Adult Care, Child Care and Labour Decisions. Spanish Evidence of the "Demonstration Effect"

José Ignacio Giménez[a], Miriam Marcén[a] and José Alberto Molina[a,b,*]

[a]Department of Economic Analysis, University of Zaragoza, Zaragoza, Spain.

[b]Institute for the Study of Labour-IZA, Bonn, Germany

Abstract

In this paper, we study the influence children have on parental allocation of time, basing our analysis on the "Demonstration Effect" hypothesis of Cox and Stark (2005). We develop a theoretical model, combining the Social Cognitive Theory and an inter-generational model. Using time-diary data from the 2002-03 Spanish Time Use Survey, we first specify a Tobit model to analyse the time parents spend in adult care, child care and market work activities, accounting for the effects of children. We then estimate a Seemingly Unrelated Three-Regression model on the same activities. The "Demonstration effect" increases the intensity of dependent care-giving, which affects the time devoted to the labour market. The increase in the time devoted to dependent care, as a result of the "Demonstration Effect", is fully compensated with a decrease in the time devoted to market work activities.

*Corresponding author: José Alberto Molina. Department of Economics Analysis, University of Zaragoza, Gran Vía 2, 50005 Zaragoza. Spain. Tel: 34 976 76 18 18. E-mail: jamolina@unizar.es

1 Introduction

Demographic changes in the European population in the last thirty years have led to a dramatic increase of the rate of growth of the elderly population in Europe, with population ageing being one of the most important challenges for all European countries.[1] This leads to an increase in the number of people requiring care, which in turn generates needs for informal care and social services. Since care for the elderly is normally provided by family members, the increasing demand for dependent care may affect the allocation of time of the informal care givers, especially the labour supply.

Family caregivers normally bear the economic and non-economic costs, including forgone labour supply and leisure. In order to develop policies to support caregivers, it is important to identify and evaluate the opportunity costs associated with informal care, and how dependent care responsibilities impact on personal and family decisions, since these decisions may affect future inter-generational time transfers and labour decisions ("Demonstration Effect" (Wolff, 2001)).

In addition, some doubts about the future viability of this pattern have appeared because of the increase of female labour force participation, and changes in family members' relationships. In this context, we analyse the effect that the presence of children has on both labour market decisions and caregiving activities, considering that both decisions are simultaneously determined. Specifically, our purpose is to analyse the effects that the "Demonstration Effect" (Cox and Stark, 1996; 2005) have on the time devoted to dependent care and labour supply. To do that, we first develop a theoretical model with a family consisting of three generations. This theoretical framework will be empirically tested with Tobit and Seemingly Unrelated Three-Regression (SUR) models, of the time parents spend on adult care, child care and market work activities. We analyze how the number of children in the household, and the presence of children during the adult care activities, influences the time devoted to all three activities.

We apply our framework to Spain, one of the countries with a growing percentage of older residents, where the informal provision of care is the most important and is left to family members (representative of the southern pattern).The issue is of relevance within Spain because of the current implementation of public policies dealing with this issue. Policies set by legislators are designed to cater to the needs of this expanding population, and their families. Informal carers are recognised as being

[1] This ageing proccess is expected to continue because of the increase in life expectancy and low birth rates.

central to these policies. Therefore, in order to develop appropriate support packages (for instance, direct cash payments to subsidize in-home care), it is important to identify the care-givers and discover how informal care responsibilities impact their lives.

We use the 2002-03 Spanish Time Use Survey (STUS). The relatively large size of the survey, the time-diary nature of the data, the possibility of identifying time spent on adult care activities, and the presence of children while parents are engaged in these activities, allows a consistent study.

It is well-documented in the economic literature about intra-family transfers that elder care depends negatively on the number of children. Considering the "Demonstration Effect", we can determine that as this negative impact diminishes, the presence of children while parents are engaged in elder care positively affects caregiving activities. According to the STUS, the presence of grandchildren while their parents are engaged in caring activities is positively related to adult care activities, with this result validating the "Demonstration Effect" hypothesis. The "Demonstration effect" increases the intensity of dependent caregiving which affects the time devoted to the labour market, but not the time spent in leisure activities. Due to this reallocation of time, the "Demonstration Effect" negatively impacts labour decisions. As a result, because of constraints on time, caring commitments lead the individual to substitute unpaid for paid work.

The paper is organized as follows. Section 2 briefly reviews the literature regarding the intergenerational transfer models and time use studies. Section 3 develops the theoretical model. Section 4 describes the data used, Section 5 describes the econometric techniques used in the estimation process, Section 6 describes the results obtained and Section 7 sets out our main conclusions.

2 Literature

The study of transfers between members of the family has given rise to an abundant literature, reflected in the so-called intergenerational transfer models (see, for an excellent survey, Laferrère, 1999). We concentrate on the Demonstration Effect thesis proposed by Cox and Stark (1996). They use a model with three generations and study the possibility that the youngest generation will replicate the conduct of their own parents.

Cox and Stark (1996, 2005) consider that a mother P maximizes the expected value of her utility, $U(x, y)$ where x is "what the maximizer does for her mother", G, and y is "what the maximizer's daughter, K, does for the maximizer", P. They suppose that the daughter may imitate her mother's behaviour or not with probability $0 \leq \pi \leq 1$, as follows:

$$EU(x, y, \pi) = \pi U(x, x) + (1 - \pi)U(x, y)$$

Let $\bar{x} = \bar{x}(y, \pi)$ be the solution of the maximization problem. In that case, the imitative behaviour benefits G (i.e. the grandmother) ($\partial\bar{x}/\partial\pi > 0$).

Jellal and Wolff (2002) explain that in this framework there is an incomplete cycle, so the decisions taken by P do not depend on the previous behaviour of his/her own parent. In that case, if there is no child, $x = 0$, there are no time transfers. They also point out that the demonstration effect theory does not provide "convincing explanation why the demonstration effect works". To solve these problems, they focus on a model of cultural transmission of altruistic values between generations.

In the literature of the allocation of time, most of the studies analyse the relationship between caregiving to elderly parents, and labour supply decisions.[2] Most of them show that there exists a negative correlation between caregiving and labour supply decisions.[3] However, these studies do not take into account the simultaneity of child care, elder care and labour decision that could lead to important biases in the estimates.

Using time-use surveys, we can take into account these three variables. Some studies have examined the time devoted to child care activities.[4] However, less evidence exists regarding the time devoted to adult care using time-use data. When people assume the role of assisting a person with impairments, or an older person, care activities account for a significant portion of their daily routines. Bittman et al. (2005) use the 1997 national Australian Time Use Survey and find that diaries provide information for a more robust estimate, and that even people who offer only occasional assistance to a person with impairments tend to spend the equivalent of more than 10 minutes a day providing care.

The literature is inconclusive for two reasons. First, the theoretical approach developed by Cox and Stark (1996) has omitted the effects on the allocation of time of individuals who are becoming care givers through a "Demonstration Effect". Second, there are limitations in the data, as the data used do not account for the presence of children, who can have an effect on dependent care (adult and child care) and labour

[2]See, for example, Ettner (1995, 1996), Johnson and Lo Sasso (2000), Wolf and Soldo (1994), Carmichael and Charles (1998; 2003).

[3]There is a "substitution response": with time being scarce, if informal care responsibilities increase, this will tend to increase the carer´s shadow wage rate and, thus, to depress the labour market activity. (Carmichael and Charles, 1998; 2003).

[4]See Fisher et al. (2006) and Aguiar and Hurst (2007). Both find that in the United States there has been an increase in the time devoted to child care activities.

decisions.

3 The Model

Our work relies on the "Demonstration Effect" theory, in which the child's behaviour is conditioned by parents who take care of their elders in order to elicit a similar conduct from their children. To solve the problems cited earlier, our theoretical approach is based on the Social Cognitive Theory. In our case, individuals are viewed both as products and as producers.[5]

We assume a family consisting of three generations. In period 0 the parent decides the hours he/she devotes to dependent care (child and adult care) and labour market. Let U_{s1} be the utility of the parent (2^{nd} generation) which takes the following form:

$$U_{s1} = U_{s1}(C_{s1}, Q, T_{s1}, U_g) \tag{1}$$

The utility of the parent depends on the level of private consumption, C_{s1}; on Q which represents the quality of the child (3^{rd} generation), which is the output of a household production process whose inputs are parental time; on T_{s1}, which is the output of elder care, and on the utility of the grandparent, that is, U_g. The level of satisfaction is increasing in all cases. We also assume that U_{s1} is continuous, twice differentiable and quasi-concave.

We should point out that assuming a model of altruism may be a strong assumption, but considering the demonstration effect, we are assuming that early transfer experience affects subsequent transfer behaviour and, therefore, the allocation of time. Although one agent makes decisions in one period, the agent is affected by the decisions taken by the parent, so we consider this to be a complete cycle.

3.1 Analysis

We assume that the parent allocates his/her own time, m,among three activities, (labour market ,e_{s1}; child care,h_{s1}; and elder care, t_{s1}), and his/her own resources, (nonlabour income,y_{s1}). We examine the parent's choice as follows:

$\underset{h_{s1},t_{s1}}{Max} U_{s1} = U_{s1}(C_{s1}, Q, T, U_g)$

$s.t.$

$C_{s1} = C_{s1}(w_{s1}e_{s1}, y_{s1})$

$e_{s1} = e_{s1}(m, t_{s1}, h_{s1})$

[5]Bandura (1986) introduced the Social Cognitive Theory (SCT) with his book "Social Foundations of Thought and Action: A Social Cognitive Theory" which is a general theory of human behaviour. (See Gimenez et al., 2007)

$T_{s1} = T_{s1}(t_{s1}, r_{s1}, w_{s1}e_{s1}, y_{s1})$
$Q = Q(h_{s1}, \alpha t_{s1}, c_{s1}, w_{s1}e_{s1}, y_{s1})$

where w_{s1} is the parent's wage, r_{s1} represents the productivity in elder care outcome, and c_{s1} indicates the productivity in child quality. Additionally, α represents the portion of time the parent devotes to care for the grandparent, when the grandchild is present. We also assume that T_{s1} and Q are marketable.

The first order conditions are:[6]

$$-\frac{\partial U_{s1}}{\partial U_g}\frac{\partial U_g}{\partial t_{s1}} = (w_{s1}\frac{\partial U_{s1}}{\partial C_{s1}}\frac{\partial C_{s1}}{\partial e_{s1}}+\frac{\partial U_{s1}}{\partial T_{s1}}\frac{\partial T_{s1}}{\partial e_{s1}}+\frac{\partial U_{s1}}{\partial Q}\frac{\partial Q}{\partial e_{s1}})\frac{\partial e_{s1}}{\partial t_{s1}}+\frac{\partial U_{s1}}{\partial T_{s1}}\frac{\partial T_{s1}}{\partial t_{s1}}+\alpha\frac{\partial U_{s1}}{\partial Q}\frac{\partial Q}{\partial t_{s1}} \tag{2}$$

$$-w_{s1}\frac{\partial U_{s1}}{\partial C_{s1}}\frac{\partial C_{s1}}{\partial e_{s1}}\frac{\partial e_{s1}}{\partial h_{s1}} = \frac{\partial U_{s1}}{\partial Q}\frac{\partial Q}{\partial h_{s1}} \tag{3}$$

We suggest that the treatment the grandparent gave to his/her own parent affects the degree of altruism of his/her son/daughter, and consequently increases intergenerational time tranfers. Thus, we assume that $\frac{\partial U_{s1}}{\partial U_g} = \beta_{s1}(t_g^{-1})$,where β_{s1} is the degree of altruism, which depends on the time the grandparent devotes to elicit a similar conduct from his/her child in the period -1. In this case, parent-to-grandparent services are not incentivised by self-interest alone. This approach suggests that the decisions taken by the son/daughter depend on the previous behaviour of his/her own parent. We also consider that $\alpha = \alpha(t_k^1)$, therefore the Demonstration Effect parameter depends on the time that the 3^{rd} generation will devote in period 1 to care for his/her own parent. We suppose that both β_{s1} and α are increasing in t_g^{-1} and t_k^1, respectively.

Let us denote the solution to the maximization problem as h_{s1}^* and t_{s1}^*. Solving the first order condition implicitly for h_{s1}^*,t_{s1}^* we find that[7]

$$h_{s1}^* = h_{s1}^*(w_{s1}, y_{s1}, m, r_{s1}, \alpha, c_{s1}, \beta_{s1}) \tag{4}$$

$$t_{s1}^* = t_{s1}^*(w_{s1}, y_{s1}, m, r_{s1}, \alpha, c_{s1}, \beta_{s1}) \tag{5}$$

We also obtain the hours that the parents spend in the labour market, e_{s1}^*,in equilibrium:

$$e_{s1}^* = e_{s1}^*(w_{s1}, y_{s1}, m, r_{s1}, \alpha, c_{s1}, \beta_{s1}) \tag{6}$$

[6]We assume that $\frac{\partial e_{s1}}{\partial h_{s1}} < 0$ and $\frac{\partial e_{s1}}{\partial t_{s1}} < 0$.

[7]Second order conditions are satisfied.

On the basis of the above, we are in a position to draw a series of results on the influence of the "Demonstration Effect" and on the relationship between t^*_{s1}, t^1_k and t^{-1}_g.

It is straightforward to deduce that changes in t^1_k and t^{-1}_g have a positive effect on t_{s1}. Differentiating expressions (2) and (3) in equilibrium, we obtain the expressions:[8]

$$\frac{\partial t^*_{s1}}{\partial t^{-1}_g} = \frac{-\frac{\partial \beta_{s1}(t^{-1}_g)}{\partial t^{-1}_g}\frac{\partial U_g}{\partial t_{s1}}\frac{\partial^2 U_{s1}}{\partial h^2_{s1}}}{\Delta} > 0 \tag{7}$$

$$\frac{\partial t^*_{s1}}{\partial t^1_k} = \frac{-\frac{\partial \alpha(t^1_k)}{\partial t^1_k}\frac{\partial U_{s1}}{\partial Q}\frac{\partial Q}{\partial t_{s1}}\frac{\partial^2 U_{s1}}{\partial h^2_{s1}}}{\Delta} > 0 \tag{8}$$

We may assume that the changes in t^{-1}_g and t^1_k can affect elder care t^*_{s1}, in the same way. Thus, the parent would like to be treated, subsequently, by the 3^{rd} generation, in the same way that he cared for his own parent, that is, an indirect process of intergenerational interaction, incorporating imitative behaviours. The parent cares for the grandparent, as he would like to be cared for himself in the future, by his own children. Formally,

$$\frac{\partial t^*_{s1}}{\partial t^1_{k1}} = \frac{\partial t^*_{s1}}{\partial t^{-1}_g} \tag{9}$$

This expression is satisfied when $\frac{\partial \beta_{s1}(t^{-1}_g)}{\partial t^{-1}_g}\frac{\partial U_g}{\partial t_{s1}} = \frac{\partial \alpha(t^1_k)}{\partial t^1_k}\frac{\partial U_{s1}}{\partial Q}\frac{\partial Q}{\partial t_{s1}}$. If we suppose that $\frac{\partial \beta_{s1}(t^{-1}_g)}{\partial t^{-1}_g} = \frac{\partial \alpha(t^1_k)}{\partial t^1_k}$,in that case $\frac{\partial U_g}{\partial t_{s1}} = \frac{\partial U_{s1}}{\partial Q}\frac{\partial Q}{\partial t_{s1}}$. Time transfers are chosen such that the parent equalizes the effect of the time transfer t_{s1} on the utility of the grandparent, with the effect of the same time transfer on the quality of the grandchildren, which is weighted by the effect of the quality of the children on the utility of the parent.

In our case, if there is no child, t_{s1} may be other than 0. The parent is affected by the early life-cycle experiences by way of the effect of t^{-1}_g on the degree of altruism.

In this study, we analyse the effects that the "Demonstration Effect" has on the parent allocation of time. When the parent devotes time to his own parent, if there is the "Demonstration Effect", and the hours the parent spends on child care do not decrease, this affects the hours this agent devotes to the labour market. Formally:

$$\frac{\partial h^*_{s1}}{\partial \alpha(t^1_k)} > 0; \frac{\partial t^*_{s1}}{\partial \alpha(t^1_k)} > 0 \rightarrow \frac{\partial e^*_{s1}}{\partial \alpha(t^1_k)} < 0$$

[8] Given the second order conditions $\Delta > 0$.
$\Delta = \frac{\partial^2 U_{s1}}{\partial h^2_{s1}}\frac{\partial^2 U_{s1}}{\partial t^2_{s1}} - (\frac{\partial^2 U_{s1}}{\partial t_{s1}\partial h_{s1}})^2$

given that m is constant and that there is Substition Effect between h^*_{s1} and t^*_{s1}. This result implies that the "Demostration Effect" requires that the parent spends less time in the labour market.

4 Data

The data come from the Spanish Time Use Survey (STUS), conducted in 2002-03. Our reference sample are people aged 24-65 who are not students, not retired and are the head of the family or are married/cohabiting with the head of the family. We focus on three uses of time: child care, adult care and market work. The market work activities are defined to include those for which people are paid (Burda et al., 2006). The child and adult care activities include the informal and unpaid supply of care services to children and adults.

The key explanatory variables are the presence of children while individuals devote time to adult care activities, and the number of children in the household. To control for the presence of children during the adult care activities, we construct a dummy variable that takes the value "1" if the individual has reported at least once engaging in adult care while accompanied by household members under 10, and "0" otherwise. To control for the number of children in the household we use three explanatory variables, the number of children aged 0-4, 5-12 and 13-17.

We include other explanatory variables, such as the age and the age squared divided by 100. This allows us to control for the life-cycle of the individuals (2^{nd} generation) and the parents (1^{st} generation). We control for the sex (1=man; 0=woman) and marital status of the individual (1=married; 0=cohabiting). Marital status can influence individual decisions on the allocation of time by means of specialization within the household (Becker, 1965). Men are better paid in the labour market (gender wage gap), so they devote more time to market work activities and less to home production activities, especially to child care activities.

We include two variables in the child care and adult care activities to control for the labour status of individuals.[9] Participating in the labour market can reduce leisure or home production, since time is scarce. Thus, working people can be less likely to devote time to child and adult care activities. We include two variables indicating if the individual is working (1) or not (0), and if the individual is working full-time (1) or not (0). The opportunity costs of participation in the labour market, mainly wages, are important determinants in the decisions of how much time to devote to paid work and, normally, the opportunity costs depend on the

[9] Controlling for the labour status of individuals in the regression on the hours of market work leads to endogeneity problems.

educational level. We control for the highest educational level reached by the individuals, introducing two dummy variables: one for the secondary level and another for the university level. With these variables, we control for the marketability of the dependent care.

We control for the household size (total number of members), the number of grandparents, and the marital status of parents in the household. The variable of the marital status of grandparents takes the value "1" if there is at least one married couple of grandparents, and "0" otherwise. Finally, we include regional dummies to control for the region of residence.

Means and standard deviations for the variables are reported in Table 1. Columns (1) and (2) report the values for the whole sample and for the individuals who devote time to adult care activities. Comparing both columns, we see that the proportion of men is reduced in the carers sample (46.70% vs. 29.10%), showing that women are the individuals who specialize in care activities. The mean age is higher in the carers sample, 47.06 years, the number of children per household is lower (0.65 children) the number of grandparents living in the household is higher (0.16) and carers tend to participate less in the labour market (43%). Finally, adult care-givers devote 25.78 minutes per day to adult care activities and 91.70 minutes to child care activities, an amount of time much higher than the 5.59 and 39.25 minutes of the whole sample. The proportion of carers reporting that children are present during adult care activities is 10%, which is significantly higher than the 0.6% reported in the whole sample.

In summary, those who report devoting time to adult care activities are older, mainly women, married, work less in the labour market and have a lower educational level. Additionally, people who devote time to adult care activities report that children are present more often than in the whole sample, and this leads us to infer the existence of a "Demonstration Effect".

5 Empirical Specification and Results

Our purpose is to analyse the effects that the "Demonstration Effect" (Cox and Stark, 1996; 2005) have on the time devoted to dependent care and labour supply, which requires several considerations. First, the number of hours devoted to adult care, child care and market work activities are left-censored at zero. As a solution, we use in a first step a Tobit Model. Second, children are time-intensive commodities and are considered as public goods that need time devoted to them by their parents (Apps and Rees, 2002; Folbre, 1994). However, time is normally scarce and people suffer from the lack of sufficient time to accomplish all desired

activities (Hamermesh and Lee, 2007) This requires parents, normally, to substitute time devoted to other activities (i.e.: leisure, market work or home production) with time devoted to child care activities. Third, comparing the time devoted to adult and child care activities by individuals in Table 1, we see that the more time is devoted to adult care activities, the more time is devoted to child care activities.These last two considerations lead us to conclude that the amounts of time devoted to child care and to adult care activities are related. For this reason, in the second step, we estimate a Seemingly Unrelated Three-Regression Model (SUR) on the time devoted to adult care, child care and market work activities.

5.0.1 Tobit Model

Since the number of hours devoted to adult care, child care and market work are left-censored, we apply a Tobit Model on these three activities.[10] In this case, we are interested in the population regression $E(y^*|X)$. If y^* and X were observed for the whole population, there would be nothing new and we could use standard regression methods (ordinary or nonlinear least squares). However, a data problem arises because y, a variable with quantitative meaning, is censored above or below some value; that is, it is not observable for some segment of the population. By definition, a censored variable has a large fraction of observations at the minimum or maximum.

The statistical model is the following: for a randomly drawn observation "i" from the population, let T_{ji} represent the minutes per day that the individual "i" reports performing the activity "j"; let X_i be a vector of demographic and household characteristics, and let u_{ji} be a random variable representing unmeasured factors. The model is defined as,

$$T^*_{ji} = \beta X_{ji} + u_{ji}, \qquad u_{ji}|X_{ji} \sim Normal(0, \sigma^2) \tag{10}$$

$$T_{ji} = \max(0, T^*_{ji}) \tag{11}$$

where β is a vector of unknown parameters, $i = 1, 2, ...n$, and $j = 1, 2, 3$. While the true response is T^*_{ji}, only the left-censored version T_{ji} of T^*_{ji} is observable. Additionally, a censoring indicator δ is defined, with $\delta = 1$ if $T^*_{ji} > 0$ and $\delta = 0$, otherwise.These equations constitute what is known as the type I Tobit model (Amemiya, 1985).

[10] Altonji et al. (1996), Schoeni (1997) and Jellal and Wolff (2002) also specify a Tobit model for the determinants of time spent helping parents.

5.0.2 Seemingly Unrelated Regressions

Each individual reports several uses of time, including that devoted to adult care, child care and market work activities as primary activities. We estimate the time devoted to all three activities (adult care, child care and market work) as a Seemingly Unrelated three-Regression (SUR) model. The statistical model is the following: for a given individual "i", let T_{1i}, T_{2i} and T_{3i} represent the daily minutes that the individual "i" reports performing the three activities; let X_i be a vector of demographic and household characteristics, and let $e_{surI1,}e_{surI2}$ and e_{surI3} be random variables representing unmeasured factors. The model is defined as:

$$T_{1i} = \gamma_{sur1} + X_{ji}\beta_{sur1i} + e_{sur1i} \tag{12}$$

$$T_{2i} = \gamma_{sur2} + X_{ji}\beta_{sur2i} + e_{sur2i} \tag{13}$$

$$T_{3i} = \gamma_{sur2} + X_{ji}\beta_{sur3i} + e_{sur3i} \tag{14}$$

with γ, β vectors of parameters and $i = 1, 2, ...n$. For each individual we jointly estimate the regressions, allowing for the correlations between e_{sur1i}, e_{sur2i} and e_{sur3i}. Regarding the specification of the error terms for each individual, we allow for correlations in the unobserved determinants of their activities, by allowing the error terms to be jointly normally distributed with an unrestricted covariance structure:

$$\begin{bmatrix} e_{sur1i} \\ e_{sur2i} \\ e_{sur3i} \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma^2_{sur1i} & \varrho_{sur1i,sur2i}\sigma_{sur1i}\sigma_{sur2i} & \varrho_{sur1i,sur3i}\sigma_{sur1i}\sigma_{sur3i} \\ \varrho_{sur2i,sur1i}\sigma_{sur2i}\sigma_{sur1i} & \sigma^2_{sur2i} & \varrho_{sur2i,sur3i}\sigma_{sur2i}\sigma_{sur3i} \\ \varrho_{sur3i,sur1i}\sigma_{sur3i}\sigma_{sur1i} & \varrho_{sur3i,sur2i}\sigma_{sur3i}\sigma_{sur2i} & \sigma^2_{sur3i} \end{bmatrix} \right) \tag{15}$$

This specification, which is akin to the Seemingly Unrelated Regressions framework, accounts for the time constraint that may require individuals to spend more time on one activity and less time on another. We additionally assume that the error components are independent across individuals.

6 Results

6.1 Tobit Model

Column (1) in Table 2 shows the marginal effects for the Tobit model on the time devoted to adult care, child care and market work activities, for individuals aged 24-65. These effects are calculated as the marginal

effects for the unconditional expected values of the dependent variable at mean values.[11]

The sex of individuals has clear effects on the time devoted to market work and dependent care. Being male has a positive significant correlation with the time devoted to market work activities, increasing the probability of working. However, being male also has a significant negative correlation with dependent care, with individuals decreasing the probability of care for adults and children by 14.17 and 2.31 percentage points, respectively.

Age has a positive correlation with the time devoted to adult care and market work activities. One additional year increases the probability of adult caregiving and working by 0.89 and 7.81 percentage points, respectively. However, one additional year also decreases the probability of child caregiving by 0.63 percentage points. However, this effect is not permanent, as shown by the opposite effect of age squared. Over the life-cycle, the time devoted to adult care and market work activities has an inverted U-shaped trend, and the time devoted to childcare activities has a U-shaped trend.

Marital status has a positive correlation with the time devoted to child care activities, since married people increase the probability of care for children by 5.51 percentage points. On the other hand, working full time has a negative and significant correlation with the time devoted to adult care activities, decreasing the probability of caregiving by 3.04 percentage points. Working full time decreases significantly the probability of care for children by 6.54 percentage points.

Educational level has a significant positive correlation with the time devoted to child care and market work activities. Secondary and university education increases the probability of caring for children, and working, by 6.99, 9.64, 40.53 and 73.36 percentage points, respectively. Secondary and university education has no effect on the time devoted to adult care activities regarding primary educational level.

The number of children has a negative correlation with the time devoted to adult care and market work activities. Additionally, the negative correlation is higher in children aged 0-4 than in children aged 5-12, as it is in children aged 5-12 compared to children aged 13-17. An additional child in the family aged 0-4, 5-12 and 13-17 decreases the probability of caregiving by 3.02, 2.24 and 1.45 percentage points, respectively, and increases the probability of care for children by 39.46, 20.64 and 6.47 percentage points, respectively. An additional child in

[11] For dichotomous variables (presence of children, marital status,...) we calculate incremental effects, as variations in the distribution function, with discrete changes in the values of the dichotomous variables.

the family aged 0-4, 5-12 also decreases the probability of working by 36.86 and 13.92 percentage points, respectively.

Finally, findings support that the "Demonstration Effect" increases the intensity of dependent caregiving which affects the time devoted to the labour market. Children aged under 10, and present during the adult care activities, have a positive and significant correlation with the time devoted to adult care activities, in such a way that parents increase the probability of caregiving by 11.47 percentage points. Additionally, children aged under 10 present during the adult care activities increases the time devoted to child care by 8.07 percentage points, and decreases the time devoted to market work by 68.39 percentage points.

6.2 Seemingly Unrelated Regressions

Table 3 shows the results obtained for the SUR model. The results are similar to the findings obtained with the Tobit model.

Column (1) in Table 3 shows results for the general sample. On the one hand, children aged 0-4 and 5-12 have positive and negative correlations with the time devoted to child care and market work activities, respectively. An additional child aged 0-4 or 5-12 increases the time devoted to child care by 75.29 and 17.84 minutes per day, respectively, and decreases the time devoted to market work by 35.01 and 13.50 minutes per day, respectively. Additionally, the number of children in the family has a negative correlation with the time devoted to adult care activities for the three age intervals considered (0-4, 5-12, 13-17). Children aged 0-4, 5-12 and 13-17 decrease the time devoted to adult care activities by 1.99, 2.53 and 2.05 minutes per day, respectively.

On the other hand, the presence of children while parents are caring for the grandparents has a significant and positive correlation with the time devoted to adult and child care activities, increasing by 38.23 and 12.64 minutes per day, respectively, the time devoted to these activities. This result supports the "Demonstration Effect" hypothesis. On the other hand, the presence of children during the adult care activities leads parents to devote 67.42 minutes less to market work activities.

The positive correlation between the presence of children during adult care activities and the time devoted to adult care activities may be the result of joint production, due to specialization. If children were present during adult care activities, individuals could care for children and adults at the same time (joint production). In such a case, the time devoted to child care activities as a primary activity should decrease.[12]

[12] We take into account adult and child care as primary activities, but we do not take into account secondary activities. The presence of children refers to children present while parents report adult care as primary activity.

If the presence of children during adult care activities was motivated by joint production, parents should report devoting less time to child care activities as primary activity, since some of the time needed to care for children might be included in the time spent caring for adult members of the family. Additionally, if they were caring for several individuals at the same time, they could devote more time to other activities (including market work), since they would be saving time with the joint production of dependent care.

However, parents who report children present while performing the adult care activities, devote more time to child care activities, so the presence of children during the adult care is not motivated by joint production, but by the "Demonstration Effect". Furthermore, the time devoted to market work activities decreases if children are present during the adult care activities, showing that the simultaneous increase in the time devoted to adult care and child care activities generated by the "Demonstration Effect" is fully compensated with the decrease in the time devoted to market work activities. Again, we obtain evidence to support that the "Demonstration effect" increases the intensity of dependent caregiving, which also affects the time devoted to the labour market.

6.3 Robustness Checks

The previous results correspond to individuals aged 24-65. However, for consistency, we have estimated with different sub-samples to correct for selection bias. In tables 2 and 3, Column (2) corresponds to individuals aged 30-55 and column (3) corresponds to married individuals aged 24-65. Results are quite consistent.[13]

7 Conclusions

This paper has studied, on the basis of the "Demonstration Effect" hypothesis, the influence children have on their parents' allocation of time, given that there are differences in the allocation of time to working and to care-giving, with and without the presence of young children. We have developed a theoretical model by combining the Social Cognitive Theory and an inter-generational altruism model. This approach suggests that the decisions taken by the child depend on the previously-observed behaviour of the parent. We use time-diary data from the 2002-03 Spanish Time Use Survey (STUS) in order to implement this

[13] Additionally, we construct variables with the relative time devoted to child care, adult care and market work. These are constructed as the percentage of the time devoted by each individual to each activity regarding the sum of the time devoted to home production and leisure. Results are consistent and are available upon request.

theoretical framework. In our empirical analysis, we first specify a Tobit model to analyse the time parents spend in adult care, child care and market work activities, taking into account the effects of children. We then estimate a Seemingly Unrelated Three-Regression (SUR) model on adult care, child care and market work activities, to determine how the number of children, as well as their presence during adult care activities, influences the time devoted to dependent care and market work.

Our Tobit results show that an additional child in the family aged 0-4, 5-12 and 13-17 decreases the probability of caregiving by 3.02, 2.24 and 1.45 percentage points, respectively, and increases the probability of care for children by 39.46, 20.64 and 6.47 percentage points, respectively. An additional child in the family aged 0-4 and 5-12 also decreases the probability of working by 36.86 and 13.92 percentage points, respectively. These empirical results argue in favour of the "Demonstration Effect" in Spain. We find evidence to support the idea that the presence of children, while parents are caring for grandparents, encourages parents to devote more time to adult care activities, by way of setting an example. Due to this reallocation of time, the "Demonstration Effect" negatively impacts the labour decisions.

The SUR estimation allows us to compare the effects that the presence of children during adult care has on child care, and on market work, as primary activities. We find evidence to support the idea that the presence of children is not due to joint production, but is a result of the "Demonstration Effect", since time devoted to child care activities increases by 12.64 minutes per day when children are present during adult care activities. The "Demonstration effect" increases the intensity of dependent caregiving, which affects the time devoted to the labour market, but not to the time spent on leisure activities. The increase in the time devoted to dependent care, as a result of the "Demonstration Effect", is fully compensated with a decrease in the time devoted to market work activities.

8 References

Aguiar, M., and Hurst E. (2007). Measuring Trends in Leisure: The Allocation of Time over Five Decades. *Federal Reserve Bank of Boston Working Paper N° 06-2*, (forthcoming *Quarterly Journal of Economics*).

Altonji, J.G., Hayashi F., and Kotlikoff L.J. (1996). The effects of income and wealth on time and money transfers between parents and children. *NBER working paper 5522*, Cambridge, MA.

Amemiya, T. (1985). Advanced Econometrics. Cambridge, MA: Harvard University Press.

Apps, P. F., and Rees R. (2002).Household Production, Full Con-

sumption and the Costs Of Children *Labour Economics*, 8, 621-648.

Bandura, A. (1986). Social Foundations of Thought and Action: A Social Cognitive Theory. Englewood Cliffs, NJ: Prentice Hall.

Becker, G. S. (1965). A theory of the Allocation of Time *Economic Journal,* 75, 493-517.

Becker, G. S. (1991). A Treatise on The Family, enlarged edition. Harvard University Press, Cambridge.

Bianchi, S. M., Wight, V., and Raley R.A. (2005). Maternal Employment and Family Caregiving: Rethinking Time With Children in the ATUS. *Paper presented at the American Time Use Survey Early Results Conference, Washington DC, USA, 8-9 December 2005.*

Bittman, M., Fisher, K., Hill, P., and Thomson C. (2005). The Time Cost of Adult Care. *Electronic International Journal for Time Use Research,* 2, 54-66.

Carmichael F, Charles S. 1998. The labour market costs of community care. Journal of Health Economics 1998; 17, 747-765.

Carmichael F, Charles S. 2003. The opportunity costs of informal care: does gender matter? Journal of Health Economics, 22, 781-803.

Cox, D., and Stark O. (1996). Ingergenerational transfers and the "demonstration effect". Mimeographed Boston college and Harvard University.

Cox, D. and Stark, O. (2005). On the demand for granchildren: tied transfers and the demonstration effect. *Journal of Public Economics,* 89, 1665-1697.

Ettner, S.L. (1995), "The Impact of "Parent Care" on Female Labor Supply Decisions", Demography, February, 32, 1, 63-80.

Ettner, S.L. (1996), "The Opportunity Costs of Elder Care", The Journal of Human Resources, Winter, 31, 1, 189-205.

Fisher, K., Egerton, M., Gershuny, J. I., and Robinson J. P. (2006). Gender Convergence in the American Heritage Time Use Study (AHTUS). *ISER Working Paper 2006-25.* Colchester: University of Essex.

Folbre, N. (1994). Children as Public Goods. *American Economic Review*, 84, 86-90.

Hamermesh, D., and Lee J. (2007) "Stressed Out on Four Continents: Time Crunch or Yuppie Kvetch," forthcoming *Review of Economics and Statistics.*

Jellal, M., and Wolff F.C. (2000). Shaping intergenerational relationships: the demonstration effect. *Economics Letters,* 68, 255–261.

Jellal, M., and Wolff F.C. (2002). Cultural evolutionary altruism: theory and evidence. *European Journal of Political Economy*, 18, 241-262.

Johnson, R.W. and Lo Sasso, A.T. (2000), "The Trade-Off between

Hours of Paid Employment and Time Assistance to Elderly Parents at Mid-Life", Report from The Urban Institute, Washington D.C.

Laferrère, A. (1999). Intergenerational transmission models: a survey. *Geneva Papers on Risk and Insurance: Issues and Practice 24, 2-26.*

Laitner, J. (1997). Intergenerational and interhouseholds economic links. In Rosenzweig, M., Stark, O. (eds): *Handbook of Population and Family Economics.* Elsevier, Amsterdam 189-235.

Schoeni, R.F. (1997). Private interhousehold transfers of money and time: new empirical evidence. *Review of Income and Wealth,* 43, 423–448.

Wolf, D.A. and Soldo, B.J. (1994), "Married Women's Allocation of Time to Employment and Care of Elderly Parents", The Journal of Human Resources, 29,4, 1259-1276.

Wolff, F.C. (2001). Private intergenerational contact in France and the demonstration effect. *Applied Economics,* 33, 143-153

Table 1. Descriptive Statistics

Variables	(1) All Sample		(2) Carers Sample	
	Mean	*S.E.*	*Mean*	*S.E.*
Male	0.467	(0.50)	0.291	(0.45)
Age	43.615	(10.17)	47.059	(9.49)
Married	0.940	(0.24)	0.965	(0.18)
Working status	0.644	(0.48)	0.436	(0.50)
Working full- time	0.617	(0.49)	0.404	(0.49)
University Education	0.163	(0.37)	0.133	(0.34)
High School Education	0.179	(0.38)	0.144	(0.35)
Number Members	3.539	(1.07)	3.682	(1.13)
Number of grandparents	0.063	(0.27)	0.163	(0.38)
Married Granparents	0.001	(0.04)	.004	(0.07)
Number of children <5	0.299	(0.57)	0.154	(0.40)
Number of children 5-12	0.352	(0.62)	0.233	(0.51)
Number of children 13-17	0.254	(0.51)	0.264	(0.51)
Time devoted to childcare	39.252	(79.70)	91.697	(119.63)
Time devoted to elderly care	5.549	(36.651)	25.778	(59.88)
Children present in adult care	0.006	(0.11)	0.105	(0.45)
Nº Observations	17211		1087	

Note: Descriptive Statistics calculated with the STUS.

Table 2. Tobit Model for the time devoted to adult care activities

	Sample 24-65			Sample 30-50			Married Sample 24-65		
Variable	Adult care	Child Care	Market Work	Adult care	Child Care	Market Work	Adult care	Child Care	Market Work
Male/Female	-2.313***	-14.174***	225.601***	-2.237***	-17.344***	226.421***	-2.338***	-14.017***	227.746***
	(5.80)	(19.47)	(56.09)	(5.12)	(18.44)	(48.34)	(5.56)	(18.86)	(54.38)
age	0.891***	-0.632**	7.807***	0.949**	1.106	10.954**	0.896***	-1.124***	9.011***
	(4.94)	(2.00)	(4.04)	(2.29)	(1.19)	(2.12)	(4.57)	(3.42)	(4.43)
age_2	-0.915***	0.036	-14.051***	-0.983**	-2.756**	-16.447***	-0.913***	0.524	-15.155***
	(4.79)	(0.10)	(6.62)	(2.07)	(2.48)	(2.73)	(4.43)	(1.43)	(6.84)
Married/Not Married	0.824	5.509***	-14.53	0.093	3.018*	-4.47	-	-	-
	(1.00)	(4.72)	(1.56)	(0.10)	(1.69)	(0.40)	-	-	-
Employment status	-0.441	-6.968***	-	-0.941	-7.176***	-	-0.454	-7.250***	-
	(0.44)	(3.63)	-	(0.86)	(2.94)	-	(0.43)	(3.68)	-
Working full time	-3.038***	-6.537***	-	-2.273*	-7.494***	-	-3.146***	-6.136***	-
	(2.64)	(3.45)	-	(1.88)	(3.07)	-	(2.60)	(3.16)	-
Secondary level of education	0.552	6.986***	40.529***	0.8	9.135***	43.574***	0.592	7.294***	38.430***
	(1.05)	(7.15)	(7.27)	(1.46)	(7.50)	(6.81)	(1.06)	(7.22)	(6.75)
Universitary level of education	0.387	9.645***	73.363***	0.455	13.233***	63.256***	0.519	9.920***	74.419***
	(0.71)	(8.90)	(12.22)	(0.81)	(9.85)	(9.37)	(0.89)	(8.88)	(12.07)
Number of persons in household	0.536***	-5.765***	5.291**	0.781***	-6.631***	-3.809	0.587***	-5.840***	4.998**
	(2.76)	(12.09)	(2.11)	(3.36)	(9.54)	(1.11)	(2.90)	(12.11)	(1.98)
Number grandparents household	3.865***	11.090***	6.582	2.853***	12.786***	14.304	4.047***	10.969***	8.346
	(7.63)	(9.19)	(0.90)	(5.01)	(7.89)	(1.57)	(7.68)	(8.95)	(1.14)
Number of grandparents in household	0.936	-9.341**	-20.277	3.357	-12.648***	7.639	0.777	-9.332**	-21.711
	(0.25)	(2.42)	(0.48)	(0.65)	(2.68)	(0.14)	(0.21)	(2.41)	(0.52)
Number Children <5	-3.020***	39.456***	-36.856***	-3.044***	43.720***	-22.178***	-3.029***	38.570***	-33.821***
	(6.13)	(49.95)	(8.28)	(6.02)	(42.50)	(4.07)	(5.77)	(47.93)	(7.41)
Number Children 5-12	-2.242***	20.635***	-13.911***	-2.240***	22.965***	-5.886	-2.282***	20.534***	-12.960***
	(6.16)	(33.35)	(3.73)	(6.05)	(27.45)	(1.30)	(6.00)	(32.85)	(3.46)
Number Children 13-17	-1.448***	6.472***	3.841	-1.813***	7.493***	11.633**	-1.470***	6.432***	4.791
	(3.80)	(8.47)	(0.89)	(4.70)	(7.64)	(2.30)	(3.71)	(8.34)	(1.11)
Present Children	11.471***	8.068***	-68.391***	10.827***	9.806***	-71.423***	11.840***	8.226***	-67.730***
	(13.37)	(3.74)	(3.60)	(12.33)	(3.68)	(3.42)	(13.34)	(3.82)	(3.61)
Nº Observations	17211	17211	17211	12454	12454	12454	16412	16412	16412

Note: Standard t-ratios in brackets. * Significant for the 90% confidence level; ** Significant for the 95% confidence level; *** Significant for the 99% confidence level. The reference regional dummy is Cantabria. The lower limit for left censoring is 0. Marginal Effects for the unconditional expected values of the dependent variable are calculated at mean values.

Table 3. Simultaneous Equations System for the time devoted to adult and child care activities

Variable	Adult care	Child Care	Market Work	Adult care	Child Care	Market Work	Adult care	Child Care	Market Work
Male/Female	-3.151***	-26.061***	235.945***	-3.181***	-29.979***	237.448***	-3.434***	-26.178***	240.396***
	(0.65)	(1.11)	(3.64)	(0.74)	(1.34)	(4.27)	(0.69)	(1.14)	(3.71)
age	1.026***	-1.739***	3.452*	0.703	-5.589***	6.886	1.017***	-2.527***	5.181***
	(0.27)	(0.46)	(1.76)	(0.70)	(1.26)	(4.71)	(0.29)	(0.49)	(1.86)
age_2	-1.017***	1.365***	-8.551***	-0.528	5.534***	-11.586**	-0.992***	2.159***	-10.271***
	(0.30)	(0.51)	(1.95)	(0.82)	(1.49)	(5.54)	(0.32)	(0.53)	(2.04)
Married/Not Married	0.366	8.575***	-17.105**	-0.206	4.360*	0.591	-	-	-
	(1.22)	(2.08)	(8.01)	(1.45)	(2.62)	(9.78)	-	-	-
Employment status	-1.626	-8.228***	-	-2.041	-6.990**	-	-1.706	-8.379***	-
	(1.77)	(2.99)	-	(1.98)	(3.55)	-	(1.87)	(3.09)	-
Working full time	-0.777	-7.033**	-	-0.547	-7.447**	-	-0.409	-6.632**	-
	(1.77)	(2.99)	-	(1.98)	(3.55)	-	(1.88)	(3.10)	-
Secondary level of education	-0.186	9.710***	31.248***	0.396	10.582***	32.784***	-0.082	9.503***	28.759***
	(0.76)	(1.30)	(4.97)	(0.84)	(1.52)	(5.62)	(0.80)	(1.34)	(5.11)
Universitary level of education	-1.703**	11.128***	59.075***	-1.549*	13.243***	48.384***	-1.697**	10.946***	58.571***
	(0.80)	(1.36)	(5.14)	(0.88)	(1.59)	(5.80)	(0.84)	(1.40)	(5.26)
Number of persons in household	0.788**	-2.081***	2.546	1.357***	-2.629***	-3.612	0.847**	-2.001***	2.583
	(0.38)	(0.64)	(2.46)	(0.48)	(0.88)	(3.26)	(0.39)	(0.65)	(2.47)
Number grandparents household	8.375***	-36.037***	2.313	1.386	-43.736***	11.34	-3.11	-36.424***	-7.495
	(1.11)	(1.89)	(43.83)	(7.75)	(14.00)	(52.16)	(6.78)	(1.91)	(7.32)
Number of grandparents in household	-2.526	9.434***	-7.789	7.477***	9.640***	13.421	8.715***	9.468***	2.546
	(6.69)	(11.39)	(7.28)	(1.32)	(2.38)	(8.85)	(1.15)	(11.29)	(43.31)
Number Children <5	-1.996***	75.299***	-35.005***	-2.205***	71.947***	-21.205***	-1.856***	74.137***	-32.503***
	(0.64)	(1.08)	(4.16)	(0.75)	(1.35)	(5.03)	(0.67)	(1.12)	(4.28)
Number Children 5-12	-2.529***	17.840***	-13.495***	-2.797***	18.323***	-7.482*	-2.496***	17.617***	-12.676***
	(0.55)	(0.94)	(3.62)	(0.64)	(1.15)	(4.29)	(0.57)	(0.95)	(3.64)
Number Children 13-17	-2.049***	-1.008	3.906	-2.727***	0.363	8.670*	-2.010***	-0.857	4.239
	(0.66)	(1.13)	(4.33)	(0.72)	(1.31)	(4.87)	(0.68)	(1.13)	(4.33)
Present Children	38.231***	12.644***	-67.421***	37.294***	15.212***	-71.161***	38.270***	12.818***	-67.254***
	(2.45)	(4.16)	(16.02)	(2.59)	(4.68)	(17.43)	(2.48)	(4.13)	(15.82)
Constant	-16.719***	79.934***	241.351***	-11.802	175.632***	152.257	-16.566**	105.942***	177.824***
	(5.96)	(10.15)	(39.05)	(14.70)	(26.56)	(98.96)	(6.58)	(10.96)	(42.01)
Nº Observations	17211	17211	17211	12454	12454	12454	16412	16412	16412

Note: Robust Standard t-ratios in brackets * Significant for the 90% confidence level; ** Significant for the 95% confidence level; *** Significant for the 99% confidence level. The reference regional dummy is Cantabria.