

CHILDCARE COSTS AND SPANISH MOTHERS'S LABOUR FORCE PARTICIPATION

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P. T. N.º 29/08

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Edita: Instituto de Estudios Fiscales

N.I.P.O.: 602-08-004-3

I.S.S.N.: 1578-0252

Depósito Legal: M-23772-2001

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ABSTRACT

In Spain, female labour force participation is among the lowest in Europe. This paper analyzes the extent to which female labour force participation is affected by the cost of formal childcare. Both decisions, labour force participation and formal childcare use, are jointly considered by means of a bivariate probit model. Based on data from the Spanish Time Use Survey, our study indicates that Spanish mothers' labour force participation is very elastic to changes in childcare costs.

Keywords: Childcare costs, female labour participation.

JEL classification: J13, J22, C35.

I. INTRODUCTION

Recent European Union employment policies have emphasized the role of childcare 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).

This statement stresses that, for mothers of preschool-age children, the decision to engage in paid employment typically implies the concurrent choice of a childcare arrangement. From this point of view, the labour force participation of mothers of young children may exhibit sensitivity to the cost, the quality or the availability of childcare.

Childcare issues have been object of study since the 1970s in the United States, United Kingdom and Northern Europe. Previous studies have analyzed the impact of childcare costs on employment participation (Heckman, 1974), on the use of formal childcare (Ribbar, 1992), on the type of care (Hofferth and Wisoker, 1992) or on the quality of care (Blau and Hagy, 1998).

In Spain the subject has been relatively neglected until very recently¹. The aim of this paper is to provide Spanish evidence on the role that childcare costs play in the decision of mothers of preschool-age children to participate in the labour market. To our knowledge, this is the first Spanish study that has examined the impact of childcare costs on labour supply decisions. The decision to become employed is jointly modelled with the decision to use formal childcare, and is considered to be influenced not only by conventional determinants such as wages and non-labour income but also by the expected costs of childcare. Thus, the paper concentrates on the aspect of the affordability of childcare services, ignoring the variability of this good along the quality dimension.

Using primarily data from the Spanish Time-Use Survey, our results show that Spanish mothers’ labour force participation is very elastic to childcare prices.

The paper is organized as follows. Section 2 provides a literature review. In Section 3 we present the institutional setting from which Spanish families make their choices and discuss the data and summary statistics. Section 4 outlines the econometric model and estimation procedure issues. Section 5 presents

¹ The scarce literature has focused on parents’ time devoted to childcare as García and Molina (1999). Data limitations may explain this lack of interest.



empirical results. Finally, Section 6 concludes with a discussion of the interpretation of the results and policy implications.

2. LITERATURE REVIEW

Female labour employment decisions have been studied extensively (Killinsworth and Heckman, 1986). In this literature, the presence of preschool-age children has been identified as a crucial determinant of labour supply (Nakamura and Nakamura, 1992, Carrasco, 2001, and Grossbard and Amuedo-Dorantes, 2007, among others).

On the other hand, during the past two decades, social scientists have analyzed various aspects of child-care decisions. Some studies have examined the influence of costs or availability of care services on fertility decisions (Blau and Robbins, 1989, Anderson, Duvander and Hank, 2004). And a separate set of research has explored the factors affecting parent's choice of type of care (Hofferth and Wissoker, 1992, 1996, Johansen, Liebowitz, and Waite, 1996).

Recently research has focused on the relationship between childcare and female labour supply. Most studies have estimated a discrete choice participation probit with childcare costs and wages as key explanatory variables. Measures of expected childcare cost have been constructed, as childcare costs are usually available only for those who purchase childcare. These measures have been based on average cost in the community (Blau and Robbins, 1988) or selectivity corrected cost estimates (Connelly, 1992, Powel, 1997, Kimmel, 1998).

Other empirical studies have combined qualitative labour supply choices with childcare mode choices to form distinct combinations of labour supply and childcare that are estimated in a multinomial framework. Ribbar (1995), Powell (2002), Blau and Hagy (1998) or Kornstad and Thoresen (2006), though following this approach, differed in the econometric estimation strategy.

In between these two approaches, some research has considered the interrelatedness of childcare choice and labour market behaviour but without incorporating choice of care mode (Cleveland *et al.*, 1997; Viitanen, 2005; Del Boca and Vuri, 2006). These studies have usually estimated a bi-variate probit of labour force participation and paid childcare use, incorporating childcare costs and wages as key explanatory variables.

The empirical evidence gathered across these studies has generally supported the theoretical expectation that higher costs of childcare have a negative effect on the probability of participating in the labour market. Nonetheless, the range of elasticities has been large (from -0.14 (Viitanen, 2005) to -0.92 (Kimmel, 1998)), probably due to the different methodologies –probit, multinomial logit, bi-variate probit– or sample characteristics –married/single

mothers, age of youngest child,... However, as Herbst and Barnow (2008) state, there appears to be a recent convergence of estimates centering on -0.40.

3. THE CHILDCARE 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 I. 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 I 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 I
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 non-parental 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 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.

4. THEORETICAL AND EMPIRICAL MODEL

The behavioural model underlying the empirical work in this paper follows the work of Ribbar (1995), Blau and Hagy (1998), Del Bocca (2006) or Wrohlich (2006).

As Blau and Hagy (1998) we assume that women are the principal caregivers in the household and thus employment decisions of family members other than the mother of the child are taken as given. We also assume two forms of care available for the child: informal care provided by the mother, father, and other household members and formal, paid care, purchased on the market.

Mothers are assumed to maximize utility, where utility is expressed as a function of leisure time, market goods and childcare quality. The constraints in this maximization problem include constraints on the mother’s and children’s time, a money budget constraint and a production function for childcare services (Ribar, 1992, Kimmel, 1998).

The maximization of this utility function subject to the constraints yields the primary estimating equations, representing the demand for leisure (labour supply) and the demand for paid childcare services.

$$\text{LFP} = f(W, P_C, \text{other factors}) \quad (1)$$

$$\text{CCU} = f(W, P_C, \text{other factors}) \quad (2)$$

Because the employment behaviour (not the continuous labour supply decision) is the focus of this paper, the above equation is shown with the dichotomous labour force participation (LFP). Similarly, instead of the continuous demand for paid childcare services, we consider the dichotomous paid-childcare use (CCU). As Kimmel (1998) states, the hourly wage W and the hourly price of care P_C are entered in the equations as two distinct terms

because the total number of hours worked per week is not constrained to be equal to the number of paid childcare hours. In other words, the model allows mothers to purchase more or less hours of childcare than their working hours and even using childcare when they are not working².

Following Cleveland *et al.* (1996), Viitanen (2005) and Del Bocca and Vuri (2007), we will simultaneously estimate the labour force participation and the use of formal childcare equations by means of a bi-variate probit (Heckman, 1978). Because the price of childcare is not observed for those who did not purchase childcare, and the wage is not observed for those who did not engage in paid employment, the econometric procedure requires prior estimation of prices and wages for all the observations in the sample.

In particular, our primary model is composed of:

$$\text{LFP} = \alpha_L + \beta_L \hat{W} + \chi_L \hat{P}_C + \delta_L X_L + \varepsilon_L \quad (3)$$

$$\text{CCU} = \alpha_C + \beta_C \hat{W} + \chi_C \hat{P}_C + \delta_C X_C + \varepsilon_C \quad (4)$$

where \hat{W} is the expected hourly wage of the mother; \hat{P}_C is the expected price of childcare; X_L is a vector of other determinants of the decision to engage in paid employment as age, non-labour income, household composition,...; X_C is a vector of other usual determinants of the decision to purchase paid childcare as age of the child, availability of alternative care arrangements, presence of other children,...; finally, ε_L and ε_C are the error terms, distributed bi-variate normal with mean 0, variance 1 and covariance ρ (Viitanen, 2005).

Nonetheless, before estimating equations (3) and (4), we must calculate expected prices and wages for all the observations in the sample. The expected wage, \hat{W} , is based on parameter estimates from the subsample of wage earners, adequately corrected for selection bias as first suggested by Heckman (1976). The wage equation is identified with variables that affect the mother's reservation wage but do not determine her wages, such as non-labour income.

Similarly, the expected price of market childcare, \hat{P}_C , is based on parameter estimates from the sub-sample of formal, paid childcare users, likewise corrected for sample selection³. The childcare price equation is identified with variables that are correlated with the decision to use formal childcare but do not affect the price paid for it, such as the presence of other adults in the household.

² See below the discussion on the endogenous variables for the Spanish data.

³ It should be mentioned that most studies using North-American or UK data employ a double selection model. Most authors argue that childcare costs are only observed for households where the mother is employed. Therefore in addition to the selection regarding utilization, employment selection is also controlled for. However, in Spain, as in Italy (see Del Boca and Vuri, 2006) or Germany (see Wrohlich, 2004), the link between employment and childcare use is not so strong and therefore a single sample selection correction term is adequate.

The key parameters of interest in equations (3) and (4) are the coefficients of the predicted wage and the predicted price of childcare. Those will allow the calculation of the corresponding elasticities with respect to labour force participation and childcare use.

5. DATA AND VARIABLE CONSTRUCTION

The study uses primarily 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. Even if it is not specifically intended to study childcare/labour supply matters, the survey provides interesting information on childcare arrangements by households and employment status of household members.

For our study, 1,970 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 relatively homogeneous choices for all families, we excluded those observations with mothers on maternity leave as well as couples in which the father did not work. To stress the importance of formal, paid care compared to parental care, children primarily cared for at public schools or by relatives were also excluded⁴. Table 3 summarizes the data selection and hence the final sample size.

Table 3
SAMPLE SELECTION

| | Observations after selection |
|--------------------------------------|------------------------------|
| Time-Use Survey | 20,063 |
| Reason for removal | |
| No children under four | 1,970 |
| Mother on maternal leave | 1,871 |
| Father not employed | 1,722 |
| Child at public school | 1,631 |
| Childcared by relative | 1,332 |
| Missing values on critical variables | 1,078 |

Source: Spanish Time-Use Survey, INE 2002/2003.

⁴ Nevertheless see the sensitivity analysis on the Empirical Results Section.



Of these 1082 mothers, 442 or 41.0 % are employed and 446 or 41.3% report using formal childcare (Table 4). Although we will consider these issues in detail later, we would like to underline two facts. The first one is that almost 25% of the surveyed non-working mothers use paid, formal care for their children. This fact has also been mentioned by Del Boca and Vuri (2006), for Italy, or Wrohlich (2006), for Germany. The second is that a non-negligible 35.7% of working mothers rely exclusively on parental care (that including care by any adult member living in the household)⁵.

Table 4
FORMAL CHILD-CARE USE AND LABOR FORCE PARTICIPATION

| | Non-Working | Working | Total |
|-----------|--------------------|----------------|--------------|
| Non-using | 474 | 158 | 632 |
| Using | 162 | 284 | 446 |
| Total | 636 | 442 | 1,078 |

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 relative to the infant and his mother. Table 5 defines and states the dimension of the relevant variables.

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 categories, the first of which corresponds to capitols and the last, to rural towns of less than ten thousand inhabitants.

Unfortunately the Spanish Time-Use Survey does not provide information on the expenditure involved in childcare activities, and thus prices for the services can not be computed. Thus information from other sources had to be collected. Concretely we have used the Spanish Household Budget Survey (INE, 2005) for the same years (2002-2003). The Spanish Household Budget Survey (INE, 2005) provides detailed information on expenditures incurred by families in different headings of seven digits' COICOP/HBS⁶, together with data on household income and information on regions and municipal sizes of the city of residence of the family. Following Del Boca *et al.* (2005), we merged the above two data sets using

⁵ This explains why we decided to include the category relative care among no care use in our sensitivity analysis of section 5.

⁶ Classification of Individual Consumption by Purpose Adapted to the Needs of Household Budget Surveys. (INE, 2005).

the propensity-score matching method (see Borra and Palma, 2008, for details in the procedure). The aim of this method is to match an individual of the Time-Use Survey with a similar individual of the Household Budget Survey, according to some particular criteria, in order to collect relevant information from both surveys. Specifically, to calculate day care prices we imputed Kindergarten Expenditures (1231208-COICOP-HBS) of an individual from the Household Budget Survey to a similar individual of the Time-Use Survey. This procedure offered prices of day-care centre services for families using this arrangement.

The final data set was completed by adding regional information on availability of childcare places from Anuario de Estadísticas Laborales y Asuntos Sociales (Ministerio de Trabajo y Asuntos Sociales, 2004), average wage rates of women working in the Personal Services Sector from Encuesta de Estructura Salarial (INE, 2004) and regional unemployment levels from Encuesta de Población Activa, Resultados Anuales (INE, 2004). Description of these variables is also provided in table 5.

Table 5
DEFINITION AND BASIC STATISTICS OF DEMOGRAPHIC AND
SOCIOECONOMIC VARIABLES. MEANS

| | Units | Definition | Mean |
|-----------|--------------|--|------------------|
| Wage | Eu/ hour | Hourly market wage of workers | 6.844 (5.85) |
| Price | Eu/hour | Hourly price of childcare of users | 1.071 (0.23) |
| Age | Years | Age of the child in years | 1.288 (1.01) |
| Agemoth | Years | Age of the mother | 33.145 (5.30) |
| M_Agemoth | 0/1 | Dichotomous variable which takes value 1 if the mother's age is between 25 and 35 years old | 0.562 (0.49) |
| Edlevel1 | 0/1 | Dichotomous variable which takes value 1 if the mother's education level is primary school or less | 0.454 (0.49) |
| Edlevel2 | 0/1 | Dichotomous variable which takes value 1 if the mother's education level is secondary school | 0.322 (0.46) |
| Edlevel3 | 0/1 | Dichotomous variable which takes value 1 if the mother's education level is University degree | 0.223 (0.41) |

(Follow)

(Continuation)

| | Units | Definition | Mean |
|--------------|----------------|--|------------------|
| Foreigner | 0/1 | Dichotomous variable which takes value 1 if the mother is a foreign person | 0.083 (0.27) |
| Children | number | Number of children under 10 living in the household | 1.862 (0.92) |
| Adchildren | 0/1 | Dichotomous variable which takes value 1 if there are additional children under 10 living in the household | 0.615 (0.48) |
| Adults | number | Number of adults living in the household | 2.089 (0.35) |
| Unincome | Thou.eu/ month | Aggregated monthly earnings of household members less mother's labour income | 1.338 (0.90) |
| Availability | Places/child | Regional availability of day-care places per child | 0.041 (0.02) |
| Care_wage | Thou.eu/ year | Regional average wage of workers in the personal services sector | 11.347 (1.37) |
| Unemploym | Percentage | Regional unemployment rate | 17.185 (7.16) |

Source: Spanish Time-Use Survey (INE 2002/2003), Spanish Household Budget Survey (INE 2003), Anuario de Estadísticas Laborales y Asuntos Sociales. 2003 (Ministerio de Trabajo y Asuntos Sociales, 2004), Encuesta de Estructura Salarial. 2002 (INE, 2004) and Encuesta de Población Activa, Resultados Anuales. 2003 (INE, 2004).

6. EMPIRICAL RESULTS

Consistent with our estimation strategy, we first present the results from the supporting equations for wages and childcare costs. The second subsection discusses the estimation results from the labour participation/childcare use bivariate probit.

Estimating wages and childcare costs

Table 6 presents a selectivity corrected log-wage model of the mother, where the selection concerns the decision to engage in paid employment. The results 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 both participation and wages. Also, on average, immigrant mothers present lower participation rates and receive lower wages. As found by Viitanen (2005), the number of children under ten is associated with decreased labour participation. Regional unemployment rates, included to control for labour demand conditions, have

the expected negative effect on both participation and wages (Kimmel, 1998). Household non-labour income is used to identify the model as it has a direct effect on the mother's reservation wage hence affecting her employment decision with no impact on her wage. Non-labour income has the expected negative effect on the employment probability (Viitanen, 2005). Consistent with model expectations, the sample selection term shows a significant positive impact, indicating that working mothers tend to obtain higher wages than non-working mothers.

Table 6

LFP PROBIT COEFFICIENT AND LOG-WAGE COEFFICIENT ESTIMATES

| Number of obs = 1078 Censored obs = 636 Uncensored obs = 442 | | Log-likelihood = -766.088 Chi2(5): 131.810 Prob > chi2: 0.000 | | |
|--|-----------|---|-----------|-------|
| Variable | LFP | | Log-Wage | |
| | Coef. | S.E. | Coef. | S.E. |
| Constant | -0.231 | 0.382 | -0.670*** | 0.225 |
| Agemoth | 0.003 | 0.000 | 0.013** | 0.006 |
| Edlevel2 | 0.595*** | 0.100 | 0.373*** | 0.079 |
| Edlevel3 | 1.147*** | 0.115 | 0.860*** | 0.089 |
| Foreigner | -0.827*** | 0.182 | -0.537*** | 0.149 |
| Unincome | -0.224*** | 0.047 | | |
| Children | -0.095** | 0.046 | | |
| Adults | 0.125 | 0.101 | | |
| Unemploy | -0.038*** | 0.006 | -0.019*** | 0.005 |
| Lambda | | | 0.509*** | 0.062 |

Significance level: *10%; **5%; ***1%.

Results of the selectivity corrected estimates of log childcare costs are shown in table 7. The age of the child and the level of education of the mother have the expected impact on the use of childcare. As found in Powell (1997), having older children significantly increases the likelihood of paying for care. Also, as reported by Viitanen (2005) more educated mothers are more likely to purchase childcare. Surprisingly, the presence of other children or adults in the household does not significantly affect the probability of using formal childcare.

As expected, the age of the child is a significant determinant of childcare prices. The regional wage rate, included to control for supply conditions, is significant and of expected sign. Contrary to intuition, the educational level of



the mother is negatively related to childcare costs. Nonetheless, it should be kept in mind that less educated mothers are likely to use less hours of care, as they are probably not working, and possibly face greater hourly prices. Regional dummies, not shown in the table because of space problems, are also quite significant indicating the importance of regional variation in determining childcare costs. The coefficient on the selection term is negative and significant. This result suggests that families purchasing childcare face lower prices than non-users.

Table 7

CCU PROBIT COEFFICIENT AND LOG-PRICE COEFFICIENT ESTIMATES

| Number of obs = 1078 Censored obs = 632 Uncensored obs = 446 | | Log-likelihood = -512.425 Chi2(29): 13368.710 Prob > chi2: 0.000 | | |
|--|-----------|--|-----------|-------|
| Variable | CCU | | Log-Price | |
| | Coef. | S.E. | Coef. | S.E. |
| Constant | -1.239*** | 0.427 | 0.884*** | 0.208 |
| Age | 0.551*** | 0.049 | -0.207*** | 0.027 |
| Agemoth | -0.002 | 0.009 | -0.005 | 0.004 |
| M_agemoth | 0.161 | 0.108 | -0.090** | 0.042 |
| Edlevel2 | 0.268*** | 0.093 | -0.092** | 0.040 |
| Edlevel3 | 0.571*** | 0.109 | -0.218*** | 0.053 |
| Foreigner | -0.247* | 0.158 | 0.072 | 0.068 |
| Unincome | -0.022 | 0.045 | 0.007 | 0.017 |
| Ad_children | -0.010 | 0.070 | | |
| Adults | -0.016 | 0.094 | | |
| Availability | -0.205 | 2.037 | | |
| Care_wage | | | 0.018** | 0.007 |
| Lambda | | | -0.410*** | 0.045 |

Significance level: *10%; **5%; ***1%.

Specification includes regional dummies

Bi-variate model results

Estimated coefficients for the primary LFP/CCU bi-variate probit equations are given in table 8. The regressors in this equation include the predicted hourly wage and the predicted hourly price of childcare, along with other socio economic characteristics of the household already included in the previous

supporting equations. Wages are estimated to have a significant positive effect on both labour force participation and paid childcare use, while the hourly cost of childcare also shows a negative significant impact on both decisions. In addition the estimated correlation coefficient (ρ) is positive and significant, indicating the adequacy of the simultaneous estimation of both equations. These basic results are all consistent with the implications of the underlying behavioural model.

Table 8
LFP/CCU BI-VARIATE PROBIT COEFFICIENT ESTIMATES

| Number of obs = 1078 | | Log-likelihood = -1169.996 Chi2(16): 358.330 Prob > chi2: 0.000 | | |
|----------------------|-----------|---|----------|-------|
| Variable | LFP | | CCU | |
| | Coef. | S.E. | Coef. | S.E. |
| Constant | 0.302 | 0.463 | 0.391 | 0.598 |
| Wagehat | 0.335*** | 0.040 | 0.116*** | 0.393 |
| Pricehat | -0.470*** | 0.103 | -0.520** | 0.206 |
| Age | | | 0.374*** | 0.080 |
| Agemoth | -0.009 | 0.008 | | |
| Foreigner | -0.077 | 0.160 | -0.097 | 0.159 |
| Unincome | -0.283*** | 0.052 | 0.072 | 0.048 |
| Ad_children | -0.292*** | 0.876 | -0.201** | 0.086 |
| Adults | 0.218* | 0.118 | -0.031** | 0.123 |
| Availability | | | 2.329 | 1.823 |
| Unemploym | -0.021*** | 0.006 | | |
| Rho | 0.580*** | 0.041 | 0.493*** | 0.655 |

Significance level: *10%; **5%; ***1%.

Specification includes regional dummies.

Controlling for the childcare costs, the presence of additional children in the household continues to have a significant negative impact on LFP, as also reported by Powell (1997). Consistent with the expected income effect, higher levels of income earned by other members of the family but the mother are found to affect labour participation decisions negatively.

As reported by Powell (1997) and Cleveland *et al.* (1996), though contrary to Viitanen's (2005) findings, when we control for both wages and childcare costs,

the mother's immigrant status does not significantly affect her labour participation decision. On the contrary, labour market conditions, included through the regional unemployment rate, are still significant determinants of female labour participation.

With respect to the childcare use decision, one of the most significant determinants continues to be the age of the child, older children being more likely to be cared for at day-care centres. Once we control for the hourly price of childcare and the mother's expected wage, availability of informal modes of care, measured by the presence of adults in the household, has a significant negative effect on the probability of using market care, as also found in Cleveland *et al.* (1996). Additionally, compared to families with only one child, mothers are much less likely to rely on purchased care if they have more than one child under the age of 10⁷.

Surprisingly the regional availability rates of day-care places do not significantly affect the probability of using paid, formal care. Even if the positive sign of this variable is intuitively correct, we suspect that better, more disaggregated data may have resulted in more accurate estimates.

Participation and childcare use elasticities, based on the estimation results in this paper, are reported in table 9. Our main empirical finding is that the expected price of childcare exerts a statistically significant and quantitatively substantial negative impact on the decision to engage in paid employment. The elasticity of labour force participation with respect to the hourly price of care is -0.80, indicating that reducing childcare costs by 10% would lead to an 8% increase in the probability of engaging in paid employment. This figure lies within the upper end of the estimates found in previous literature which range from -0.14 in Viitanen's (2005) study for United Kingdom to -0.92 in Kimmel's (1998) study for the USA⁸.

The elasticity of labour force participation with respect to the mother's wage is 1.00. Previous estimates are quite similar (Cleveland *et al.* (1996), 0.81, Powell (1997), 0.85), with the exception of Kimmel's (1998) 3.25.

The elasticity of paid childcare use with respect to its own price is -0.89. This indicates that a 10% reduction in childcare costs would increase the probability of using market care by about 9%. Compared to previous studies, the figure lies within the range of former estimates which vary from -0.46 for United Kingdom (Viitanen, 2005) to -1.06 for Canada (Cleveland *et al.*, 1996) or -1.86 for the United States (Ribar, 1992).

⁷ Cleveland *et al.* (1996) report a similar result.

⁸ Blau and Robbins (1988) obtain -0.38, Cleveland *et al.* (1996), -0.39, Ribar (1992), -0.74 and Lokshin and Fong (2006), -0.46.

Table 9
PRICE AND WAGE ELASTICITIES FROM LFP/CCU MODEL. 1078 OBS.

| | LFP | | CCU | |
|----------|------------|-------|------------|-------|
| | Elasticity | S.E. | Elasticity | S.E. |
| Wagehat | 1.005*** | 0.123 | 0.353*** | 0.119 |
| Pricehat | -0.800*** | 0.178 | -0.893** | 0.357 |

Significance level: *10%; **5%; ***1%.

In order to test the sensitivity of our results with respect to the criteria employed in selecting the sample, we estimated equations (3) and (4) including 269 observations pertaining to the relative care choice, along with the parental care, no paid care option. This specification involves assuming families do not distinguish between taking care of preschool children at home by household members or relying in other relatives living in a different household. Table 10 shows elasticities computed for this new sample. As can be observed wage elasticities are quite similar to our former results. On the contrary, price elasticities are somewhat inferior. Nonetheless the figures are still substantial. In fact, the estimated elasticity of labour force participation with respect to the hourly price of childcare indicates that a 10% reduction of childcare costs would increase the labour participation rate of mothers of pre-school-age children by approximately 6%. This estimate can be considered a floor –and the former 9%, a ceiling– for the actual effect of a price reduction on labour participation rates.

Table 10
SENSITIVITY TEST. PRICE AND WAGE ELASTICITIES. 1351 OBS.

| | LFP | | CCU | |
|----------|------------|-------|------------|-------|
| | Elasticity | S.E. | Elasticity | S.E. |
| Wagehat | 0.928*** | 0.106 | 0.210** | 0.089 |
| Pricehat | -0.639*** | 0.139 | -0.603** | 0.225 |

Significance level: *10%; **5%; ***1%.

Finally, to asses the public policy implications of our empirical estimates, we simulate the employment effects of different levels of childcare costs subsidization. Specifically, we have calculated the mean predicted probabilities of labour force participation for direct childcare subsidies of 25%, 50% and 100%. The subsidy simulation provides estimates of the degree of employment response that could be anticipated in the event of significant childcare subsidies. The results of these simulations are given in Table 11, together with results from similar exercises.

Table 11
LABOUR FORCE PARTICIPATION SIMULATIONS

| Study | Country | Baseline | 25% sub. | 50% sub. | 100% sub. |
|-------------------------------|---------------|----------|----------|----------|-----------|
| This study | Spain | 39.9% | +8.1% | +16.3% | +31.7% |
| This study with relative care | Spain | 45.8% | +6.8% | +14.1% | +27.4% |
| Del Bocca and Vuri (2006) | Italy (North) | 61.5% | : | +15.5% | +26.5% |
| | (South) | 40.8% | | +2.7% | +5.4% |
| Kimmel (1998) | USA | 58.0% | | +5.0% | +9% |
| Powell (1997) | Canada | 46.4% | : | +9.5% | +16.8% |
| Connelly (1992) | USA | 58.8% | : | +5.2% | +9.9% |

The mean predicted probability for our original sample is 39.9%. This measure is very close to the actual participation rate in the sample, which is 41.0%. If childcare costs were subsidized by 50%, the model predicts a LFP rate of 56.2%. If childcare costs were fully subsidized the LFP probability rises to 71.6%. These simulations indicate that Spanish mothers' LFP behaviour can be expected to respond substantially to subsidized childcare. When families using primarily relative care are included in the sample, the changes in LFP rates predicted by the model are still considerable, with universal childcare subsidization implying that 73.2% of Spanish mothers would be employed. These results are similar to those found for Canadian (Powel, 1997) or Italian mothers living in non-rationed areas (Del Bocca and Vuri, 2006). United States' studies show slightly reduced effects.

CONCLUSIONS

This paper has analyzed the effect of childcare costs on the labour supply decision of Spanish mothers. This is done through the estimation of bi-variate probits on the probability of using formal paid childcare and the probability of engaging in paid employment on the labour market, being both decisions functions of expected childcare costs, expected wages and other household characteristics. Since childcare prices are not observed for families who did not purchase market care, and wages are not observed for mothers who did not participate in the labour market, sample-selection corrected estimates of expected costs and wages are used. The model is estimated primarily on data from the Spanish Time Use survey.

The key finding in this paper is that childcare prices significantly impede Spanish mothers' labour force participation behaviour. A commonly argued

rationale for government subsidization of childcare costs is to facilitate labour force participation by mothers. The responsiveness of the labour supply of mothers to childcare costs demonstrated in this study indicates that such subsidies do have their intended effect of encouraging labour supply.

Finally, we should recognize that the use of aggregate data is not optimal. Better data on child care costs and availability is desirable and would result in more accurate predictions⁹. Also, further research is required in order to analyze the distribution of mothers' time between the productive and reproductive activities (Le Fuvre, 1997) or the determinants and child developmental consequences of parental time investments in childcare (Blau, 1999, Averet *et al.*, 2005).

⁹ We have used regional data. County level data or data relative to Spanish provinces would be very illuminating.

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SÍNTESIS

PRINCIPALES IMPLICACIONES DE POLÍTICA ECONÓMICA

Este documento constituye, para España, el primer análisis del efecto de los costes de atención a los niños menores de tres años sobre la participación laboral femenina. Para ello se estima un modelo probit bi-variable de la probabilidad de utilizar servicios formales para el cuidado de los niños y la probabilidad de participar en el mercado de trabajo, considerando ambas decisiones en función tanto del precio esperado de los servicios, como del salario esperado de la madre. Se acentúa de este modo la interrelación existente entre la adopción de un modo formal de atención a los hijos y la decisión de participar en el mercado de trabajo. Dado que no se observan precios de atención para las familias que no utilizan servicios de mercado y que no se observan salarios para las madres que no trabajan, nuestro estudio estima precios y salarios esperados, adecuadamente corregidos para tener en cuenta el error de selección muestral. El modelo se estima principalmente a partir de los datos de la Encuesta de Empleo del Tiempo (INE, 2005).

La principal conclusión de este trabajo es que los precios de los servicios formales de atención a la infancia ejercen un efecto negativo significativo sobre la oferta de trabajo de las madres españolas. La justificación común de los subsidios de precio de los servicios de guardería es que éstos facilitan la participación laboral de las madres. De hecho, las últimas políticas de empleo de la Unión Europea han hecho hincapié en el papel de las decisiones de cuidado de los hijos sobre la oferta de trabajo femenina. El Consejo Europeo de Barcelona (marzo de 2002) declaró que los Estados Miembros debían eliminar los desincentivos a la participación laboral femenina e intentar llegar en 2010 a una cobertura de servicios de atención infantil de al menos el 90% para los niños entre 3 años y la edad escolar y al menos el 33% de los niños menores de 3 años. La sensibilidad de la oferta de trabajo de las madres a las variaciones en el coste unitario de cuidado de los niños, encontrada en este estudio, indica que este tipo de subvenciones ejercen ciertamente el esperado efecto de fomentar la oferta laboral femenina. Concretamente, de acuerdo con nuestros cálculos, una reducción del precio esperado de atención en torno al 10% conlleva aproximadamente un incremento de un 8% en la probabilidad de que la madre participe en el mercado de trabajo. Desde el punto de vista de la política económica, si pretende alcanzarse el objetivo de Lisboa de incrementar la participación laboral femenina, deberían llevarse a cabo políticas de reducción de los costes de atención, vía subvenciones o vía desgravaciones fiscales de este tipo de gastos. No parece que las políticas de subsidios familiares no finalistas puedan tener este beneficioso efecto. No en vano, nuestro estudio encuentra un fuerte impacto negativo del aumento de la renta no salarial de las madres sobre su probabilidad de participación en el mercado de trabajo.

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