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## Female labour participation and child care choices in Spain

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### RESUMEN

Este trabajo analiza el comportamiento de las familias españolas en cuanto a las decisiones de empleo y atención a la infancia. Estima un modelo econométrico de ecuaciones simultáneas para estudiar el efecto de los costes del cuidado de niños sobre las decisiones de participación laboral y la selección del modo de cuidado. Utilizando datos de la Encuesta de Empleo del Tiempo, nuestro estudio indica que la participación laboral femenina es muy elástica a los cambios en los precios de los servicios de guardería. Además, la selección del modo de atención al niño se encuentra condicionada a la situación de empleo de la madre. Asimismo, el tipo de familia o su situación socioeconómica, junto con los precios de las diversas opciones afectan al modo de atención elegido.

### Palabras clave:

Atención a la infancia, Participación laboral femenina

### ABSTRACT

This paper analyzes Spanish families' behaviour relating to child care and employment issues. It estimates a simultaneous equation econometric model to study the effect of child care costs on labour participation decisions and child care choices. Based on data from the Spanish Time Use Survey, our study indicates that female labour force participation is very elastic to changes in prices of day-care services. Also, choice of child care mode is conditional on employment status. In addition, the type of family or its socioeconomic situation, along with the prices of the different options influences in the chosen child care mode.

**Keywords:** Child care, female labour participation

**JEL classification:** J13, J22, C35

## 1. Introduction

Recent European Union employment policies have emphasized the role of child care decisions. In fact, the European Council of Barcelona (March 2002) stated that “member States should remove disincentives to female labour force participation and strive (...) to provide childcare by 2010 to at least 90% of children between 3 years old and the mandatory school age and at least 33% of children under 3 years of age” (European Council, 2002).

As Connelly and Kimmel (2003) state, in the past 15 years, economists and policy analysts have learned a lot about the Economics of Childcare. Previous studies have focused primarily on two issues: first, the impact of child care costs on mother’s labour force participation (Heckman, 1974; Blau and Hagy, 1988; Powell, 1997), and, second, the factors affecting parents’ choice of child care type (Hofferth and Wissoker, 1992, Hofferth and Chaplin, 1998). Also recently employment and child care type decisions have been modelled jointly (Blau and Hagy, 1998, Powell, 2002, Dorion and Kalb, 2005). Interestingly, to date there has been no formal study on these relationships for Spain.

In this paper we use the Spanish Time-Use Survey to analyse household’s behaviour relating to child care and employment issues. As suggested by Maddala (1983, p.122) we develop a simultaneous equation recursive model that estimates labour force participation decisions and child care choices. The first equation will allow us to study the effect of child care prices on the employment status of the mother. The second equation will estimate the demand for child care, controlling for the potential endogeneity of the mother’s labour participation.

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

## 2. The child care system in Spain

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				
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
Source: OECD Employment Outlook 2005.				

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 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.		
	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
Source: INECSE (2004) and González López (2003).		

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, 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 work-childcare options of Spanish families with children from 0 to 3 years old, that is, children not eligible for Infant Education. Coincident with the 'male breadwinner model' of Le Feuvre (1997), in Spain young children's responsibility and care relies on their mother. She may decide to remain in the labour market after the birth, in which case, non-parental care is generally needed. Usual arrangements are day care centres, care by relatives, schools and baby-sitters, in this order of importance. Nonetheless, even if the mother remains outside the labour market, help can be obtained in any of these ways.

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 mostly 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.

### **3. 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.<sup>1</sup> 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.<sup>2</sup> They have found the demand for care, in particular centre care, to be price sensitive.

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<sup>1</sup> The seminal work of Heckman (1974) and several articles such as Blau and Robbins (1988), Ribbar (1995), Powell (1997) or Del Bocca, Locatelli and Vuri (2003) could also be examined.

<sup>2</sup> Hotz and Kilburn (1991) analyse working and nonworking mothers.

More recently, Blau and Hagy (1998), Powell (2002), Kornstad and Thoresen (2006) 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 three papers consider different joint employment-care type choices which are treated as multinomial models. The estimation procedures required to adequately estimate such intricate relationships remain complex.<sup>3</sup>

Davis and Connelly's (2005) paper, on the other hand, 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.

#### 4. Empirical model

As already stated, this study estimates a simultaneous-equations recursive model of joint labour participation and child care choices of Spanish families. The system is composed of two equations. The first one describes the mother's labour participation decisions; the second one explains the type of care chosen by households. Using Maddala's (1983, pp. 123-125) terminology, we consider it a recursive model where the female participation decision precedes the choice of care type. As this author states that is different from a sequential model, where the occurrence of one variable is a precondition for the other.

Formally stated the system of equations is:

$$H^* = \gamma'_h x_h - u_h \quad [1.]$$

$$C_j^* = \beta_j \tilde{H} + \gamma'_{cj} x_{cj} - u_{cj} \quad [2.]$$

The first equation (equation [1]) explains the number of hours  $H^*$  worked by the mother. It depends on a number of observed variables  $x_h$ , including the mother's wage rate, child care prices, other specific features of the mother and the household, and also regional characteristics. The labour force participation is equal to 1 when the number of hours is positive, and equal to zero, otherwise. The second equation (equation [2]) approximates the utility obtained from each of the J care alternatives  $C_j$ . It is a function of different observed variables  $x_{cj}$

<sup>3</sup> From our point of view, a multinomial logit does not capture adequately the implied correlations. The methodology used in Blau and Hagy (1998) requires deciding which parameters are to be considered random variables.



among which we consider the prices of care services, the mother's education, age and marital status, the age of the child, the number of dependent children,... It also depends on  $\tilde{H}$ , defined as the probability of employment of the mother, that is,  $\tilde{H} = \Pr(H^* > 0)$ . The family will choose care alternative  $j$  if the utility from this choice exceeds that of every other alternative, that is:  $C_j > C_n \quad \forall n \neq j$ .

Since the expressions for the supply of labour [1] and demand for child care [2] are generated from a common optimization problem, the error terms,  $u_h$  and  $u_{cj}$ , are likely to be correlated. We will follow a two-stage estimation method suggested by Maddala and previously implemented by Connelly and Kimmel (2003) and Davis and Connelly (2005).

In the first stage, we first obtain an estimate  $\hat{\gamma}_h$  of  $\gamma_h$  by using the probit maximum likelihood method for the labour participation equation (equation [1]).

In the second stage, we substitute  $\Phi(\hat{\gamma}'_h x_h)$  for  $\tilde{H}$  in equation [2], obtaining the logit maximum likelihood estimates of the child care choice expression.<sup>4</sup> As Maddala states the resulting estimates can be shown to be consistent.<sup>5</sup>

We expect a positive relationship between this predicted probability of employment  $\tilde{H}$  and the likelihood of choosing any non-parental care. The endogeneity of the labour decision can be tested by the significance of the predicted labour force participation parameters  $\beta_j$ .

Nevertheless, before we can estimate the coefficients in equation [1], 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:

$$\ln W = \gamma'_w x_w + v \quad [3.]$$

Where  $x_w$  represents a vector of observed determinants and  $v$  represents unobserved variation. In the estimation of equation [3] standard techniques are used to correct for selection bias as first suggested by Heckman (1976). The

<sup>4</sup> We assume that each mode depends not only on its own characteristics but also in other modes'. Therefore we use what Hofferth and Wissoker (1992) refer to as universal logit model.

<sup>5</sup> Though they may turn to be inefficient.

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, 1,970 households were 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. After controlling for missing data, 1,700 households compose the sample.

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. This information allows the construction of our dependent variable, mode of primary child care arrangement, both for working and non-working mothers.

We consider five modes of care: parental care, care by a relative, care by a baby-sitter (generally home-based), care at a day-care centre and care at a school. We regard it as a multinomial variable and thus study the primary child care arrangement used for the youngest child in the household. This primary arrangement refers to 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. Day care centres and schools are differentiated here because prices paid may differ.<sup>6</sup> Also hours contracted for day-care centres appear to have much more variability than those relating to schools. Sitter care, even if belonging to the market sector as those former forms of care, is generally unregulated and frequently informal. Finally, paid and unpaid relatives are included as a single category, although the most common form is unpaid. Table 3 provides a simple tabulation of the variable. To stress the relative importance of the employment

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<sup>6</sup> We found schools were either more expensive than day-care centres or almost free.

situation of the mother, the table also shows the differences in child care mode choice by employment situation of the mother. Although we will consider these issues in detail later, we would like to underline two facts. The first one is that almost 50% of the surveyed non-working mothers use some kind of regular external (non-parental) care for their children. The second is that a non-negligible 20% of working mothers rely exclusively on parental care.

TABLE 3 MODE OF PRIMARY CHILD-CARE ARRANGEMENT FOR CHILDREN UNDER 4			
	WORKING MOTHERS	NON-WORKING MOTHERS	ALL
PARENTAL CARE	19.71	54.97	37.53
RELATIVE CARE	22.92	12.05	17.41
BABY-SITTER	12.00	0.94	6.49
DAY-CARE CENTRE	33.25	17.31	25.18
SCHOOL	12.11	14.74	13.41
TOTAL	100.00	100.00	100.00
N. Obs.	843	857	1,700
Source: Spanish Time-Use Survey, INE 2002/2003			

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. MEANS			
	UNITS	DEFINITION	MEAN
AGE	years	Age of the child in years	1.541 (1.11)
MEMBERS	number	Number of family members	4.121 (1.26)
CHILDREN	number	Number of children under 10 living in the household	1.978 (1.01)
ADULTS	number	Number of adults living in the household	2.156 (0.49)
ONEPA	0/1	Dichotomous variable which takes value 1 if it is a one-parent family	0.022 (0.14)
INCOME	Thou.eu/ month	Aggregated monthly earnings of household members	1.847 (1.19)
AGEMOTH	Years	Age of the mother	33.500 (5.08)
AGEMOTH2	Years	Square of the age of the mother	1148.171 (358.75)
UNINCOME	Thou.eu/ month	Aggregated monthly earnings of household members less mother's labour income	1.415 (0.98)
EDUCATION1	0/1	Dichotomous variable which takes value 1 if the mother's education level is primary school or less	0.127 (0.33)
EDUCATION2	0/1	Dichotomous variable which takes value 1 if the mother's education level is secondary school	0.288 (0.45)
EDUCATION3	0/1	Dichotomous variable which takes value 1 if the mother's education level is high school diploma	0.123 (0.32)
EDUCATION4	0/1	Dichotomous variable which takes value 1 if the mother's education level is first level professional training	0.104 (0.30)
EDUCATION5	0/1	Dichotomous variable which takes value 1 if the mother's education level is second level professional training	0.097 (0.29)
EDUCATION6	0/1	Dichotomous variable which takes value 1 if the mother's education level is three-year college degree	0.113 (0.31)
EDUCATION7	0/1	Dichotomous variable which takes value 1 if the mother's education level is five-six-year college degree or doctorate	0.146 (0.35)
MARRIED	0/1	Dichotomous variable which takes value 1 if the mother is married	0.897 (0.30)
FOREIGNER	0/1	Dichotomous variable which takes value 1 if the mother is a foreign person	0.064 (0.24)
UNEMPLOYM	Percentage	Regional unemployment rate	17.185 (7.16)
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.<sup>7</sup> 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. As the Household Budget Survey only records actual expenditures, those prices could only be of use for families paying for the services. Thus for those cases in which families manifested a zero cost for caring services, a zero price was recorded. Table 5 offers some descriptive statistics of the three prices used.

TABLE 5. DEFINITION AND BASIC STATISTICS OF PRICE VARIABLES. MEANS			
	UNITS	DEFINITION	MEAN
PBABYSIT	Eu/hour	Price of babysitting services	2.701 (1.02)
PDAYCA	Eu/hour	Price of kindergarten services	1.039 (0.35)
PSCHOOL	Eu/hour	Price of schooling services	1.212 (0.50)
Source: Spanish Household Budget Survey and Spanish Time-Use Survey, INE 2002/2003			

## 6. Empirical results

Consistent with our estimation strategy, we first present the results for the labour participation equation. The second subsection discusses the estimation

<sup>7</sup> Classification of Individual Consumption by Purpose Adapted to the Needs of Household Budget Surveys. (INE, 2005).

results from the childcare choice equation with endogenous labour participation decisions.

#### 6.1. First stage: labour force participation results.

Estimation of the structural labour force participation 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.

The outcomes from the log wage equation are consistent with those usually found in the labour supply literature. As reported for example by Powell (1997), increases in the mother's level of education and age have a significant positive effect on wages. Also, on average, immigrant mothers receive lower wages. Contrary to Powell's (1997, 2002) results, the sample selection term is statistically significant at the 10% level, with a positive impact, indicating that working mothers tend to obtain higher wages than non-working mothers.

Results from the labour force participation equation are given next. It includes as independent variables demographic characteristics of the mother and her family, economic characteristics of the mother and her family (including the predicted wage), regional control variables, and noticeably, prices of care services.

Table 6 reports marginal effects evaluated at sample means. They offer the incidence of a marginal change in the corresponding variable on the probability of employment of the mother. As can be seen, all the variables show the expected signs.

Turning first to the price of care services variables, we can state that increases in any of the prices of the paid care services reduce the likelihood of labour participation of the mother. The mayor impact corresponds to day care prices: a one-euro increase in the hourly price of day-care centres reduces the probability of employment by 32%. School costs offer also a significant effect, but relatively smaller. Variation in the prices of baby-sitting services does not influence labour decisions significantly.

Wages are estimated to have a significant positive effect on labour force participation. In fact, when wages are controlled for, the age of the mother and the higher education levels no longer affect participation decisions significantly.

Income earned by other members of the family but the mother affects employment decisions negatively. Quantitatively a 1,000-euro increase in the mother's unearned income (UNINCOME) diminishes the probability of employment slightly less than a one-euro decrease in the wage rate (10% compared to 16%).

The number of children also presents a very significant though relatively small negative impact on employment decisions. Each additional child is estimated to reduce the probability of participating in the labour market by 5%.

Married are less likely to be on the labour market, as expected.

As for the location and municipality size variables, living in provincial capitols or in the regions of Baleares, Canarias, Cataluña, Valencia or Rioja increases the likelihood of employment of the mother drastically.

TABLE 6 MARGINAL EFFECTS FROM STRUCTURAL LABOUR FORCE PARTICIPATION PROBIT MODEL		
Number of obs = 1697		LR(32): 445.857 Prob > LR: 0.000
Log-Lik Full Model: -948.293		McFadden's R2: 0.194 McFadden's Adj R2: 0.166
Variable	Coefficient	t-statistic
PBABYSIT	0,0100	0,29
PDAYCARE	-0,3228	-3,33***
PSCHOOL	-0,1357	-2,47**
WAGEFIT	0,1615	10,76***
UNINCOME	-0,1064	-6,47***
AGEMOTH	-0,0037	-1,13
EDUCATION2	0,1205	2,71***
EDUCATION3	0,1793	3,90***
EDUCATION4	0,1594	3,16***
EDUCATION5	0,1874	3,97***
EDUCATION6	0,1323	2,63***
CHILDREN	-0,0537	-3,25***
MARRIED	-0,1374	-3,06***
FOREIGNER	-0,0673	-1,15
ARAGÓN	-0,0160	-0,19
ASTURIAS	-0,1149	-1,10
BALEARES	0,2302	3,08***
CANARIAS	0,2811	2,95***
CANTABRIA	0,1807	1,93*
CAS-LEÓN	-0,0060	-0,08
CAS-MANCHA	0,0288	0,37
CATALUÑA	0,3428	8,57***
VALENCIA	0,2246	4,37***
EXTREMAD	0,1578	1,90*
GALICIA	-0,0459	-0,46
MADRID	0,1557	1,91*
MURCIA	0,0371	0,47
NAVARRA	0,1299	1,90*
PVASCO	0,1547	1,20
RIOJA	0,2573	3,57***
CAPITOLS	0,2599	4,45***
LESSTEN	0,1054	1,35
Significance level: *10%; **5%; ***1%.		

Participation elasticities, based on the estimation results in this paper, are reported in table 7. The child-care costs elasticities evaluated at sample means are -0.05, with respect to babysitting services, -0.67, with respect to day-care prices, and -0.32, with respect to schooling costs. Except for the baby-sitting services, these figures are within the range of elasticities reported in other papers. Mid-range measures of -0.38 have been reported both by Blau and Robbins (1988) and Powell (1996). Ribar (1992) obtained an elasticity of -0.78 and Connelly and Kimmel (2003) found -0.45 for married mothers and -0.98 for



singles. Nevertheless, our estimates differ from most of the other papers in that different care prices have been considered for each paid alternative.

The predicted elasticity of labour force participation with respect to wages is 1.59 (also shown in table 7). This figure is slightly over most of those reported in the literature. Powell (1996) obtained an elasticity of 0.85. Connelly and Kimmel (2003) state 0.74 for married mothers and 1.24 for singles.

TABLE 7 MARGINAL EFFECTS FROM STRUCTURAL LABOUR FORCE PARTICIPATION PROBIT MODEL	
PBABYSIT	-0.05
PDAYCARE	-0.67***
PSCHOOL	-0.32**
WAGEFIT	1.59***
Significance level: *10%; **5%; ***1%.	

## 6.2. Second stage: multinomial child care choice results

Predicted probability of labour force participation substitutes for  $\tilde{H}$  in our second stage.

Table 8 presents the marginal effects of the multinomial logit model for child care type. Predicted probability of labour force participation is positively and significantly associated with all non-parental care alternatives, except for relative care. Thus those women most likely to be employed are also most likely to choose baby-sitters, day-care centres and schools. Non-working mothers choose mostly parental care. But relative care is not significantly determined by predicted employment status, indicating its use by employed and non-employed women alike.

We include three different price variables, one for each of the pay modes: baby-sitter, day-care and school. Economic theory dictates that price and quantity demanded usually vary negatively. Thus we should expect a negative effect for those prices on the probability of their own modes, that meaning for instance that an increase in the price of day-care center diminishes the probability of center care being the chosen option. As can be observed, that circumstance can be corroborated for all the three paid options. But also, the price of day-care services significantly affects the probability of parental care. An increase in this

price augments the likelihood of caring for the children at home by its family members.

Besides predicted labour participation status of the mother and prices some other circumstances explain family's reliance on parental care. For instance, lower household incomes tend to increase the probability of parental care. Also younger children are cared for at home by family members. Availability in this case is measured by the number of adults in the household. As the number of adults increases parental care is relatively more often.

Use of relative care is explained for younger children of households with less adult members not living in provincial capitols or regions like Madrid, Navarra, Canarias or País Vasco. In this case, availability of relatives living nearby is the most convincing explanation.

Baby-sitters are relatively used by families with higher incomes and many children.

Older children of higher income families from Cataluña, Madrid, and provincial capitols, but not from Asturias, tend to attend day-care centres.

Large families are likely to send their children to school. Schooling is also more probable for older children and for those living in Canarias.

TABLE 8. CHOICE OF CHILD-CARE TYPE. MULTINOMIAL LOGIT										
Multinomial logistic regression					Number of obs = 1700					
LR chi2(60) = 1105.60 Prob > chi2 = 0.0000 Log likelihood = -1939.					McFadden's R2: 0.222 McFadden's Adj R2: 0.196					
	PARENT CARE		RELATIVE CARE		BABY-SITTER		DAY-CARE CENTER		SCHOOL	
	Y=0.4043		Y=0.205		Y=0.028		Y=0.314		Y=0.0475	
	Marg.	t-stat.	Marg.	t-stat.	Marg.	t-stat.	Marg.	t-stat.	Marg.	t-stat.
PRED. LFP	-0,418	-5,09	-0,009	-0,14	0,124	4,55	0,277	3,58	0,026	1,17
PBABYSIT	0,033	0,84	0,057	1,96	-0,024	-2,32	-0,038	-1,06	-0,028	-2,34
PDAYCARE	0,683	2,93	0,119	0,81	-0,017	-0,58	-0,848	-5,15	0,063	1,16
PSCHOOL	0,084	0,91	0,030	0,37	0,046	0,63	-0,072	-0,92	-0,088	-4,72
AGE	-0,182	-12,18	-0,052	-4,66	-0,002	-0,50	0,150	10,02	0,085	8,99
CHILDREN	0,013	0,71	-0,025	-1,76	0,016	3,58	-0,015	-0,82	0,011	2,31
AUDULTS	0,202	4,42	-0,204	-4,89	-0,022	-1,69	-0,001	-0,03	0,025	2,15
INCOME	-0,105	-6,74	0,021	2,01	0,021	4,67	0,060	4,66	0,003	0,84
ARAGÓN	0,113	1,19	-0,121	-2,59	-0,016	-1,34	0,046	0,50	-0,023	-1,46
ASTURIAS	0,217	1,97	0,088	0,88	-0,001	-0,08	-0,285	-6,82	-0,018	-0,76
BALEARES	-0,188	-2,59	0,027	0,37	-0,003	-0,16	0,167	1,75	-0,002	-0,06
CANARIAS	-0,265	-2,92	-0,151	-2,64	-0,032	-5,08	0,051	0,33	0,399	2,38
CANTABRIA	0,079	0,64	-0,126	-2,14	0,023	0,81	-0,073	-0,73	0,097	1,41
CAS-LEÓN	0,084	1,01	-0,143	-3,78	0,033	1,12	0,023	0,29	0,003	0,11
CAS-MANC	0,048	0,58	0,005	0,07	-0,005	-0,27	-0,038	-0,49	-0,010	-0,49
CATALUÑA	-0,158	-2,21	-0,089	-2,12	-0,026	-3,29	0,268	3,81	0,006	0,28
VALENCIA	-0,035	-0,55	0,041	0,77	-0,033	-4,13	0,034	0,53	-0,008	-0,52
EXTREMAD	-0,066	-0,77	0,118	1,40	0,023	0,65	-0,074	-0,85	-0,001	-0,03
GALICIA	0,069	0,44	-0,038	-0,44	0,023	0,55	-0,240	-4,79	0,187	1,32
MADRID	-0,052	-0,52	-0,146	-3,98	0,023	0,65	0,091	0,92	0,083	1,28
MURCIA	-0,057	-0,69	0,020	0,30	-0,025	-3,02	0,042	0,48	0,021	0,58
NAVARRA	0,182	2,20	-0,141	-3,79	0,027	0,66	-0,072	-1,02	0,004	0,16
PVASCO	-0,183	-1,51	-0,159	-3,95	0,135	0,89	0,000	0,00	0,207	1,40
RIOJA	-0,122	-1,44	0,071	0,89	-0,019	-2,20	0,058	0,63	0,013	0,40
CAPITOLS	-0,332	-3,07	-0,110	-1,55	0,002	0,16	0,464	5,50	-0,025	-0,96
LESSTENTH	0,142	1,23	0,018	0,18	-0,046	-3,49	-0,177	-2,77	0,064	1,30
Significance level: *10%; **5%; ***1%.										

As Train (2002, p.49), among others, states the logit model implies a certain pattern of substitution across alternatives. For any two alternatives  $j$  and  $k$ , the ratio of the logit probabilities is  $P_{ij}/P_{ik} = e^{V_{ij}-V_{ik}}$ . This ratio does not depend on any alternatives other than  $j$  and  $k$ . That is, the relative odds of choosing  $j$  over  $k$

are the same no matter what other alternatives are available or what their attributes are. Therefore it is said that the logit model exhibits Independence of Irrelevant Alternatives (IIA).

Whether IIA holds in a particular setting is an empirical question. Following Hausman and McFadden (1984) we will perform a Hausman-type test. The intuitive idea is that the model can be estimated on a subset of the alternatives. If IIA holds in reality, then the parameter estimates obtained on the subset of alternatives will not be significantly different from those obtained on the full set of alternatives. A statistic can be calculated which is asymptotically distributed as a chi-squared with degrees of freedom equal to the number of regressors.<sup>8</sup> Significant values of the statistic indicate that the IIA assumption has been violated.

Table 9 presents Hausman tests results for the multinomial model of choice of care type. As can be observed in none of the cases is the difference among coefficients as large as to reject the null hypothesis.

TABLE 9. HAUSMAN TESTS OF INDEPENDENCE OF IRRELEVANT ALTERNATIVES FOR MULTINOMIAL MODEL OF CHOICE OF CARE-TYPE				
Omitted	chi2	df	P>chi2	evidence
Relative care(1)	17.928	80	1.000	for Ho
Baby-sitter (2)	6.671	80	1.000	for Ho
Day-care centre(3)	-129.647	81	1.000	for Ho
Pre-school (4)	3.886	79	1.000	for Ho
Parental care (0)	1.252	81	1.000	for Ho
Ho: Odds(Outcome-J vs Outcome-K) are independent of other alternatives.				

## 7. Conclusions

This paper has analyzed Spanish households' choices concerning child care and female employment. We have developed a simultaneous equation econometric model in which feminine labour participation decisions precede child care choices.

We have found that, consistent with our expectations, increases in the wage rate and decreases in the costs of child care augment the probability of

<sup>8</sup> Long and Freese (2003, p.207) offer the calculations involved.

employment of the mother. Child care costs elasticities for employment range from 0.05 for baby-sitting services to 0.67 for day care centres. The results suggest that child care policies that affect child care prices will have an impact on the labour supply of Spanish mothers. Nonetheless, not all variations in prices are alike and prices of institutionalized care (like schools and day-care centres) have greater effects.

The second research question began at this point. We have found that employment status of the mother is a determining factor affecting child care choices. According to our results both decisions are taken simultaneously. Nonetheless many other factors affect child care choices. From a policy perspective prices of the services and income of the family are the more important factors. We have found that the influence of the price of day-care services is greater than any other variable. Thus subsidizing this price can be the most efficient way of orienting family choices away from internal or informal sources of care (parental care, relative care or baby-sitters) towards institutional sources of care. It would be more efficient than subsidizing schools, which do not significantly influence the probability of other alternatives; and also better than mere income transfers which families could use in baby-sitting services or in other goods.

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## APPENDIX

TABLE A1 REDUCED FORM LABOUR FORCE PARTICIPATION PROBIT AND LOG WAGE ESTIMATES				
Number of obs = 1481			Log likelihood = -1122.547	
Censored obs = 855			Wald chi2(11) = 129.39	
Uncensored obs = 626			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*