E-03**	2.336	7,90E-03**	2.315
PURLEIS_ADULTS	-1,00E-02	-1.115	-1,00E-02	-1.233	-9,70E-03	-1.196
RELATIVEH_AGE	8,68E-03***	2.613	8,68E-03***	3.057		
BABY-SITH_AGE	5,27E-03	1.348	5,27E-03	1.351		
DAY-CAREH_AGE	2,43E-02***	8.999	2,43E-02***	8.742		
SCHOOLH_AGE	7,30E-02***	14.148	7,30E-02***	17.270		
INFORMH_ADULTS	3,09E-02***	3.787	3,09E-02***	4.214	3,05E-02***	4.181
RELATH_INCOME	2,10E-05	1.295	2,10E-05	1.468	1,97E-05	1.373
BABY-SH_INCOME	1,19E-04***	8.429	1,19E-04***	8.477	1,19E-04***	8.405
DAY-CAH_INCOME	4,37E-05***	3.516	4,37E-05***	3.832	4,27E-05***	3.726
SCHOOLH_INCOME	2,16E-05	1.403	2,16E-05	1.468	2,05E-05	1.381
			SD of param. Distributions		SD of param. Distributions	
sINCOME			1,30E-05	0,043	4,30E-05	0,143
sPURLEISURE			4,29E-04	0,157	2,19E-04	0,080
sRELATIVEHOUR			6,28E-04	0,246	2,23E-04	0,087
sBABY-SITHOUR			2,36E-04	0,068	2,60E-04	0,075
sDAY-CAREHOUR			4,41E-04	0,213	1,83E-04	0,088
sSCHOOLHOUR			3,08E-06	0,001	1,88E-04	0,061
sINFORMHOU			1,66E-04	0,056	2,91E-04	0,098
					Heterogneity in mean param.	
INCOME:AGE					4,03E-04	0,424
PURLEISURE:AGE					2,60E-02***	4.540
RELATIVEH:AGE					9,64E-03*	1.772
BABY-SITH:AGE					4,44E-03	0,657
DAY-CAREH:AGE					2,45E-02***	5.072
SCHOOLH:AGE					7,30E-02***	12.630
INFORMH:AGE					9,20E-03*	1.653
Log-likeli.	-3368.530		-3368.468		-3362.963	
Adj. R2	0.1952		0.1949		0.1962	

In order to compare our results with results from previous studies, we have used estimates for this last model to calculate wage elasticities and child care cost elasticities by simulating a one percent increase in gross hourly wages and childcare costs, respectively. These are presented in Table 8.

A 1% increase in wages increases female labour participation by 0.012 and the demand for non-parental modes of care by 0.0055. Similarly, a linear increase in the cost of the paid modes of care by 1 percent reduces female labour participation by 0.0044 and the demand for non-parental modes of care by 0.0053. Even if its signs are correct, these figures are considerably lower than those reported for other studies (Wrohlich, 2006, Lokshin, 2004, Kornstad and Thoresen, 2005). And therefore we are not confident about them.

TABLE 8 ELASTICITIES OF LABOUR SUPPLY AND DEMAND FOR CHILD CARE		
	WAGE	COST OF CHILD CARE
Labor Market Decision		
NO WORK	-0.0120	0.0044
WORK PART TIME	-0.0096	0.0010
WORK FULL TIME	0.0007	0.0016
Child Care Decision		
MATERNAL CARE	-0.0055	0.0053
RELATIVE CARE	0.0028	0.0044
BABY-SIT	-0.0051	0.0070
DAY-CARE CENTER	0.0037	-0.0010
SCHOOL	0.0157	-0.0040

7. Conclusions

This paper has analyzed Spanish households' choices concerning child care and female employment. We have developed a structural labour supply and child care demand for Spanish mothers, in which both decisions are endogenously determined.

Our results illustrate that mothers show clear preferences for income and pure leisure but seem to dislike non-parental modes of care relative to maternal care.

Further work is clearly needed in order to compare results of our models with similar work in the literature as that of Ribar (1995), Kornstad and Thoresen (2006), Wrohlich (2006) or Choné et al. (2003).

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APPENDIX

TABLE A1 REDUCED FORM LABOUR FORCE PARTICIPATION PROBIT AND LOG WAGE ESTIMATES				
Number of obs = 1481 Censored obs = 855 Uncensored obs = 626			Log likelihood = -1122.547 Wald chi2(11) = 129.39 Prob > chi2 = 0.0000	
LR test of indep. eqns. (rho = 0): chi2(1) = 2.60 Prob > chi2 = 0.1071				
	Labour force participation equation		Log-wage equation	
	Coefficient	t-statistic	Coefficient	t-statistic
AGEMOTH	0.0163	1.98**	0.0149	3.64***
EDUCATION2	0.4762	3.36***	0.1243	1.25
EDUCATION3	1.0513	6.70***	0.2772	2.22**
EDUCATION4|	0.8983	5.53***	0.2234	1.82*
EDUCATION5	1.3275	8.06***	0.4005	2.91***
EDUCATION6	1.8544	11.06***	0.6891	4.52***
EDUCATION7	1.8002	10.87***	0.7891	5.55***
CHILDREN	-0.1714	-3.69***		
UNINCOME	-0.2853	-6.25***		
MARRIED	-0.3569	-2.67***		
FOREIGNER	-1.0283	-5.88***	-0.3197	-2.55***
UNEMPLOYM	-0.0296	-5.31***		
CAPITOLS	0.1840	2.50**	0.0483	1.24
_cons		-0.2128	-0.66	0.6916	2.91***
LAMBDA			0.2067	1.81*