Female employment and child care choices in Spain through the Great Recession

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Abstract

The aim of this paper is to analyse how the Great Recession has changed the patterns in female employment and the demand for formal and informal child care in Spanish mothers. We explore a sample of small children drawn from the EU-SILC (2005-2013). The analytical strategy consists in a set of *trivariate probit* models that allows to consider potential interdependencies amongst such decisions. Our results confirm that working women are more likely to use formal child care and formal and informal one are mutual substitutes. The interdependencies across these decisions have changed throughout the economic cycle as the complementarities between paid employment and the demand for external care seems to weaken while the substituibility across types of care becomes stronger. During the economic crisis, Spanish mothers tended to use less informal care, but not less formal care, which goes rather in line with their employment patterns.

Keywords: female employment; childcare; economic cycle; *trivariate probit.*

JEL Classifications: J13, J22.

1. Introduction

In recent decades women have considerably increased their labour force participation in Spain, particularly from the mid-80s and among married women and mothers (Treviño et al. 2007). Still, labour market participation rates of mothers have remained amongst the lowest in the European Union. At the same time, Spanish women also register very low total fertility rates (Bettio and Villa 1998; Del Boca 2002). This low-participation–low-fertility puzzle is a common feature of countries in the Mediterranean welfare regime and it is said to be very much related with their similarities regarding both labour market institutions and the provision of child and adult care (Del Boca et al. 2009).

Empirical evidence shows important interdependencies between mothers' labour participation and decisions concerning external child care (Heckman 1974; Chiuri 2000; Wrohlich 2004; Rammohan and Whelan 2005; Del Boca and Vuri 2007, among others). The first aim of this paper is to contribute to this strand of literature by simultaneously analysing the probability to work and to demand formal and informal childcare by mothers in Spain[1]. To conduct the analysis, we draw a sample of mothers and their young children (under 3 year-olds) from the Spanish Living Conditions Survey[2] from 2005 to 2013. The analytical strategy consists on a *trivariate probit* model, which allows to address potential inter-dependencies (complementarities and substituibilities) across labour market and childcare decisions. This approach is more realistic than multinomial models, which are commonly adopted in previous pieces of research to study the choice of type of childcare (Hofferth and Wissoker 1992; Connelly and Kimmel 2003); instead, it allows for both types of child care being combined as well as the possibility of no use of external care at all.

The second aim of this paper is to look at the evolution of mothers paid employment and their demand for different types of childcare along the economy cycle: As a result of the increase in the provision of places in pre-school education, the loss of jobs and, consequently, income from employment in Spanish households has not meant a reduction in the use of formal care, as would otherwise be expected during an economic crisis. As a matter of fact, during the Great Recession, informal care (most of which is unpaid) is far less common than before the crisis. Demand for formal care, instead, has followed a parallel pattern to maternal employment. But the economic crisis is expected to cause as well

[1] To the best of our knowledge, this is the first time the three decisions are simultaneously addressed to study the Spanish case; in Nicodemo and Waldmann (2009) a similar exercise is developed for Italy.
[2] It is the Spanish Section of the European Union Survey on Income and Living Conditions (EU-SILC), freely provided by the Spanish National Statistics Institute.

changes in the profiles of women in paid employment and their demand for childcare. Namely, a structural change may result from several forces: (a) a larger coverage from private and public provision for pre-school education and care in the context of shrinking cohorts of new-born children, (b) as unemployment amongst fathers persist and finally spreads among mothers as well, there is more parental time available in the households which turns into less demand for informal care, most likely to be used outside school hours and during working hours.

The demand for childcare should respond to mothers' preferences subject to income and time constraints, both of which depend on their employment status. At the same time, other resources and constraints may apply, such as the overall household income, the features of the child's father (ie, the mother's partner) and the household composition (featured by the number of children in different ages and coresidence with other adults that may provide informal care). Finally, the related literature also acknowledges the role of the so-called *environmental factors*, namely, the availability and cost of public and private childcare provisions/institutions. Which we only may take into account very indirectly. We aim at confirming/contrasting those drivers in the use of childcare in Spain while considering the endogenous nature of mothers' employment status in its demand. Moreover, our interest very much relies in detecting changes in their incidence and profile along the economic cycle: the irruption of the Great Recession means less employment opportunities for women and a reduction in households income, from which we would expect a more intensive connection between the demand for formal care and mothers' employment status. We have found that this has been instead overcome by a larger supply of places which (in our view) weakens such connection in the last years of the economic crisis.

Consistently with much of previous evidence in Spain and in other countries our main results show that, along the whole observation period, (a) more educated mothers are more likely to work and to use child care, as paid employment and demand for formal and informal childcare are positively correlated, while (b) formal and informal care are mutual substitutes. The age and composition of children in the household conditions the caring strategy in the family. Household income is positively related to the demand for formal care while is not relevant in the demand for informal care. Regardless the level of income in the household, mothers who receive child benefits are more likely to demand both formal and informal external care, most probably because a large part of child benefits are only addressed to working mothers. Those mothers who cohabit with their own parents (or in laws) are less likely to use formal care

(and more likely to deploy informal care) although the effect is not significant in specific sub-periods; non-partnered mothers are not necessarily more prone both to work and to demand external care.

During the Great Recession there have been changes in the profile of mothers in paid employment and in their demand for formal and informal care. Namely, the economic crisis has changed the profile of employment opportunities by age and therefore the demand for formal and informal care along the life cycle of Spanish mothers; it has considerably reduced the return to education in terms of employment opportunities; it has widened the gap in the use of external childcare between Spanish born and non-Spanish born mothers. It has increased income elasticity in the demand for formal care and it has weakened the connection between the demand for informal care and the mothers' employment status. Finally, as a result of the drop in the households income, there is a more intensive trade-off between formal childcare and informal childcare over the crisis.

The remainder of this article is organized as follows. In the next section, we explain the institutional set-up that affects formal care provision in Spain, as well as policies addressed to families with small children. In Section 3 we review the theoretical approaches that explain both mothers' labour market supply and use of external child care while Section 4 surveys some of the empirical works on those topics. Section 5 presents the data-set. In Section 6 the methodology and the main results are described. The article ends with a concluding section that outlines our main findings.

2. The provision of formal child care: early childhood education in Spain

In recent decades pre-school systems in developed countries have undergone profound changes to adapt to developments in families such as higher female labour market participation (Llorent 2013). Spain has not been an exception in this sense: early childhood education has considerably expanded, with the share of children attending pre-school education steadily increasing (Figure 1) over the last 20 years. The early childhood education system is organized into two cycles in Spain: the first one is for children up to 3 years old and the second one covers from 3 to 6 years of age only. Around two thirds of places in the latter are publicly provided and public education at that level is free. This probably explains the nearly universal employment rates in 3 (to 5) year-olds since the early 2000s, well above the average in the European Union.

Several causes or factors are potentially driving the increased use of pre-schools, day care centres or nursery schools in recent decades in Spain: the better knowledge about the benefits of schooling at an early age, the extension of new family models and of new patterns of behaviour in rising children (González López 2003), among others; however, the main one is the need for mothers to reconcile work and family life in the context of low incidence of part-time employment and extremely long and family unfriendly work hours during the day, as time use surveys reveal (Guner et al. 2014). Moreover, the use of (unpaid) parental leaves beyond the statutory (paid) 16 weeks is very limited[3].

The share of publicly provided pre-school places for under threes has steadily increased over the period and is nearly 50% in the recent years; as for the second cycle of pre-primary school, around two thirds of places are publicly provided. Moreover, many of the private pre-schools are publicly funded (*concertados*) and their fees are therefore rather inexpensive/affordable. The full-time (8 hours) average fees in private care centres were around 310 € (including daily meals) per month in 2009[4]. Public day care centres for under threes may be as expensive as private ones but the real paid fees are always below as they are subsidised for low income families, who have priority access to these centres. The cost of childcare in centres is therefore not dramatically expensive and their use is more constrained by the availability of places than by the price itself.

'Insert figure 1 here'

One may infer from the significant distance in enrolment between the first and the second cycle of pre-primary education that, in Spain, women must face difficulties to work until their children reach 3 years of age unless either informal help is provided within the family or private care (babysitters) is available in the market. . And, as a matter of fact, the provision of early childhood centres has become the main stimulus for female labour participation (Del Boca 2002), together with the presence of foreign labour force– often employed in domestic and care services - during the migration boom in Spain (Guner et al. 2014). Interestingly, and as a way to increase mothers' labour force participation, one of the most important family/child subsidies are only for working mothers as a deduction from their income tax[5] (100 € per month per child). From their design, family/child benefits for working women may be considered

[3] Whenever possible, mothers tend to extend their statutory leave by accumulating the statutory daily free paid hour for breastfeeding during 9 months so that they may lengthen it for a few weeks more. Mothers hardly ever take longer, unpaid leave, to look after their children (fathers, even less).

[4] This information has been obtained from a private survey, *Consumer Erosky* (2009), which only covers 18 out of 50 provinces. Prices vary quite a lot both across and within provinces.

[5] Royal Decree 27/2003, dated 1-10-2003; introduced as a reform to the Income Tax Law. It is still in force.

regressive but the provision of care in public centres together with other specific income tested benefits for low income families may compensate for this. Moreover, from July 2007 to the end of 2010 a universal child benefit of 2,500 € paid at the moment of birth was implemented[6]. It had a mild positive impact on fertility rates while negative on mothers' labour force participation soon after childbirth (González 2013).

Overall, second cycle pre-school is fully in force but coverage for under threes is still incomplete. Formal care is not particularly expensive but, it is still related to income and employment. What is more, policies aiming to help mothers are mostly addressed to working mothers. Anyway, their amounts are not high enough to fully cover child care and to effectively enhance female labour market participation.

3. Theoretical approaches to mothers' labour force participation and use of childcare

In industrialized countries women face severe difficulties to look after their children at home while in paid employment (Connelly and Kimmel 2003) as these two activities usually represent competing uses of time. Consequently, the provision for childcare is a relevant determinant in mothers' labour participation decisions (Connelly 1992). As a matter of fact, female labour supply and demand for child care are most likely simultaneous decisions, often within the couple. This section aims at providing theoretical background that points at determining factors of the decisions of them all from human capital and consumer choice approaches.

The first and best known / standard economic approach to female labour participation decisions, the New Economics of the Family (Becker 1960) is both based on and favours the gendered division of labour. The household is the unit of analysis and decision making, where adults allocate their time in the production/provision of both market and non-market goods. Time in the labour market will allow for the former and time at domestic activities, for the latter. Each family member will specialize in that activity where she has a greater comparative advantage, namely, a higher efficiency or productivity and lower opportunity cost. As women's productivity at home is often higher than their potential labour market income, the optimal allocation of their time between the market and household production will be very much in oriented to the latter (Lokshin et al. 2000). Likewise, men will specialise in the labour market.

[6] Law 35/2007, dated 11-15-2007. It was colloquially known as "*cheque bebé*".

The postulates of the New Economics of the Family are therefore fully consistent with the traditional allocation of time within the couples, the male breadwinner model, which was prevalent in Spain until the 80s (Martín García and Castro Martín 2013).

But in recent decades there has been an increase in two-income couples because of women's longer investment in education - among other sociological and cultural factors. Consistently with the human capital approach, as women's productivity in the labour market increases, they spend more time in paid employment and less on the production of domestic goods, while demand more formal and/or informal child care. Therefore, more educated women will be particularly likely to work and to demand external care for their children, both formal and informal.

In the consumer choice approach (see Chaudry 2010, for a throughout review) child care services are demanded by mothers in accordance to their preferences and in response to their absolute and relative prices (the price of alternative options) and consistently with their budgetary restrictions. The latter are defined by the mothers' own income from work and income from other sources, such as their husbands'/partners' income and other coresident relatives' as well as family/child benefits.

Like any other demand for goods or services, the choice for formal versus informal care responds to preferences. For instance, more educated women are more likely to demand formal care not only because of their higher expected income, but also because of their awareness of the benefits from pre-school; in the human capital terminology, they are more likely to value quality over quantity of children (Smith and Ratcliffe 2009). Secondly, the choice for formal versus informal care may also respond to their relative prices and the potential economies of scale in its use: if there are several children in the household in pre-school age paid informal care may be more interesting than paid formal care while formal care is better for children without siblings as it helps them to socialize (Del Boca and Vuri 2007); likewise, if there were siblings in school age in the household, formal care and pre-school or day care centres may be more convenient to arrange care the education and care of all the children in the household at a time. Thirdly, constraints from the supply side, defined by the availability of places in public and private pre-school centres as well as informal help networks (nearby relatives and friends) are also relevant in the demand for childcare (Borra 2010).

One of the assumptions in the conventional consumer choice approach when applied to the demand for child care is that it is a discrete choice in the sense it only contributes to maximize the

mothers' utility concerning childcare, which is largely separate from other utilities (Chaudry et al. 2010). This assumption is not realistic in the case of the utility from labour force participation, among other choices. There is in fact a fruitful strand of literature where mothers' labour supply decisions (whether to work or not and for how many hours) and child care demand are modelled simultaneously (Chiuri 2000; Del Boca and Vuri 2007). This allows to control for potential interdependencies across these two decisions, consistently from the predictions from the above explained New Economics of the Family framework. In the empirical exercise to be developed in this paper these interdependencies are taken into account.

4. Empirical evidence on mothers' employment and childcare decisions

Pioneering research on the relationship between demand for child care and female labour market participation mainly focused on exploring the effects of childcare costs on mothers labour supply decisions – measured by worked hours- in the United States and the United Kingdom (see Heckman 1974). Later on, Blau and Robins (1988) confirmed the impact of the costs of care in participation decisions: child-care costs reduce the probability of using purchased child care by non-working mothers and even discourage women from working. Similarly, Connelly (1992) and Ribar (1992) with data from the 1984 Panel of the Survey of Income and Program Participation (SIPP) find that high child care costs have a strong negative effect on married women's labour supply to the point to entirely explaining the gap between labour force participation rate in mothers of pre-schoolers and the rest of women. Averett et al. (1997) study a sample of married women from the 1986 wave of the National Longitudinal Surveys of Labor Market Experience of Youth (NLSY) and show that women's labour supply responds to the effective wage (i.e., the wage net of child care costs and family subsidies – when applicable) rather than to the (expected) gross wage. Kimmel (1998) distinguish between married and single mothers in the 1987 SIPP and find that the child care price elasticities differ across marital status: it is lower for married mothers as they are more responsive to quality factors than single mothers (Connelly 1992). Similarly, Jenkins and Symons (2001) find significant disincentive effects for child care costs on lone mothers' employment rates.

Similar evidence for other Anglo-saxon liberal countries such as Canada (Powell 1998, 2002) and Australia (Rammohan and Whelan 2005) confirm that childcare prices have significant negative

effects on the probability of working, particularly on a full-time basis. Doiron and Kalb (2002, 2005) show substantial and negative price elasticity for formal care, with informal care being a substitute to formal care for most households.

The relationship between child care and labour market participation has been studied in continental and southern European countries: Netherlands (Van Gameren and Ooms 2009; Wetzels 2005); Germany (Wrohlich 2004) or Italy (Chiuri 2000; Del Boca 2002 and Del Boca and Vuri 2007). In contrast to most of the evidence from Anglo-saxon liberal countries, in the Netherlands higher costs of childcare were found not to have significant effect on the probability of women participating in the labour market (Gameren and Ooms 2009; Wetzels 2005). Similarly, Wrohlich (2004) show a small significant effect, much lower than in other countries, of child care costs on mothers' labour supply behaviour in Germany. Meanwhile, Chiuri (2000) and Del Boca and Vuri (2007) analyse the effect of child care costs on mothers' employment considering the rationing in the provision of care services, which is an important factor in interpreting price effects on employment and use of child care.

In Spain relatively few studies childcare and mothers' labour supply decisions explicitly analyse the relationship between women's employment and childcare (Baizán and González 2007; Borra 2010). Exploring the Spanish Labour Force Survey (EPA), Baizán and González (2007) analyse the effect of childcare availability on women's labour force participation and conclude that it has a positive effect on female employment; Borra (2010) exploits the Spanish Time-Use Survey (STUS) to instead study the effect of childcare costs on the female labour supply decision. Her main conclusion is that childcare prices negatively affect female labour force participation.

Another group of studies analyse the determinants of the use of childcare. These include women's education attainment and wages, household income or price of care, among others. Nicodemo and Waldmann (2009) find that the education attainment of both parents is positively correlated with the number of hours children spend in childcare and women's wage has a positive effect in the use of childcare arrangement. In Spain, Borra (2010) confirms that more educated mothers are more likely to purchase childcare and their wages have a significant positive effect on paid childcare use. Only a few pieces of work find no significant relationship between the educational level of the mother and the use of care (Cleveland et al. 1996; Del Boca and Vuri 2007).

The decision to use formal childcare is expected to be influenced by the mothers' education attainment and wage, her partner's wage and the household income. Still, evidence is not conclusive on

this respect. Chiuri (2000) shows finds a positive effect of household non-labour income on household expenditure on formal childcare in Italy, but no significant impact in the husband's wage. In the same line, Del Boca and Vuri (2007) find that families with higher levels of unearned income pay significantly more for care, while husband's labour income does not have a significant effect. Additionally, Nicodemo and Waldmann (2009) did not find a significant relationship between the use of care and husband's hourly wage.

Finally, childcare cost also plays an important role in women's childcare decisions, as it reduces the demand for market/paid chidcare (Cleveland et al. 1996; Viitanen 2005). Similarly, Duncan et al. (2001) show that the hourly cost of childcare shows a strongly negative significant impact on childcare decisions and, specifically, Borra (2010) indicates that a 10% reduction in childcare costs would increase the probability of using market care by about 10%.

In a different strand of literature the demand for diverse types of childcare (formal *versus* informal and also paid *versus* unpaid) are explored. The first and most common explanatory variable in the childcare choice is the mother's income, often from paid work. In fact, many pieces of research in this line of work focus only on employed mothers. Hofferh and Wissoker (1992) estimate the probability of married mothers using child care for under six year-olds while Michalopoulos and Robins (2002) estimate single mothers demand for child care for their under-five year-olds. Both pieces of evidence confirm that the mother's wage rate has a significant effect on the choice of type of care; namely, it increases the option for paid care over relative, unpaid care. Moreover, Hofferh and Wissoker (1992) find that the price of a type of care will reduce the use of that care and increase the use of other types of care.

Mothers' education attainment also determines their preferences for certain types of care: Duncan et al. (2001) and Viitanen (2005), exploring Family Resources Survey (FRS), a cross-sectional survey of British households, conclude that women with higher education are more likely to use formal childcare. In the same vein, Leibowitz et al. (1992) show that American women with college education are more likely to choose nonrelative care.

Similarly, Borra and Palma (2009) find that employed mothers were much more likely than non-employed mothers to use relative care, babysitter care or care at a day care centre. Meanwhile, Connelly and Kimmel (2003) confirm that women who work full time are more likely to use centre-based care and less likely to use relative care. This may be the result of higher affordability of this type of care but also of their need to cover longer hours of childcare, which are more difficult to obtain from informal carers.

Moreover, higher non-labour income increases the probability of using centre-based care, while more expensive centre-based childcare increases the probability of using relative care. Such results are later confirmed, among others, in Doron and Kalb (2005): fees are negatively related to usage of formal care while income is positively correlated with the usage of both formal and informal childcare.

5. Database and Sample

The data used in this article come from the Spanish Living Conditions Survey (SLCS), which covers income and living conditions issues at either household or individual level (Atkinson and Marlier 2010), but also addresses education and labour market (employment and job search) issues, among others. The cross-sectional files of the SLCS micro-data provide detailed information about hours per week spent in different types of childcare for each child in the household. The wording of the questionnaire items allows to differentiate between formal and informal care. Formal care refers to education at pre-school, education at compulsory school, child care at centre-based services and child care at day-care centres; informal care is related to child care by professional child-minders - at child's the home or at the child-minder's – by grandparents, by other household members (outside parents) or other relatives, friends or neighbours.

We explore nine waves of the SLCS (2005-2013). The sample is a pool of young children (under 3 years old[7]) caring records which have been matched to their mothers' personal information (working status, educational attainment, age and nationality) and other information from their household composition and income. Our sample is therefore made up by mother-child observations, completed with a set of variables at the household level capturing income (total disposable household income and perception of family/child benefits in the household in the year of reference for the information on income), the presence of other children/siblings of different ages in the household, the presence of the mothers' parents (or in laws) and the mothers' partner (*ie*, the child's father or stepfather) labour market status (if present). Finally, environmental variables such as the region of residence (NUTS1) and the degree of urbanization will be used to identify employment opportunities for women and informal and formal care availability/supply. After dropping observations with missing values in any of the variables

[7] The 3 year-old children in the sample are only up to 42 months. Otherwise, at the moment of the interview (between January and June every year) they would already be in pre-school. As already mentioned, from that age on, pre-school net enrolment rate is nearly universal so that the decision for formal care is no longer relevant in our study.

used in the multivariate models, the final selected sample is made by 9,046 mother-child observations (corresponding to 7,558 mothers).

Table 1 describes the distribution of the three dependent variables in our study as regards the incidence of the three decisions (mother in paid work, use of formal care and use of informal care) and their combinations/inter-relations: near 56% of the observations correspond to children of working mothers, 40% of the children in the sample receive formal care while only 20% of them receive informal care. Most children receiving formal care attend pre-school centres while the large majority of informal care is provided by friends and relatives.

Interdependence and substitution effects across decisions are also noticeable: both formal and informal care are more frequent in children of working mothers than the average, with a 9 and 8 percentage points higher incidence, respectively. At the same time, the share of working mothers is higher than the average amongst those children who receive formal care (15 percentage points higher) and, particularly, amongst those who are looked after by informal carers (around 17 percentage points). Formal and informal care are shown to be substitutes of each other, as children who receive formal childcare are less often looked after by informal carers than the average (5 percentage points less) and those who have informal carers receive less formal care (11 percentage points) than the average.

'Insert table 1 here'

Over the 2007-2013 period there were interesting and relevant changes in the employment patterns of mothers and the demand for childcare: in consistence with the well-known added worker effect phenomenon in Spain during the economic crisis (Anghel et al. 2014), there was an increase in the employment rate of mothers in Spain during the economic crisis with peak employment rates in 2008 and 2011 followed by a final drop to 2005 levels (Figure 2, upper part).

'Insert figure 2 here'

Interestingly, the use of formal care is quite stable but smoothly follows the trend in mothers' employment patterns. Overall, there has been a considerable decrease in the demand for informal care, with two noticeable drops in 2008 and 2013; both years are marked by important job losses; the first is the outburst of the recession, particularly affecting male-oriented industries, and the latter is related to recent broader employment losses also in services (and therefore, affected women as well). The progressive reduction in the use of informal care may also reflect a compositional effect: as fertility rates decline, the

age of children in the sample is increasing along time and the use of informal care is lowest amongst the 3 year-olds (Figure 2, lower part).

The mean values of all the explanatory variables in the multivariate models are presented in Appendix Table A.I. They are organized in five groups: (a) mothers' characteristics; (b) age of the children and presence of siblings of different ages in the household; (c) income variables (total household disposable income, receipt of child/family benefits); (d) other features of the household (presence of grandparents, presence and labour market status of the fathers / mothers' partners) and (e) environment variables (NUTS1, degree of urbanisation and period/year of observation). Regarding mothers' personal characteristics, 70% of mothers are in their thirties. In terms of educational attainment, the educational structure is certainly polarised, with 32% of children having low educated mothers (at most, compulsory education) while 43% of children have university graduate mothers. Consistently with the process of educational expansion in Spain over the last decades, during the observation period there has been an increase in the education attainment of mothers. Employment rates of mothers as well as their demand for both formal and informal care for their children go hand in hand with educational attainment. Over 23% of the children had non Spanish-born mothers, featured by lower employment rate and demand for child care than native mothers.

The evolution of the age distribution in the children in the sample reflects the decrease in fertility rates since 2009. Around 15% of the observations of under 4 year-olds correspond to children with other siblings in the same age range only. In this case mother's employment rates are considerable lower than the average and so it is somehow the use of informal care. Children who have only over 3 year-old sibling(s) account for 42% of the sample. In case of families with more than one under-three and at least one child over that age, mothers' employment rates do not differ much from the average, but the demand for care does.

Around 8% of young children live with at least one grandparent (namely, the mother's parents or in laws); those children receive less formal care than the average. Nearly 6 % of children in the sample live with unpartnered mothers, whose employment rates are well below the average. The share of children living with working fathers or stepfathers has severely dropped over the observation period. Accordingly, the share of short-term unemployment fathers increased in 2008-2010 over 2005-2007, and later on, in the 2011-2013 period, there was an upsurge in the share of long-term unemployed fathers/stepfathers.

The higher the level of household income, the higher the incidence of both types of care. Around 1/3 of children live in households which had received family/child allowances the year prior to the interview (the reference year for all income variables). Because of the universal child benefit in the period 2008-2010 (a lump sum at the moment of birth), the observations in this period register a higher incidence of such benefits (10 percentage points). In Spain, family benefits are more frequent amongst working mothers, as mentioned in Section 2, which explains the higher share of working mothers amongst those children who live in households with this source of income. Despite child/family allowances are not very generous in Spain, they are related to a higher incidence of both formal and informal care (some of which is paid) although it is difficult to disentangle to which extent this is due to the amount of the benefit itself or to the fact that working mothers are more likely to receive child benefits and non-working mothers, to have special discounts and easier access to public pre-schools and child care centres.

Nearly half of the observations correspond to families living in densely populated areas. Interestingly, although mothers in thinly populated areas are less likely to work than those in intermediate and, particularly, in densely populated areas, the level of demand for care does not differ very much across levels of population density. This is somehow puzzling as mothers living in densely populated areas are expected to have more formal care opportunities and mothers living in small cities and villages should have a tighter network of friends and relatives. As regards NUTS1[8], the regions with the highest level of maternal employment (East and North-West) are not necessarily the ones with the highest incidence of formal care (both North-East and North West).

6. Methodology and results

6.1. Methodology

In order to take into account the endogenous nature of mothers' employment status and their demand for formal and informal care we estimate them simultaneously with a multivariate *probit* model. This strategy allows to consider potential unobserved characteristics that may influence all three decisions at a time and may cause the correlation across them. Our *trivariate probit* model starts from three latent

[8] NUTS1 are seven large areas which aggregate the 17 regions/autonomous communities in Spain: Madrid, Northeast (the Basque Country, Navarre, La Rioja and Aragon), North-west (Galicia, Asturias and Cantabria), Centre (Castilla y Leon, Castilla-La Mancha and Extremadura), East (Catalonia, Valencia and Balearic Islands), South (Andalusia, Murcia, Ceuta and Melilla) and Canary Islands.

variables, y_{i1}^*, y_{i2}^* and y_{i3}^*, representing the latent utility or propensity of working, using formal childcare and using informal childcare, respectively (for a thorough explanation of the model, see Greene 2003):

$$y_m^* = \beta_m' X_m + \varepsilon_m, \qquad m = 1, 2, 3 \tag{1}$$

$$y_m = 1 \text{ if } y_m^* = > 0 \text{ and 0 otherwise} \tag{2}$$

where X_m (m = 1, 2, 3) are the vectors of observable variables that are expected to explain each decision; β_m (m = 1, 2, 3) are the vectors of unknown coefficients to be estimated, the error terms, ε_m, represent the impact of unobserved variables on y_m and are normally distributed with mean 0 and variance 1. The joint probability of the three decisions ($y_m = 1$) conditioned to parameters β, Ω and the set of X_{im} explanatory variables is as follows:

$$Pr[y_m = 1, i = 1,2,3 \,|\beta, \Omega]$$

$$= \int_{-\infty}^{\beta'_1 X_1} \int_{-\infty}^{\beta'_2 X_2} \int_{-\infty}^{\beta'_3 X_3} \emptyset(\varepsilon_1, \varepsilon_2, \varepsilon_3, \rho_{12}, \rho_{13}, \rho_{23}) d\varepsilon_3 d\varepsilon_2 d\varepsilon_1 \tag{3}$$

where ϕ is the density function of a *trivariate normal* distribution with mean vector 0 and variance-covariance matrix (correlation matrix) Ω. The error terms, ε_m, may be mutually correlated, with off-diagonal elements of the variance-covariance matrix (Ω) being ρ_{12}, ρ_{13} and ρ_{23}. The sign and significance of the pairwise correlation across the errors of the three equations contribute to our understanding of complementarities between women's decisions and substituibility between types of childcare. The New Economics of the Family theoretical background, the existing evidence and our own descriptive analysis lead us to expect paid employment to be positively correlated with the use of formal and informal child care (ρ_{12} and $\rho_{13} > 0$) [H0A]; at the same time, since both types of care are mutual substitutes, their error terms will be negatively correlated ($\rho_{23} < 0$) [H0B].

The estimated structural model allows for vectors X_m to differ, which is convenient to set exclusion restrictions. As mentioned above, we distinguish five sets of explanatory variables in the vectors X_m: (a) mothers' characteristics (age, education attainment and foreign/native born); (b) age of the children and number of siblings in different age ranges; (c) income variables (overall household income and receipt of child/family benefits); (d) other features of the household (presence of grandparent(s), and partner's labour force status – when present) and (e) environment variables (NUTS1, degree of urbanisation and period/year of observation).

In our estimation we deploy a simulation-based method implemented in Stata by Cappellari and Jenkins (2003), the *mvprobit* command. Additionally, since the sample is made by a pool of young children, some of which are siblings (our sample is made by 9,046 children from 7,558 mothers), we obtain a robust estimation with clustered errors at the household level.

In accordance with the already outlined trends from the literature review and our own description of the sample our hypotheses about the main variables of the model are as follows:

H1: Mothers' age is a proxy for potential labour market experience and therefore correlated with their potential expected wage, which increases the shadow price of leisure and housework and, hence, also the probability of being in employment. Women in paid employment are more likely to use child care both because they have time restrictions and because they can afford paid care. Nevertheless, as women age they may have more children, which will increase the cost of care to the point of decreasing the net returns from paid employment and, consequently, employment probabilities. We therefore expect a non-linear relation between mothers' age and both the likelihood of employment and demand for formal and informal care.

H2: Mothers' educational attainment provides incentives to participate in the labour market and increases the opportunity cost of not participating; it is therefore expected to positively contribute to the likelihood of being in paid employment and using child care (Nicodemo and Waldmann 2009). In addition they can value more the services provided by regulated child care settings, such as the opportunity for socialization with other children, relationship with teachers, etc. (Del Boca et al. 2005). Therefore education attainment will be more positively related with the demand for formal care than with the demand for informal care.

H3: Foreign-born mothers we may be less likely to work as they face more severe difficulties both to combine work and family and to ask for help from informal carers than Spanish-born mothers. Similarly, their reduced employment chances and expected income may also drive them to a lower demand for formal care as well.

H4: The demand for formal care will depend more on household income than the demand for informal care, most of which is unpaid (provided by relatives or friends).

H5: The number of children in different ages may as well influence the use of both formal and informal care, the overall cost of child care in the household and potential economies of scale in the

provision of child care. The presence of more small children might discourage rather than encourage mothers' paid employment. The presence of elder children might instead favour the demand for formal care to facilitate caring arrangements in the same or nearby educational centres for all the children in the household.

H6: The presence of the mother's parents or in laws would provide support in informal child care and reduce the need for formal childcare.

H7: Non-partnered women and those with an unemployed partner are more likely to work (and to demand both sorts of care) as they have less economic support to raise their children (income effect and added worker effect).

H8: The higher the degree of urbanization, the more opportunities for mothers to work and to demand formal care and the less likely the use of informal care will be, as relatives and friends may live far away and/or be unavailable to help with the children if they are in paid work themselves as well.

Since our interest very much relies in detecting changes in the demand for childcare and labour market participation along the Great Recession, we may as well hypothesise how these decisions and their interconnections may change with the deterioration of the economy, as we expect to find a structural change in mothers' access to paid employment and demand for external care along the economic cycle. In order to take this into account, we have estimated three sub-period specifications: the before crisis period (2005-2007), the early years of the crisis (2008-2010) and the late phase of the recession (2011-2013). From this strategy, we expect to find that:

H9A: During the years of the recession the positive connection between paid employment and demand for childcare will strengthen as families with women in paid employment will be characterised by a larger income gap with the rest of households than before the crisis. Additionally, because of increasing income restrictions in the households, the negative correlation between the use of formal and informal care will also strengthen as their sustituibility will become more intensive (H9B).

6.2. Results

The results of the multivariate analysis may be found in Table 2. We discuss here how the explanatory variables (arranged in 5 groups) influence the three decisions along three specified phases of

the economic cycle. We display marginal effects instead of coefficients to better appreciate the size of the effects of the diverse explanatory factors and to compare the profiles of the three decisions across specifications, *ie.* along the economic cycle.

'Insert table 2 here'

Consistently with Ribar (1992) and Kimmel (1998), the probability to work and use formal and informal care increased with age, but at a decreasing pace. Therefore, the profile of being in paid employment displays an inverted *u* shape (H1 is confirmed). Nevertheless, when the observation period is split into thirds, this holds only clearly in the 2008-2010 period.

Education attainment is positively related with the decision to work and with the demand for formal care, but not with the demand for informal care (H2 is confirmed). This is in line with Leibowitz et al. (1992) and Nicodemo and Waldmann (2009). Interestingly, the impact of education on the likelihood of being in paid employment was stronger before the crisis (2005-2007) than during the recession. Additionally, the impact of mothers' education attainment on the demand for formal care also varies along the economic cycle: it reaches peak levels at the first stage of the crisis.

Foreign-born women are less likely to work and to use both type of childcare than Spanish–born (H3 is confirmed). This result differs from those obtained by Borra (2010), who finds that the mother's immigrant status does not significantly affect her labour force status.

The demand for formal care is more responsive to the total household income than the demand for informal care (H4 is confirmed) though this is only clear in the last stage of the economic crisis. Interestingly enough, though, the demand for informal care is more responsive to the perception of child benefits in the household than the demand for formal care, and this holds true along the whole observation period.

As children age their mothers will be more likely to resume/start work and to demand formal care, while informal care is more common in 1 year-olds than for both young babies and elder children. These results are in line with those obtained by Hofferth and Wissoker (1992) and Michalopoulos and Robins (2002). Interestingly, during the economic recession (2008-2010 and 2011-2013), the likelihood of mothers being in paid employment did not significantly increase until their children reached 3 years of age.

Our results concerning the impact of the composition of siblings show that only mothers with children both under and over 3 years old are less likely to work than mothers with a single under-three (H5 is confirmed). And the presence of more under threes in the household increases the likelihood of using formal care for all of them and decreases the demand for informal care. This result is in contrast to Michalopoulos and Robins (2002) who find that the number of children under age 6 in the household reduces the probability of using centre care but increases the probability of non-relative care. Still, it makes perfect sense in the institutional context described in Section 2, as most informal care in Spain is unpaid. Therefore when there are two or more children in pre-school age in the household the potential economies of scale of hiring baby-sitters are overcome by the larger difficulty to find informal unpaid carers for more than one child. As child benefits to contribute to the affordability of formal care centres (often low/ subsidised) fees by some families, they may as well partially explain the preference for formal over informal care in households with more than one child under age 3.

Regarding other family variables, the presence of grandparents in the household is hardly related with a lower demand for formal care, and this may be due to the fact that it is also weakly connected with a lower likelihood of being in employment (H6 is not confirmed).

Interestingly, if the mother's partner is out of employment, women were more likely to work only during the pre-crisis period. In addition, un-partnered women are only more likely to work in the 2008-2010 period. Therefore, H7 is not confirmed.

Women residing in thinly populated areas are less likely to be in paid employment but they are not less likely to use informal care than those living in intermediate and low populated areas (H8 is not confirmed). These results differ from those which find less employment opportunities and a reduced provision of formal care in rural areas (Hoffeerth and Wissoker 1992) as well as those finding a higher employment probabilities in women residing in metropolitan areas (Ribar 1992; Nicodemo and Waldmann 2009).

Overall, the results show that during the economic crisis, women have been more likely to be in paid employment (except in 2013) and less likely to use informal care while the use of formal care is rather steady until the second phase of the crisis, in line with mothers' employment (our initial expectations are only partially confirmed in this sense). This may be a result of the significant added worker effect and the availability of more time from husbands to look after their children which means a

lower need for informal care of family members living outside the household. The extension of formal care provisions both in public and private centres and, particularly, the greater share of public places in pre-school and early child care centres may partly explain this result as well.

From the sign and significance of the different *athrhos* (the estimated proxies for ρ_{12}, ρ_{13} and ρ_{23}, that is, the pairwise correlations of the error terms across the three equations), we confirm the positive correlation between work and child care and the negative correlation between formal and informal child care that reflects that they are substitutes of each other. During the economic crisis, though, the size of the interdependencies across decisions have changed. Interestingly the pre-crisis period (2005-2007) and the first stage of the crisis (2008-2010) were very similar in this sense and the changes were only appreciated during the late phase of the recession (2011-2013). First, the correlation between being in paid employment and demanding external care for children decreased (H9A is not confirmed). This means that in this period mothers' employment and the demand for formal childcare became independent decisions. Although this result challenges our initial hypothesis it may mean that the extension and coverage of formal public care over the whole observation period reduces the connection between mothers labour force status and the demand for formal care. Still, as part-time employment is not common in Spain, many working mothers will need extra help with their children outside school hours. This help is likely to be provided under informal basis. Secondly, and consistently with our expectations, the sustituibility relation between formal and informal care have become more intensive during the economic crisis as ρ_{23} keeps negative and increases in absolute value (H9B is confirmed).

7. Conclusions

In this paper, we have analysed the determinants of the labour force participation and child care in Spanish women. We have distinguished between formal and informal care. Since empirical evidence suggests that employment and child care decisions are closely linked and there are common determinants that affect to the three decisions simultaneously, to avoid a possible endogeneity problem in the estimation of all of them, we estimated a *trivariate probit*, which allows errors to be correlated and therefore estimates three equations simultaneously. We have exploited a sample of under-threes linked to their mothers' records/registers, drawn from the Spanish Living Conditions Survey (2005-2013) which provides information about the different forms of care provision used for the child.

The results from our estimations confirm that the mothers' decisions to work and use childcare are positively correlated (working women are more likely to use child care and *vice versa*) while the two types of care are negatively correlated (as they are mutual substitutes). This also confirms that the chosen strategy (*trivariate probit*) is correct and preferable to separate estimations.

Some of our initial expectations concerning the profile of mothers' employment and child care decisions were confirmed: (a) the probability to work and use formal and informal care increased with age, but at a decreasing pace; (b) education attainment is positively related with the decision to work and with the demand for formal care, but not with the demand for informal care; (c) foreign-born mothers are less likely to work and to use both type of childcare than native–born; (d) the demand for formal care is more responsive to the total household income than the demand for informal care and (e) the presence of more under threes in the household increases the likelihood of using formal care for all of them and decreases the demand for informal care. Still, our expectations concerning some other features of the household composition, such as the presence of the children's grandparents and the labour force status of the mother's partner (when present in the household) were not confirmed.

We have as well observed relevant changes in the incidence and profile of the decisions under study during the economic crisis: women have been more likely to be in paid employment and less likely to use informal care during the Great Recession while the use of formal care is rather steady until the second phase of the crisis, in line with mothers' employment. The economic crisis has meant unbearable job losses for both Spanish women and, particularly, for their husbands. As a result, the already very low fertility rates are again decreasing, not only generating disutility and frustration in many women and families but also contributing, in the long-term, to the financial imbalance in Social-Security system. The cutbacks in social expenditure and the reduced income in households with young children may not imply a retreat in the child care system in Spain which had experienced a long-term sustained evolution in the last decades. This should be prevented at any rate: keeping the system of formal child care in good shape is very important to avoid that women will find provision of child care as an obstacle to participate in the labour market. If the incipient economic recovery is confirmed, our early care and education system must be ready to fuel female employment in the future.

Acknowledgements

This research was supported by *Consejería de Educación, Cultura y Deportes* of the *Junta de Comunidades de Castilla – La Mancha* (ref. POII-2014-014-A).

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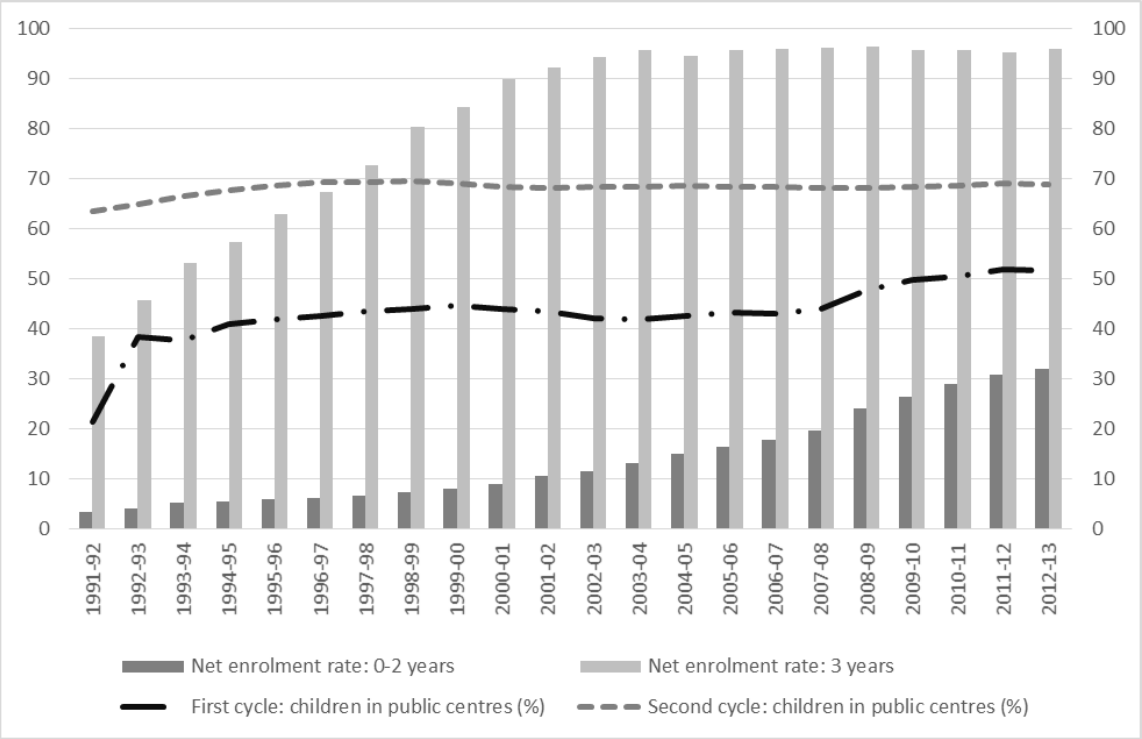
Figure 1: Net enrolment rate in pre-school in Spain and share of pre-school students in public centres, by cycle (1991/92-2012/13)



Source: Spanish Ministry of Education, Culture and Sports.

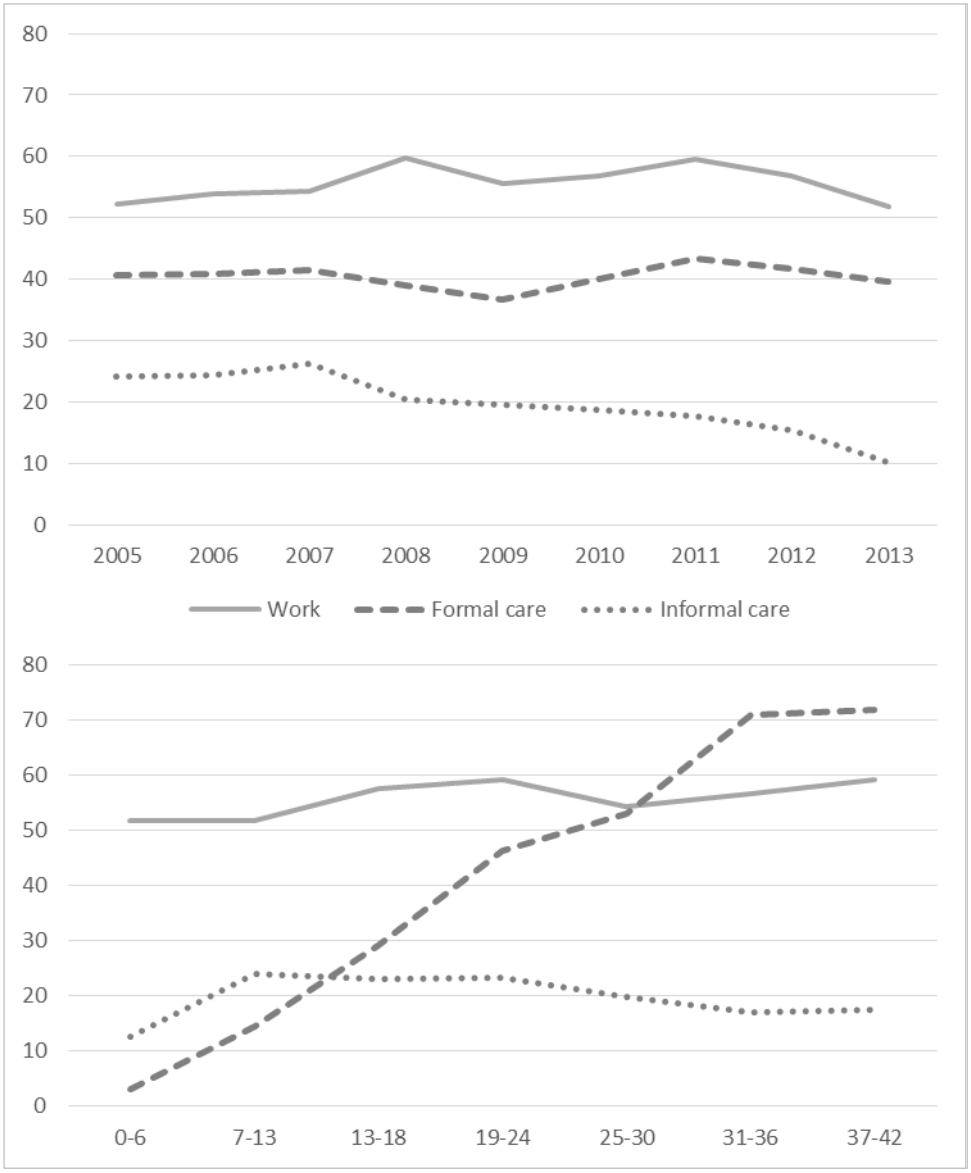
Table 1. Dependent variables: incidence and interdependencies across employment and child care decisions.

Dependent variables (incidence)	**2005-2007**	**2008-2010**	**2011-2013**	**Overall (2005-2013)**
Work	**53.57**	**57.43**	**56.01**	**55.72**
Formal care *	**41.07**	**38.64**	**41.54**	**40.39**
Pre-school	38.11	37.59	40.67	38.79
Centre-based	0.55	0.04	0.00	0.19
Day-care centre	3.03	1.21	0.99	1.72
Informal care *	**25.00**	**19.59**	**14.41**	**19.59**
Professional child-minder	5.14	2.82	1.15	3.00
Relatives, friends	20.34	17.16	13.42	16.93
Dependent variables (Interdependencies and substitution effects)				
	Work	**Formal care**	**Informal care**	
Overall	**55.72**	**40.39**	**19.59**	
Work	100	51.21	29.20	
Formal care	70.64	100	14.37	
Informal care	83.04	29.63	100	

Source: Spanish Living Conditions Survey (SLCS), cross-sectional files 2005-2013, Spanish Statistical Institute.

*: Since children may receive several types of formal or informal child care, the shares of observations in the different types do not add up to the share of children receiving formal/informal care.

Figure 2: Mothers employment and child care decisions across time and children's age children (in months).



Source: Spanish Living Conditions Survey (SLCS), cross-sectional files 2005-2013, Spanish Statistical Institute.

Table 2. *Multivarite probit* results (marginal effects).

		Specification 1 (total)			Specification 2 (2005-2007)			Specification 3 (2008-2010)			Specification 4 (2011-2013)		
		Work	**Formal care**	**Informal care**	**Work**	**Formal care**	**Informal care**	**Work**	**Formal care**	**Informal care**	**Work**	**Formal care**	**Informal care**
Mother's age (*ref.* Less than 25 years)	From 25 to 29 years	0.114 (0.003)	0.084 (0.001)	0.008 (0.007)	0.051 (0.010)	0.061 (0.021)	-0.020 (0.014)	0.180 (0.006)	-0.002 (0.001)	-0.002 (0.028)	0.057 (0.046)	0.174 (0.012)	-0.005 (0.011)
	From 30 to 34 years	0.176 (0.002)	0.112 (0.003)	0.016 (0.005)	0.129 (0.004)	0.118 (0.013)	-0.040 (0.000)	0.204 (0.019)	0.039 (0.013)	0.024 (0.034)	0.051 (0.004)	0.011 (0.013)	0.006 (0.000)
	From 35 to 39 years	0.139 (0.003)	0.089 (0.002)	-0.003 (0.004)	0.058 (0.004)	0.759 (0.015)	-0.052 (0.004)	0.220 (0.013)	0.053 (0.013)	-0.001 (0.028)	0.105 (0.041)	0.129 (0.016)	0.015 (0.002)
	From 40 to 44 years	0.144 (0.003)	0.089 (0.006)	-0.028 (0.005)	0.098 (0.004)	0.100 (0.011)	-0.050 (0.009)	0.217 (0.010)	0.028 (0.009)	-0.056 (0.027)	0.091 (0.044)	0.145 (0.020)	-0.008 (0.000)
	More than 44 years	0.105 (0.012)	0.010 (0.017)	0.016 (0.004)	0.125 (0.016)	0.200 (0.011)	-0.131 (0.020)	0.047 (0.016)	-0.071 (0.022)	-0.079 (0.040)	0.079 (0.029)	-0.084 (0.030)	0.208 (0.018)
Mother's education attainment (*ref.* Up to Compulsory Education)	Upper Secondary Education	0.109 (0.000)	0.102 (0.000)	0.006 (0.002)	0.175 (0.001)	0.113 (0.004)	0.040 (0.002)	0.065 (0.004)	0.083 (0.004)	0.001 (0.003)	0.086 (0.002)	0.112 (0.001)	-0.017 (0.004)
	Tertiary Education	0.278 (0.003)	0.146 (0.001)	0.056 (0.002)	0.364 (0.005)	0.125 (0.002)	0.101 (0.004)	0.280 (0.005)	0.197 (0.008)	0.050 (0.004)	0.168 (0.004)	0.101 (0.006)	0.024 (0.001)
Mother's country of birth (*ref.* Spain)	Any other country	-0.129 (0.002)	-0.049 (0.005)	-0.051 (0.001)	-0.028 (0.004)	0.010 (0.021)	-0.025 (0.001)	-0.138 (0.010)	-0.072 (0.007)	-0.089 (0.004)	-0.215 (0.006)	-0.092 (0.004)	-0.057 (0.012)
Age of the child (*ref.* Under one year)	1 year	0.074 (0.005)	0.291 (0.000)	0.062 (0.002)	0.094 (0.012)	0.288 (0.002)	0.107 (0.004)	0.053 (0.000)	0.315 (0.007)	0.057 (0.001)	0.059 (0.012)	0.252 (0.004)	0.025 (0.003)
	2 years	0.057 (0.001)	0.511 (0.001)	0.040 (0.001)	0.096 (0.010)	0.515 (0.002)	0.049 (0.006)	0.031 (0.007)	0.497 (0.003)	0.042 (0.012)	0.042 (0.005)	0.517 (0.004)	0.043 (0.006)
	3 years	0.093 (0.002)	0.571 (0.001)	0.038 (0.005)	0.119 (0.006)	0.569 (0.001)	0.035 (0.018)	0.083 (0.015)	0.565 (0.001)	0.004 (0.011)	0.075 (0.005)	0.566 (0.001)	0.046 (0.002)
The child has siblings under 4 years only (*ref.* Yes)	No	-0.006 (0.005)	0.050 (0.010)	-0.040 (0.001)	-0.025 (0.007)	0.094 (0.006)	-0.080 (0.008)	-0.033 (0.005)	0.044 (0.002)	-0.051 (0.002)	0.031 (0.034)	0.029 (0.003)	0.018 (0.002)
The child has siblings over 3 years only (*ref.* Yes)	No	-0.064 (0.001)	-0.029 (0.003)	-0.035 (0.002)	-0.059 (0.003)	-0.026 (0.000)	-0.056 (0.007)	-0.053 (0.001)	-0.029 (0.005)	-0.025 (0.011)	-0.081 (0.006)	-0.032 (0.008)	-0.008 (0.003)
The child has siblings both under 4 an over 3 (*ref.* Yes)	No	-0.048 (0.014)	-0.130 (0.013)	0.081 (0.005)	-0.036 (0.004)	-0.113 (0.005)	0.150 (0.016)	-0.025 (0.034)	-0.099 (0.001)	0.151 (0.010)	-0.040 (0.016)	-0.211 (0.008)	-0.081 (0.008)

Source: Spanish Living Conditions Survey (SLCS), cross-sectional files 2005-2013, Spanish Statistical Institute.

Table 2. *Multivarite probit* results (marginal effects) (*continued*).

		Specification 1 (total)			Specification 2 (2005-2007)			Specification 3 (2008-2010)			Specification 4 (2011-2013)		
		Work	**Formal care**	**Informal care**	**Work**	**Formal care**	**Informal care**	**Work**	**Formal care**	**Informal care**	**Work**	**Formal care**	**Informal care**
Living with parents (*ref.* No)	Yes	-0.017	-0.019	0.024	-0.033	0.016	0.020	-0.017	-0.026	0.030	-0.027	-0.053	0.033
		(0.002)	(0.001)	(0.006)	(0.002)	(0.001)	(0.006)	(0.011)	(0.012)	(0.010)	(0.016)	(0.005)	(0.002)
Mother's partner employment status (*ref.* Employed)	Short-term unemployed	-0.028	-	-	0.048	-	-	-0.064	-	-	-0.013	-	-
		(0.013)	-	-	(0.019)	-	-	(0.002)	-	-	(0.021)	-	-
	Long-term unemployed	-0.032	-	-	0.042	-	-	-0.024	-	-	-0.065	-	-
		(0.003)	-	-	(0.023)	-	-	(0.033)	-	-	(0.013)	-	-
	Inactive person	-0.062	-	-	-0.060	-	-	-0.076	-	-	-0.003	-	-
		(0.028)	-	-	(0.003)	-	-	(0.025)	-	-	(0.023)	-	-
	No partner present in the household	-0.006	-	-	0.103	-	-	0.024	-	-	-0.113	-	-
		(0.000)	-	-	(0.016)	-	-	(0.004)	-	-	(0.008)	-	-
Overall household disposable income (*ref.* Quartile 2 / 3)	Quartile 1	-	-0.046	-0.023	-	-0.021	-0.027	-	-0.025	-0.002	-	-0.075	-0.017
		-	(0.000)	(0.010)	-	(0.001)	(0.007)	-	(0.008)	(0.008)	-	(0.001)	(0.002)
	Quartile 4	-	0.057	0.006	-	0.057	0.027	-	0.024	0.002	-	0.080	0.016
		-	(0.002)	(0.006)	-	(0.003)	(0.001)	-	(0.006)	(0.003)	-	(0.002)	(0.005)
Family/Children related allowances (*ref.* Yes)	No	-	0.030	0.078	-	0.034	0.079	-	0.042	0.107	-	0.016	0.054
		-	(0.001)	(0.002)	-	(0.002)	(0.008)	-	(0.003)	(0.005)	-	(0.001)	(0.004)
Region of residence (*ref.* Madrid)	Northeast	-0.086	-0.055	0.027	-0.121	-0.026	-0.009	-0.044	-0.077	0.080	-0.107	-0.076	0.018
		(0.001)	(0.006)	(0.005)	(0.010)	(0.008)	(0.019)	(0.014)	(0.007)	(0.005)	(0.006)	(0.018)	(0.009)
	Northwest	-0.065	-0.103	0.024	-0.028	-0.069	0.017	-0.045	-0.104	0.087	-0.152	-0.147	-0.016
		(0.002)	(0.003)	(0.004)	(0.013)	(0.003)	(0.004)	(0.009)	(0.007)	(0.015)	(0.008)	(0.017)	(0.009)
	Centre	-0.137	-0.085	0.015	-0.159	-0.073	-0.026	-0.140	-0.112	0.115	-0.138	-0.099	-0.036
		(0.002)	(0.003)	(0.003)	(0.015)	(0.011)	(0.010)	(0.007)	(0.008)	(0.001)	(0.001)	(0.008)	(0.008)
	East	0.001	-0.079	0.030	0.043	0.023	0.021	-0.015	-0.089	0.078	-0.036	-0.168	-0.002
		(0.006)	(0.001)	(0.001)	(0.013)	(0.005)	(0.006)	(0.006)	(0.005)	(0.007)	(0.002)	(0.012)	(0.002)
	South	-0.119	-0.041	-0.018	-0.117	0.047	-0.066	-0.138	-0.076	0.048	-0.133	-0.107	-0.039
		(0.010)	(0.007)	(0.000)	(0.015)	(0.004)	(0.003)	(0.012)	(0.002)	(0.001)	(0.020)	(0.016)	(0.008)
	Canary Islands	-0.125	-0.115	-0.062	-0.097	-0.137	-0.078	-0.153	-0.054	0.001	-0.158	-0.154	-0.072
		(0.008)	(0.001)	(0.001)	(0.016)	(0.006)	(0.005)	(0.013)	(0.006)	(0.002)	(0.023)	(0.010)	(0.002)
Degree of urbanisation (*ref.* Densely populated area)	Intermediate area	-0.013	-0.000	0.003	0.066	-0.003	0.028	-0.023	0.014	-0.028	-0.053	0.003	0.027
		(0.003)	(0.000)	(0.001)	(0.004)	(0.008)	(0.001)	(0.007)	(0.004)	(0.012)	(0.004)	(0.003)	(0.008)
	Thinly populated area	-0.022	0.022	0.002	0.039	-0.008	0.004	-0.040	0.051	-0.029	-0.053	0.023	0.029
		(0.004)	(0.000)	(0.003)	(0.002)	(0.000)	(0.005)	(0.008)	(0.003)	(0.008)	(0.007)	(0.002)	(0.003)

Source: Spanish Living Conditions Survey (SLCS), cross-sectional files 2005-2013, Spanish Statistical Institute.

Table 2. *Multivarite probit* results (marginal effects) (*continued*).

		Specification 1 (total)			Specification 2 (2005-2007)			Specification 3 (2008-2010)			Specification 4 (2011-2013)		
		Work	**Formal care**	**Informal care**	**Work**	**Formal care**	**Informal care**	**Work**	**Formal care**	**Informal care**	**Work**	**Formal care**	**Informal care**
Year (*ref.* 2005)	2006	0.007	-0.007	0.002	-0.000	-0.011	0.001	-	-	-	-	-	-
		(0.013)	(0.005)	(0.002)	(0.001)	(0.000)	(0.001)	-	-	-	-	-	-
	2007	0.012	-0.002	0.013	0.003	-0.005	0.019	-	-	-	-	-	-
		(0.013)	(0.007)	(0.002)	(0.007)	(0.007)	(0.008)	-	-	-	-	-	-
	2008	0.073	-0.009	-0.049	-	-	-	*ref.*	*ref.*	*ref.*	-	-	-
		(0.000)	(0.001)	(0.006)	-	-	-				-	-	-
	2009	0.040	-0.044	-0.049	-	-	-	-0.029	-0.032	-0.014	-	-	-
		(0.002)	(0.003)	(0.001)	-	-	-	(0.004)	(0.001)	(0.006)	-	-	-
	2010	0.052	-0.013	-0.059	-	-	-	-0.017	0.001	-0.016	-	-	-
		(0.011)	(0.001)	(0.001)	-	-	-	(0.009)	(0.002)	(0.006)	-	-	-
	2011	0.047	-0.021	-0.063	-	-	-	-	-	-	*ref.*	*ref.*	*ref.*
		(0.004)	(0.002)	(0.001)	-	-	-	-	-	-			
	2012	0.027	-0.134	-0.079	-	-	-	-	-	-	-0.021	-0.114	-0.021
		(0.002)	(0.004)	(0.006)	-	-	-	-	-	-	(0.010)	(0.005)	(0.001)
	2013	-0.021	-0.047	-0.131	-	-	-	-	-	-	-0.068	-0.030	-0.071
		(0.006)	(0.003)	(0.004)	-	-	-	-	-	-	(0.009)	(0.002)	(0.006)
-2Log Likelihood		-19927357			6488579.8			-6625031			-6410985.1		
Wald Chi_2 (sign.)		2139.77 (0.0000)			934.63 (0.0000)			876.45 (0.0000)			808.12 (0.0000)		
Rho21 (sign.)		0.2409 (0.000)			0.2761 (0.000)			0.3125 (0.000)			0.1880 (0.000)		
Rho31 (sign.)		0.3762 (0.000)			0.4497 (0.000)			0.3803 (0.000)			0.2737 (0.000)		
Rho23 (sign.)		-0.2865 (0.000)			-0.2438 (0.000)			-0.2679 (0.000)			-0.3713 (0.000)		
Number of mothers/households		7,558			2,719			2,631			2,208		
Number of observations (children-mothers matched registers)		9,046			3,262			3,160			2,624		

Source: Spanish Living Conditions Survey (SLCS), cross-sectional files 2005-2013, Spanish Statistical Institute.

Appendix

Table A.I. Mean values of the independent variables used in the multivariate model.

Variables		Total	Period			Incidence (total)		
		Mean	Mean (2005-2007)	Mean (2008-2010)	Mean (2011-2013)	Work	Formal care	Informal care
Mother's age	Less than 25 years	5.95	5.03	7.86	4.87	25.92	20.19	15.60
	From 25 to 29 years	13.74	14.86	13.63	12.78	44.17	30.98	17.75
	From 30 to 34 years	35.45	38.91	34.25	33.38	60.78	40.96	22.10
	From 35 to 39 years	33.67	30.11	34.16	36.59	59.77	44.44	19.32
	From 40 to 44 years	9.89	9.76	9.05	10.86	58.40	49.75	16.60
	More than 44 years	1.30	1.33	1.05	1.52	50.75	40.93	18.68
Mother's education attainment	Up to Compulsory Education	32.13	34.17	32.24	30.06	36.31	29.05	15.55
	Upper Secondary Education	24.89	24.30	26.06	24.24	52.55	41.85	17.77
	Tertiary Education	42.98	41.53	41.70	45.70	72.06	48.02	23.67
Mother's country of birth	Spain	77.23	79.97	75.47	76.42	59.82	42.38	21.27
	Any other country	22.77	20.03	24.53	23.58	41.79	33.65	13.90
Age of the child	Under one year	25.63	27.79	29.23	19.84	51.75	6.86	18.60
	1 year	29.61	28.91	31.56	28.28	57.79	33.12	24.30
	2 years	30.40	31.22	29.07	30.97	55.67	59.49	19.85
	3 years	14.36	12.08	10.13	20.91	58.62	70.84	17.73
The child has siblings under 4 years only	No	84.53	85.84	83.78	84.04	55.77	40.08	20.04
	Yes	15.47	14.16	16.22	15.96	55.40	42.08	17.16
The child has siblings over 3 years only	No	58.04	57.41	59.30	57.36	59.67	40.57	21.61
	Yes	41.96	42.59	40.70	42.64	50.24	40.15	16.80
The child has siblings both under 4 and over 3	No	96.50	96.73	96.59	96.18	56.17	40.68	19.70
	Yes	3.50	3.27	3.41	3.82	43.35	32.58	16.68
The mothers lives with parents or in laws	No	91.73	92.27	89.61	93.38	56.88	41.04	19.59
	Yes	8.27	7.73	10.39	6.62	42.83	33.22	19.64
Mothers' partner employment status	Employed	81.16	89.09	79.55	75.22	58.47	42.03	21.19
	Short-term unemployed	5.73	2.63	7.14	7.24	44.51	27.81	11.89
	Long-term unemployed	5.32	1.45	4.78	9.59	41.55	29.37	7.77
	Inactive person	1.42	1.04	1.76	1.44	40.67	25.51	8.54
	No partner present in the household	6.37	5.78	6.77	6.52	45.91	43.33	18.49

Source: Spanish Living Conditions Survey (SLCS), cross-sectional files 2005-2013, Spanish Statistical Institute.

Table A.I. Mean values of the independent variables used in the multivariate model (*continued*).

Variables		Total	Period			Incidence (total)		
		Mean	Mean (2005-2007)	Mean (2008-2010)	Mean (2011-2013)	Work	Formal care	Informal care
Overall household disposable income	Quartile 1	23.76	27.10	21.49	22.90	25.67	29.74	12.24
	Quartile 2	25.37	28.94	24.61	22.71	46.64	37.88	18.32
	Quartile 3	25.14	23.76	25.73	25.84	68.06	41.41	22.27
	Quartile 4	25.73	20.19	28.17	28.55	80.35	51.70	25.01
Family/Children related allowances	No	68.70	71.42	62.65	72.31	48.44	39.48	15.33
	Yes	31.30	28.58	37.35	27.69	71.68	42.40	28.94
Region of residence	Madrid	14.87	14.11	15.04	15.43	57.63	37.28	23.05
	Northeast	7.32	7.89	7.11	7.00	57.23	43.25	22.23
	Northwest	9.19	8.59	8.85	10.13	64.89	47.58	17.94
	Centre	11.37	10.62	12.11	11.32	47.90	38.77	20.34
	East	31.00	30.92	30.83	31.25	61.28	38.72	21.53
	South	22.01	23.44	21.74	20.91	46.60	39.83	16.70
	Canary Islands	4.24	4.43	4.32	3.96	44.56	33.79	12.52
Degree of urbanisation	Densely populated area	49.96	50.43	50.01	49.48	59.66	41.34	20.03
	Intermediate area	24.21	22.90	24.83	24.82	54.42	38.66	19.17
	Thinly populated area	25.83	26.67	25.16	25.70	49.31	40.17	19.13
Year	2005	10.06	31.33	-	-	52.29	40.74	24.21
	2006	11.02	34.34	-	-	53.93	40.98	24.46
	2007	11.02	34.33	-	-	54.37	41.47	26.26
	2008	11.58	-	33.62	-	59.67	39.07	20.48
	2009	11.19	-	32.48	-	55.65	36.80	19.52
	2010	11.67	-	33.90	-	56.92	39.98	18.75
	2011	10.90	-	-	32.56	59.60	43.32	17.68
	2012	11.06	-	-	33.07	56.89	41.73	15.53
	2013	11.50	-	-	34.37	51.76	39.67	10.24
Number of mothers/households		7,558	2,719	2,631	2,208	4,205	3,088	1,563
Number of observations (children-mothers matches)		9,046	3,262	3,160	2,624	5,032	3,691	1,858

Source: Spanish Living Conditions Survey (SLCS), cross-sectional files 2005-2013, Spanish Statistical Institute.