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## Family Labor Participation and Child Care Decisions

### The Role of Grannies

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# Family Labor Participation and Child Care Decisions: The Role of Grannies.<sup>1</sup>

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## Abstract

One of the most significant long term trends in the labor market in most OECD countries has been the increase in the proportion of working mothers. However, not all countries show the same pattern. Countries in Southern Europe (Italy, Greece and Spain) show an average participation rate of about 45% whereas the participation rates in Northern countries (Denmark, Sweden) are around 75%. The characteristics of child care systems also differ significantly across OECD countries. This along with the characteristics of the labor market may have led families to get the necessary social services in an alternative way, i.e. through grandmothers.

In this paper I analyze how and to what extent child care is provided by grandmothers and how this task is combined with paid work in 10 European countries. Moreover, I study whether the child care provided by grandmothers is encouraging the labor participation of their sons and, especially, their daughters. For this aim, I use a sample drawn from the Survey of Health, Aging and Retirement in Europe (SHARE) which provides detailed information about grandmothers (the units of observation) as well as their offspring with children. The econometric model considered takes into account the simultaneity of labor market decisions and care-giving activities, while controlling for unobserved heterogeneity in care-giving decisions. Here I exploit the fact that, information about multiple offsprings with children is usually available for each grandmother. I find a negative and very significant effect of participating in the labor market on the probability of taking care of the grandchildren on a regular basis. I also find evidence that, for some countries, the child care provided by grandmothers has a positive effect on the labor participation of their daughters.

Keywords: Binary choice, Female labor participation, Child care decisions, Simultaneous estimation, Panel data.

JEL classifications: J13, J21, C30.

# 1 Introduction

One of the most significant long term trends in the labor market in most OECD countries has been the increase in the proportion of working women. Even though female labor market participation has increased through out all OECD countries not all countries show the same pattern. Ahn and Mira (2002) divided OECD countries in 3 groups. The first is the high participation group in which the female participation rate is higher than 60%. This group includes U.S., Canada, UK, Sweden and Norway. The second is the medium participation group with participation rates between 50 and 60% (Germany, France, Austria and Portugal are in this group, among others) and the third is the low participation group with participation rates below 50% (Italy, Spain and Greece).

This dramatic rise in young women's labor force participation rates during the past decades has significantly increased the demand for non-maternal child care. As a consequence, different European countries have developed family friendly policies to help improve access to affordable and quality child care. However, the nature and coverage of these policies differ significantly across countries. In particular, Southern European countries have a lower level of social protection. That is, they have lower social expenditures for families and children. This along with the characteristics of the labor market may have led families to provide the necessary services through informal channels, namely through grandmothers<sup>1</sup>. Indeed, grandmothers have become one of the primary providers of child care for children in Europe and the provision of this time help is a significant intergenerational transfer. On the other hand, since the mid 1980's labor force participation rates among middle age and older women have also been on the rise. Little attention has been paid to the link between child care and labor force participation in literature.

This paper will help answer the key question of how and to what extent child care is provided by grandmothers and how this task is combined with paid work. Is this social service provided by grandmothers encouraging the labor participation of their sons or their daughters? Using data from families drawn from the Survey of Health, Aging and Retirement in Europe (SHARE),

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<sup>1</sup>In this paper, I focus only on grandmothers and not on grandmothers and grandfathers because of the fact that grandmothers had traditionally provided grandchild care with a higher probability and frequency (in our sample around 14% of grandmothers declare providing grandchild care once per day whereas only 9% of grandfathers do so).

which includes grandmothers and their offspring with children, I analyze the determinants of this kind of family support and the influence that it has on the labor participation of both the providers of help as well as the receivers. In addition, I also study the effect of different features of the formal child care systems across European countries (i.e. generosity of parental leaves, fees for child care), on the provision of care and on mother's labor participation.

The econometric model considered takes into account the simultaneity of labor market decisions and care-giving activities, while controlling for unobserved heterogeneity in care-giving decisions. Here I exploit the fact that, we usually have information about multiple offspring with children for each grandmother. I find a negative and very significant effect of participating in the labor market on the probability of taking care of the grandchildren in a regular basis. I also find some evidence that the care received has a positive effect on the labor participation of the daughters.

The rest of the paper is organized as follows. Section 2 reviews the economic literature on child care and mothers labor participation while Section 3 provides a theoretical framework for understanding the determinants of grandchild care and labor decisions. Section 4 gives an overview of child care systems across European countries, and Section 5 presents the dataset and the variables that we use in the empirical analysis. Section 6 discusses the econometric methodology. Section 7 presents the empirical results. Finally, Section 8 contains the conclusions.

## 2 Previous Literature

Most of the literature on child care and labor supply has focused on the effect of child care costs. Heckman (1974), Blau and Robins (1988), Connelly (1992), Ribar (1992) and Kimmel (1998) among others studied the relationship between child care costs and female labor market participation in the U.S. and UK. Using different methodologies these studies found that female labor participation is significantly influenced by child care policies.

Concerning Europe, Wroolich (2004) studied the effect of child care costs on the participation decision of mothers in Germany. He found negative but very small effects. A possible explanation given to this result is the fact that, in Germany, opening hours of child care facilities are not long and flexible enough. Kornstad and Thoresen (2004) and Gustafsoon and Stafford (1992) found significant effects only in areas without a problem of rationed supply

in Sweden and Norway, respectively. Similar results were found by Del Boca and Vuri (2005) for the case of Italy. All of these papers focus on the price of formal child care and ignore the possibility of informal care providers.

It should be pointed out that there is no much literature where the role of informal care provided by grandmothers is analyzed empirically. Only a few recent studies have examined the labor supply and child care decisions of grandparents and their effect on their offspring. Cardia and Ng (2003) calibrate an overlapping generation model extended to allow for both time and monetary transfers to the US economy. They find that intergenerational time transfers in the form of grand-parenting have important positive effects on labor supply and capital accumulation. Dimona and Wolff (2010) presented a theoretical framework to analyze the effect of grandparent's time and money transfers on maternal labor supply. Using SHARE, they find a strong positive impact of grandchild care on the labor force participation decision of the mother but no impact of money transfers. Lei (2006) using data from the Health and Retirement Study (HRS), investigates the determinants of transfers to children and paid employment of older woman. The study estimates reduced form models for money and time transfers provided by grandmothers as well as for their labor force participation, separately. As such, this study does not provide estimates of the causal effect of grandparents' labor force participation on provision of grandchild care. The main finding in Lei (2006) is that American women who have a new grandchild are likely to provide more money and time transfers to their children while they do not change their time in paid employment. In comparison with these studies, the main focus of this paper is studying the determinants of time transfers and how grandmothers combine them with paid work. A big effort is employed in estimating grandmother's care and labor participation decisions jointly, allowing for grandmother's unobserved heterogeneity, to arrive to causal estimates of the effect of grandmother's labor force participation on the provision of care.

### **3 Theoretical Framework**

This section presents an illustrative theoretical framework for better understanding the determinants of the grandmother's decision of providing grandchild care and its interaction with grandmother's and parent's labor supply. The model presented here is an adaptation of the overlapping generation

model with domestic production and time transfers introduced by Cardia and Ng (2003).

Assume a population composed of three cohorts: children, young (parents) and old (grandmothers). However, decisions are only made by the young and the old; children do not make economic decisions. Then, the model can be set up around two periods. An agent of age 1 (young (parents)) decides how to divide her time among work, leisure and care of their children. In addition, following the framework of Becker (1965) parents have to decide the amount of resources devoted to produce a home good interpreted as total child care. An agent of age 2 also decides how to divide her time among work, leisure and care of their grandchildren. Define as  $C_t^i$  a non durable market good purchased by the household of age  $i$  at time  $t$ , and as  $Z_t^i$  the part of  $C_t^i$  used to produce the home good  $q_t^i$  (i.e. child care) the rest is consumed directly. Individuals derive utility from leisure  $L_t^i$  and from  $\bar{C}_t^i$ , the composite of the home produced good ( $q_t^i$ ) and the part of the market good not used in home production ( $C_t^i - Z_t^i$ ).

Generations are assumed to be one-sided altruistic and hence to maximize their utility and the utility of their children in the following way:

$$V_t = U(\bar{C}_t^1, L_t^1) + \beta U(\bar{C}_{t+1}^2, L_{t+1}^2) + \gamma \beta V_{t+1} \quad (1)$$

where  $\beta$  is the discount factor and  $\gamma$  measures the extend to which one generation cares about the other. Denote as  $H_t^{ij}$  the time spent by those of age  $i$  in the production of the home good that is consumed by those that are age  $j$ . That is  $H_t^{11}$  denotes the time parents devote to child care while  $H_t^{21}$  indicates the time spent grand-parenting. Thus, the production function of the home good (child care) is assumed to have the following form:

$$q_t^1 = \Gamma_1(H_t^{11}, H_t^{21}, Z_t^1) \quad (2)$$

Note that for parents  $H_t^{21}$  is assumed exogenous. Our empirical analysis will study how this time transfer affects their allocation of work time. In this sense, the expected effect of  $H_t^{21}$  will depend on the extend it is a substitute of other inputs in the home production function above. The endowment of time is normalized to 1 so, the time constraints have the following form:

$$H_t^{11} + L_t^1 + H_t^{1w} = 1 \quad (3)$$

and for the old,

$$H_t^{21} + L_t^2 + H_t^{2w} = 1 \quad (4)$$

where  $H_t^{iw}; i = 1, 2$  denotes the time spent working.

Assume no monetary transfers across generations in which case the budget constraints have the following form:

$$\begin{aligned} C_t^1 &= H_t^{1w} w_t^1 \\ C_t^2 + \tau_t H_t^{21} &= H_t^{2w} w_t^2 \end{aligned} \quad (5)$$

Where  $\tau_t$  denotes the cost to be paid by grandparents for each unit of time transferred.  $w_t^i; i = 1, 2$  is the salary rate.

Individuals maximize their utility (1) subject to the home production function (2) and time and budget constraints (3,4 and 5). Then, the first order conditions have the following form:

$$\begin{aligned} \{L_t^1\} &: \frac{\partial U}{\partial L_t^1} = w_t \frac{\partial U}{\partial C_t^1} \\ \{L_{t+1}^2\} &: \frac{\partial U}{\partial L_{t+1}^2} = w_{t+1} \frac{\partial U}{\partial C_{t+1}^2} \\ \{Z_t^1\} &: \frac{\partial U}{\partial q_t^1} \frac{\partial \Gamma_1}{\partial Z_t^1} = \frac{\partial U}{\partial C_t^1} \\ \{H_t^{11}\} &: \frac{\partial U}{\partial q_t^1} \frac{\partial \Gamma_1}{\partial H_t^{11}} = w_t \frac{\partial U}{\partial C_t^1} \\ \{H_{t+1}^{21}\} &: \frac{\partial U}{\partial L_{t+1}^2} + \tau_{t+1} \frac{\partial U}{\partial C_{t+1}^2} \geq \gamma \frac{\partial U}{\partial q_t^1} \frac{\partial \Gamma_1}{\partial H_{t+1}^{21}} \end{aligned}$$

The first two conditions are the inter-temporal Euler equations for consumption and leisure. The third condition states that the marginal utility of the market good should be equal to the marginal utility of the home produced good. The next condition concerns the time devoted by parents to child care and states that this time is chosen in a way that the ratio of the marginal utility of a unit of time spent at home and at work should equal the wage rate. Finally, the last condition states that for time transfers to be positive the gain of a unit of time spent helping the young should be at least equal to the loss induced by time transfers (i.e. cost due to the reduction of leisure as well as physical cost of such transfers).

The theoretical model presented above suggests reduced form equations for grandchild care and labor supply provided by grandmothers that would be a function of grandmother's wage, preferences toward future generations, and cost of providing care among others. Although wage rates are not included directly in our empirical model described below, they will be proxy by variables such as level of education. Concerning preferences toward future generations, the empirical application in this paper allows for different grandmothers to have different preferences towards taking care of all their grandchildren (grandmother's unobserved heterogeneity). Finally, the cost of providing care will be measured by variables such as distance to their children, the additional effort of taking care of them due to health problems, number of grandchildren, etc. It should be pointed out that the model above assumes that grandmother's can adjust their working hours in each period of time. However, if we make the more plausible assumption that time devoted to labor is chosen in a first period of time and that in the second period there are market hour constraints then, grandmother's adjustments would need to come through adjustments to their time devoted to leisure or taking care of their grandchildren. In our empirical analysis we will study to what extent labor status affects the grandmother's decision of taking care of their grandchildren introducing labor supply as an explanatory variable in grandmother's care decisions.

## **4 Institutional Support for child care across Europe**

Parents throughout Europe share the common challenge of balancing labor in paid work and child care. Yet despite relatively common problems across countries, social and labor market policies vary dramatically in the level of support that they provide to parents. The first column of Table 1 shows public social expenditures in family policies for several countries. As we can see in this table, Nordic Governments (Denmark and Sweden) are the most generous ones, employing a range of policies designed to help people balance their work and family life. In these countries, public day care is heavily subsidized and flexible work schedules are common. In countries in central Europe (Austria, Netherlands, Switzerland, Germany and France) child care providers are mainly private institutions although facilities are subsidized by

the Governments. The main problem in some of these countries is the lack of available child care places (see e.g. Wrohlich (2004)). Finally, in southern Europe (Italy, Spain and Greece), child care providers are private institutions and subsidies from the Governments are limited. This higher generosity in family policies from Northern countries comes along with a higher proportion of children (aged under 3) using formal care facilities, as it can be seen in the second column of Table 1.

At least 3 areas of family policy influence dominant patterns of parental care-giving. First, family leave policies grant parents the right to take time off for care-giving, especially in young ages of the children. These policies replace some or all wages during parents' time off. Across Europe, there are different types of child-related leave, which generally offer employment protection during absence from work to care for children. The most common forms of child-related leaves are: maternity leave (or pregnancy leave) offering leave of absence for employed women at around the time of childbirth, paternity leave offering leave of absence for employed fathers at the time of childbirth, and parental leave which offers an employment protected leave of absence for employed parents, normally supplementary to specific maternity and paternity leave periods and usually following the period of maternity leave.

Comparing the generosity of child leave policies across countries is a difficult task given the differences in duration of leaves and level of payment. Plantenga and Siegel (2004) in an attempt to compare parental leave policies across countries constructed an "effective leave" measure computed by weighting the duration of the legislated parental leave by the level of the replacement wage or benefit offered. The first column of Table 2 shows the "effective leave" duration for the European countries in SHARE as calculated by Plantenga and Siegel (2004). The longest parental leave is in Sweden (119 weeks), followed by Austria (71 weeks), Germany (64 weeks) and Denmark (36 weeks). The shortest parental leaves are offered in The Netherlands (11 weeks), Greece (12 weeks) and Italy (24 weeks).

Secondly, different working time regulations help parents to free up care giving time. Flexible labor arrangements with the possibility of part-time employment may help families to combine work and child responsibilities. The third column of Table 2 presents the incidence of total part time employment as a percentage of total employment for the European countries considered in this paper. As we can see in this table the incidence of part time employment varies among European countries ranging from around 35%

in the Netherlands to only 7.5% percent in Greece. The highest incidence of part time employment takes place in The Netherlands and Germany. On the other hand, Greece, Spain, France and Italy are in the group of countries with lowest part time employment rates.

Finally, public provisions for early childhood education and care vary substantially across European countries. The second column of Table 2 shows OECD (2007) estimates of the "typical" fees charged by accredited child care centers, for children aged 2, as a percentage of the average wage in the country. Fees charged by child care centers range from 4 percent in Greece to 30 percent in Spain. In addition, it should be pointed out that compulsory school-ages vary from 3 to 6 years old among European countries. Moreover, some European countries offer public pre-school education with enrollment ages ranging from 2 years old in France to 6 years old in Sweden. Eligibility for public pre-school education is universal for almost all European countries and in most countries it is available free of charge while in others like The Netherlands and Germany they are subsidized. An additional important related aspect is the opening hours offered in these public pre-school centers. Most of the European countries considered have opening hours of less than 30 weekly hours. Table 3 summarizes relevant characteristics of pre-school education and age of compulsory education for different European countries.

The characteristics of the child care system along with the characteristics of the labor market may have led families to seek the necessary social services through the informal market, i.e. through grandmothers. Figure 1 shows the proportion of grandmothers who take care of their grandchildren at least once per week. As we can see in this figure, Greek grandmothers are the ones who take care of their grandchildren in the highest proportion, followed by Italy, Spain and The Netherlands. As illustrated in Figure 2, these countries also have the lowest proportion of grandmothers in paid employment.

## 5 Data

The data considered for this analysis comes from the Survey of Health, Aging and Retirement in Europe (SHARE) Release 2<sup>2</sup>. SHARE is a new multidis-

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<sup>2</sup>For more information about SHARE see <http://www.share-project.org/>. This paper uses data from the early release 2 of SHARE 2004. This release is preliminary and may contain errors that will be corrected in later releases. SHARE data collection in 2004-2007 was primarily funded by the European Commission through its 5th and 6th

disciplinary and cross-national database of micro data on health, socioeconomic status, social and family networks. The uniqueness of SHARE lies on 3 important and appealing features of the data: multidisciplinary, longitudinal character and cross-country comparability. It has data of about 28,000 continental Europeans who are over the age of 50. Countries included in Release 2 of the first wave of this survey (2004) are: Sweden, Denmark, Germany, The Netherlands, France, Austria, Italy, Spain, Greece and Belgium<sup>3</sup>. The cross-national nature of SHARE data will help us learn from different policies across Europe. For the first time comparable data was collected in Europe including health variables, socioeconomic variables (labor situation, wealth, consumption, housing etc.), as well as information related to social support. SHARE's structure gives the possibility of analyzing a wide variety of questions related to population ageing and the quality of life of the elderly. This paper considers information about labor status of the grandmothers, their offspring, number of grandchildren, and child care time allocated to taking care of grandchildren as well as other sociodemographic information relevant for the analysis.

The sample considered consists on grandmothers who are in working age (between 50 and 65 years old), who reported the relevant information. SHARE provides information about the number of living children and some basic information about them (gender, age and residence closeness). Moreover, more detailed information is asked about up to four children. When there are more than four children, the selection is not random. In that case, they choose the four children who live closer and who are older. So, for each grandmother we have detailed data up to four offspring. This will imply that our estimates could be interpreted as an upper bound estimate of the possible effect as these are the children with highest needs of care. We selected those sons or daughters who have children younger than 13 years old to be included in the analysis. The final sample consists on 1689 grandmothers who contributed to 2545 observations. Table 4 shows the distribution of the observations by number of children. Tables 5 and 6 show some descriptive

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<sup>3</sup>SHARE also includes Israel and Switzerland. We exclude Israel since it was added after 2004, and Switzerland due to its low response rate and extremely small sample size.

statistics for grandmothers and their offspring.

## 6 Econometric Model

The empirical model considered takes into account the relationship between labor market decisions, care-giving activities and the fact that these decisions are made in a family context. In particular, the empirical analysis is based on the following reduced form model of labor market participation and care-giving decisions:

$$\begin{aligned} PD_j^* &= \alpha_D C_j + \beta_D X_{Dj} + \gamma_D^c I_{jc} - \varepsilon_{Dj} \\ PGM_i^* &= \beta_{GM} X_{GMi} + \gamma_G^c I_{ic}^P - \varepsilon_{GMi} \\ C_{ij}^* &= \alpha_i + \alpha_{GM} PGM_i + \gamma Z_{ij} + \gamma_{GM}^c I_{jc} - \varepsilon_{Cij} \end{aligned}$$

$PD_j^*$  is the net utility for the offspring ( $j$ ) to participate in the labor market,  $PGM_i^*$  is the net utility of the grandmother ( $i$ ) to participate in the labor market and,  $C_{ij}^*$  is the net utility for the grandmother ( $i$ ) to take care of the children of her offspring ( $j$ ) on a regular basis (at least once per week). In the same way,  $C_j$  is a dummy variable that takes the value one if the grandmother takes care of the children of her offspring ( $j$ ) on a regular basis.  $PGM_i$  is another dummy variable that takes the value one if grandmother ( $i$ ) participates in the labor market (full time or part time).  $X_{Dj}$  are observed variables that affect the offspring's utility of participating in the labor market. These variables include: age, level of education, number of children, and marital status.  $X_{GMi}$  are observed variables that affect the grandmother's utility of participating in the labor market. These variables include: age, level of education, health status, marital status, labor status and level of education of the couple, other household income, and country controls. Finally,  $Z_{ij}$  includes all the observed variables that may affect the decision of taking care of grandchildren such as: age and number of grandchildren, grandmother's health status, distance to the children's home, a dummy for the offspring being a daughter and offspring's marital status.  $I_{jc}$  denotes a set of institutional variables affecting the grandmother's care and offspring's labor participation decisions. In particular, we use information about each countries parental leave policies and child care fees as explanatory variables, interacted with a dummy indicating whether the youngest grandchild is younger than the

starting age of preschool in public school centers set in their country. In the same way,  $I_{jc}$  also includes information on whether the youngest grandchild in the family is in between the starting age of public pre-school education and/or above the starting age of compulsory education, interacted with country dummies, to capture country differences in pre-school and compulsory education systems (e.g. different flexibility in opening hours). Finally, country fixed effects are also included directly in order to capture any remaining institutional differences across countries.  $I_{ic}^P$  includes institutional information about eligibility to public pension systems which will affect grandmother's labor participation. Specifically, we introduce a dummy variable indicating whether the grandmother is above the statutory early retirement age set in her country<sup>4</sup>, as well as country fixed effects.  $\alpha_i$  represents the grandmother specific unobserved heterogeneity. That is, the grandmother's "taste" or willingness to take care any of her grandchildren.  $\varepsilon_{Dj}$ ,  $\varepsilon_{GMi}$  and  $\varepsilon_{Cij}$  contain any remaining unobserved variables. Note that, with respect to the participation decisions of the offspring, we have observations of individuals of the same family. So, we may have that  $\varepsilon_{Dj}$  are correlated among offspring. This will be taken into account when estimating the model by obtaining cluster-robust standard errors. Finally, this model considers that grandmothers decide to participate in the labor market before they make the decision of providing child care to their grandchildren. This is consistent with the idea that labor force participation was a pre-existing choice before grandchild care and with the existence of market hours constraints.

Therefore, according to this model, the observed variables of labor market participation and care-giving decisions will have the following form:

$$\begin{aligned}
 PD_j &= 1(\alpha_D C_j + \beta_D X_{Dj} + \gamma_D^c I_{jc} - \varepsilon_{Dj} > 0) \\
 PGM_i &= 1(\beta_{GM} X_{GMi} + \gamma_G^c I_{ic}^P - \varepsilon_{GMi} > 0) \\
 C_{ij} &= 1(\alpha_i + \alpha_{GM} PGM_i + \gamma Z_{ij} + \gamma_{GM}^c I_{jc} - \varepsilon_{Cij} > 0)
 \end{aligned} \tag{6}$$

Where,  $1(A)$  is an indicator function that takes value 1 if the event  $A$  is true. Estimates of the parameters of interest can be obtained considering distributional assumptions for the unobservables and maximizing the corresponding

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<sup>4</sup>The main source for this data was Natali (2004), but was supplemented with information from OECD (2003), the Bartelsmann Foundation, Sundén (2004), Preesman (2006), and OECD (2005). Slight differences can be found between our retirement ages and those from other OECD publications (for example, OECD, 2005), due to the differences between current law and the law that was in place when these individuals were facing the retirement decision.

likelihood function. It is natural to think that the unobservable determinants of the participation decision of the grandmother ( $\varepsilon_{GMi}$ ) and those of the care decision ( $\alpha_i - \varepsilon_{Ci j}$ ) would be correlated. For example, grandmothers with unobservables that make them less likely to participate in the labor market may be those with higher “family values” and so, with unobservables that increase the probability of taking care of their grandchildren. Alternatively, grandmother’s participating in the labor market might be more familiar with the challenges of balancing work and child care responsibilities and thus, they might be more willing to provide care to their grandchildren. On the other hand, it is not very unrealistic to consider that the unobserved determinants of the participation and care decisions of grandmothers are not correlated with the unobserved determinants of the participation decision of their offspring. That is, care provided is a given decision for the children. This assumption helps simplify the estimation of the system of equations described in (6) as the model for grandmothers and the model for their offspring can be estimated separately.

## 6.1 Identification

In order to estimate the model we assume the following distribution for the unobservables:

$$\begin{pmatrix} \varepsilon_{GMi} \\ \alpha_i \\ \varepsilon_{Ci 1} \\ \varepsilon_{Ci 2} \\ \varepsilon_{Ci 3} \\ \varepsilon_{Ci 4} \\ \varepsilon_{Dj} \end{pmatrix} \sim N \left[ \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \sigma_{\alpha, \varepsilon_{GMi}} & 0 & 0 & 0 & 0 & 0 \\ & \sigma_{\alpha}^2 & 0 & 0 & 0 & 0 & 0 \\ & & 1 & 0 & 0 & 0 & 0 \\ & & & 1 & 0 & 0 & 0 \\ & & & & 1 & 0 & 0 \\ & & & & & 1 & 0 \\ & & & & & & 1 \end{pmatrix} \right]$$

$j = 1, 2, 3, 4$

Note that  $\sigma_{\alpha}^2$  will measure the variance of the grandmother’s random effect while,  $\sigma_{\alpha, \varepsilon_{GMi}}$  will give us information about the importance of the endogeneity problem as well as about the direction of the endogeneity bias.

It can be shown<sup>5</sup> that, in order to have identification in this type of models, exclusion restrictions in variables affecting care and participation

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<sup>5</sup>See, e.g. Heckman (1978)

decisions of grandmothers are required. In this respect, eligibility for early retirement public pensions will affect the grandmother's labor participation but will not have a direct effect on grandchild care provided.

## 6.2 Estimation

Given previous distributional assumptions, we estimate the model by maximum likelihood. The model for the offspring is a probit decision model. The only econometric problem when estimating this model is due to the fact that the unobservables may be correlated as we have observations of individuals in the same family. So we obtain cluster-robust standard errors.

On the other hand, we estimate the care and participation decisions of grandmothers jointly. As we can see in equation (6) for each grandmother we have information about her labor status and about the care decision of their grandchildren of at most 4 of her offspring. Consider the case of a grandmother with 4 offspring then her contribution to the likelihood would be:

$$\Pr(PGM_i = a, C_{i1} = b, C_{i2} = c, C_{i3} = d, C_{i4} = e | X) \\ a = 1, 0; b = 1, 0; c = 1, 0; d = 1, 0; e = 1, 0$$

Defining as  $G(\alpha_i)$  the distribution function of the individual random effect we get:

$$\begin{aligned}
& \Pr(PGM_i = a, C_{i1} = b, C_{i2} = c, C_{i3} = d, C_{i4} = e|X) = & (7) \\
& = \int_{-\infty}^{\infty} \Pr(PGM_i = a, C_{i1} = b, C_{i2} = c, C_{i3} = d, C_{i4} = e|X, \alpha_i) dG(\alpha_i) = \\
& = \int_{-\infty}^{\infty} \Pr(PGM_i = a, C_{i1} = b, C_{i2} = c, C_{i3} = d, C_{i4} = e|X, \alpha_i, PGM_i = a) \\
& \quad \times \Pr(PGM_i = a|X, \alpha_i) dG(\alpha_i) = \\
& = \int_{-\infty}^{\infty} \Pr(C_{i1} = b|X, \alpha_i, PGM_i = a) \Pr(C_{i2} = c|X, \alpha_i, PGM_i = a) \\
& \quad \times \Pr(C_{i3} = d|X, \alpha_i, PGM_i = a) \Pr(C_{i4} = e|X, \alpha_i, PGM_i = a) \\
& \quad \times \Pr(PGM_i = a|X, \alpha_i) dG(\alpha_i)
\end{aligned}$$

The last step comes from the fact that we assume that, the care giving decisions are not correlated, once we condition on the individual effect ( $\alpha_i$ ). In the same way, we obtain the contribution to the likelihood of grandmothers with information about 3, two or one offspring. We maximize the log-likelihood function using Gauss Hermite integral procedures evaluated in 26 points.

## 7 Results

### 7.1 Labor participation of the offspring

In this section we present estimates for the labor participation decision of the children. Separate models are estimated for sons and daughters. Table 7 presents the estimated coefficients for a probit model of the participation decision of daughters. The set of explanatory variables include, age, number of children, level of education, marital status, a set of institutional variables representing characteristics of the child care system in her country of residence, as introduced in previous section, and interactions between country dummies and a dummy indicating whether care was provided by the grandmother. These variables were constructed with information presented in

Tables 2 and 3. Country controls are also included in the regressions directly to capture any remaining country differences that could affect female labor participation.

Age and education variables have a positive effect on the labor participation of daughters while the higher the number of children the lower mother's labor force participation. Concerning institutional differences, no differences are found in participation of mothers with young children depending on the generosity of parental leave policies. However, the labor participation of mothers of young children is lower in countries with higher child care fees. Similar results were found for Germany, Sweden, Norway and Italy in studies that ignored the possibility of informal care providers (see e.g. Wroolich (2001), Kornstad and Thoresen (2001), Gustafsoon and Stafford (1992) and Del Boca and Vuri (2005)). In comparison with the Northern European countries (Denmark and Sweden), mothers of children in pre-school age living in The Netherlands, Spain, France and Belgium have a lower probability of participating in the labor market. All these countries except Spain have limited opening hours of their public pre-school centers. These differences in mother's labor participation persist with children of compulsory education age. In addition, mother's labor participation is lower for Greek mothers in this case. Care provided by grandmothers has a positive and significant effect on labor participation of mothers living in The Netherlands, Greece, Belgium and France.

Table 8 shows estimated coefficients for the labor participation decision of sons. In this case, no significant effect was found for any of the institutional variables introduced in the daughters' labor participation estimates. Therefore, a simplified model is presented in this table. In this case, care provided by grandmothers does not have a significant effect on the labor participation decision of their sons and the only significant country effect found was for the case of Germany. Living in Germany reduces the probability of working. This latter result may be indicating a particular bad economic situation for this country in the year of the survey. Finally, being married has a positive and significant effect on father's labor participation.

## 7.2 Care and participation decisions of the grandmother

### 7.2.1 Estimates without taking endogeneity into account

In this section we present estimates of the determinants of the grandmother's decision of providing care to their grandchildren. These are estimates that do not correct for the possible endogeneity of grandmothers' participation in the labor market. The next section shows estimates taking endogeneity of labor participation into account. The explanatory variables in these estimates include: age dummies, grandmother's participation in the labor market, number of grandchildren, marital status of the child, self reported health, a dummy for the child living further than 25 kilometers, a dummy for the child being a daughter, and variables capturing institutional differences in child care systems across countries. Country fixed effects are also included to capture any remaining differences across countries. As we can see in Table 9, those grandmothers who participate in the labor market have a lower probability of taking care of their grandchildren. Having more grandchildren also lowers the probability of care-giving. Surprisingly, not having good health does not seem to have a very strong effect on grandchild care provided. If the child lives further than 25 kilometers the probability of the grandmother providing grandchild care is lower. An interesting result is that grandchild care seems to be provided in a higher probability from mothers to daughters than from mothers to sons. With respect to institutional variables, grandmother's of young children in countries with higher child care fees provide care with a higher probability. This suggests that grandmother's care might be used as a substitute when child care facilities are too expensive. Grandchild care is provided with a higher probability in Italy and Belgium for grandchildren in preschool age. Italian and Greek grandmother's provide care to their grandchildren in compulsory education age with a higher probability. In comparison with the results for daughter's labor participation, presented above, we find that with the exception of Greece, grandmother's are not providing care with a higher probability on those countries with institutional features that reduced mother's labor supply. This suggests that the adjustment to the necessity of child care in most countries, derived from institutional features, is performed in a greater extend through a reduction in mother's labor supply and in a lesser extend through an increase in grandmother's care. Finally, the variance of the grandmother's random effect is significant indicating the importance of controlling for unobserved heterogeneity.

### 7.2.2 Joint estimates of care and labor participation decisions

Estimates presented in previous section do not take into account the endogeneity of labor participation decisions and as so, the estimate of labor participation on care decisions cannot be interpreted as causal. In this section we present estimates, that correct for the endogeneity of labor participation decisions, obtained maximizing the joint likelihood of care and labor participation decisions based in individual contributions as introduced in (7).

Table 10A shows the estimated coefficients for the participation decision of the grandmother. Age and education have the expected effect, participation declines with grandmother's age and increases with grandmother's education level. Married grandmothers participate in the labor market with a lower probability. Health related variables have also the expected effect, the healthier the grandmother the higher the probability of participating in the labor market. Grandmothers with partners still working participate in the labor market with a higher probability. However, the higher the level of education of the partner the lower the probability of the grandmother participating in the labor market. Finally, being above the early retirement age, our exclusion restriction, has a negative and significant effect on the probability of the grandmother's labor participation.

Table 10B shows the estimated coefficients for the care giving decision. Once we control for the endogeneity of grandmother's labor participation we find a bigger effect for this variable. Moreover, we find that having not good health has a negative and more significant effect. As expected young grandmothers provide care with a higher probability. As it was found in previous estimates without controlling for endogeneity, living further than 25 kilometers has a negative effect while if the child is a daughter there is a positive and significant effect on grandmother's care provided. Grandmothers of young children who live in countries with higher child care fees provide care with a higher probability but the effect is smaller than in the regressions presented in previous section. Finally, only grandmothers of preschool children living in Italy and Greek and Italian grandmothers of compulsory school age children provide care with a higher probability.

The significant variance of the grandmother's unobserved heterogeneity term shows the importance for controlling for unobserved heterogeneity in grandmother's care. The correlation between the unobservables in the participation and care decisions turned out to be negative and significant indicating that those grandmothers with a higher probability of participating in the la-

bor market are also those with unobservables that urge them to take care of their grandchildren. This suggests that grandmothers participating in the labor market may be more familiar with the challenges of balancing work and care responsibilities and might be more willing to provide care to their daughters.

## 8 Conclusions

The dramatic rise in women's labor force participation rates during the past four decades has significantly increased the demand for non-maternal child care. One source for this care is grandmothers. Indeed, grandmothers have become one of the primary providers of child care for children in Europe and the provision of this time help is a significant intergenerational resource transfer. In this paper we studied to what extent child care is provided by grandmothers and how this task is combined with paid work. In addition, we studied whether this social service provided by grandmothers is encouraging the labor participation of their offspring.

This paper finds a negative and very significant effect of participating in the labor market on the probability of taking care of the grandchildren in a regular basis. From the point of view of policy makers this is an important finding because, recent tendencies to try to prolong grandparents' working life might change the care provided to grandchildren and affect the labor supply of young mothers by changing the set of child care options that are available. Moreover, the quality of child care is an important determinant of a child's development (See Peisner-Feinberg et. al., 2001). Thus, if the care provided by grandmothers is not substituted by formal care of equal or better quality, the reduction of grandmothers' care may have implications on the child's development. In this respect, it will be good if future research explores the relationship among retirement and child care decisions the possible effects that prolonging working life might have.

We also find that grandmother's of young children in countries with higher child care fees provide care with a higher probability. This suggests that grandmother's care might be used as a substitute when child care facilities are too expensive. In addition, we find that, with the exception of Greece, grandmother's are not providing care with a higher probability on those countries with institutional features that tend to reduce mother's labor participation. This result suggests that the necessary adjustments due to in-

stitutional features are performed in a greater extend through reductions in mother's labor supply than in increases in grandmother's care. Finally, we find a positive effect of the offspring being a daughter on the probability of providing grandchild care indicating that this kind of time transfer is mostly provided from mothers to daughters.

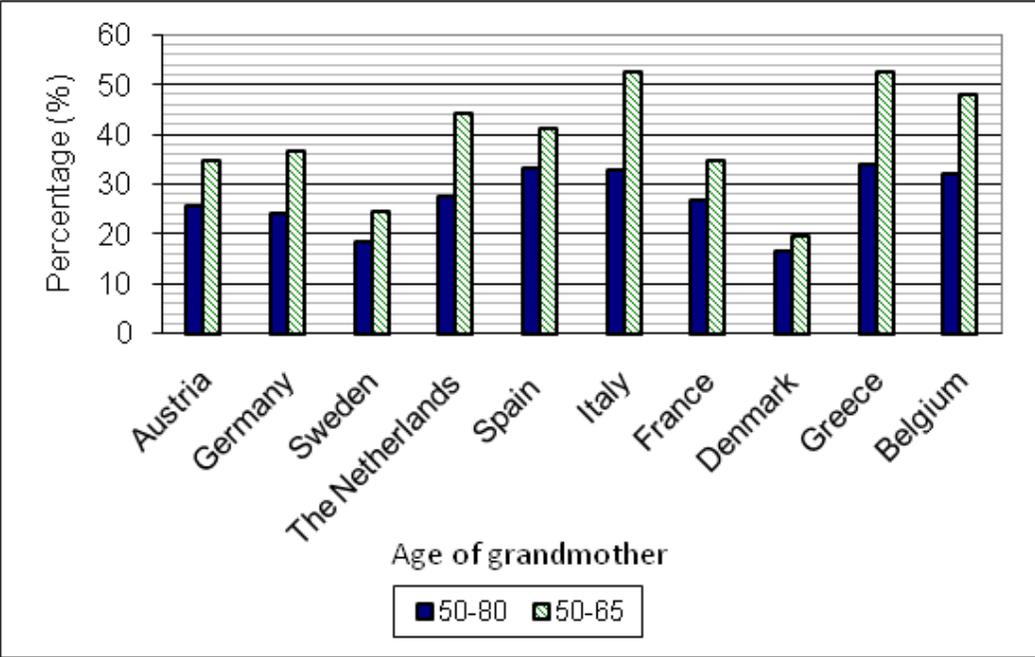
Concerning the offspring's labor participation, we find evidence that care received has a positive and significant effect on the labor participation of mothers in The Netherlands and in Greece.

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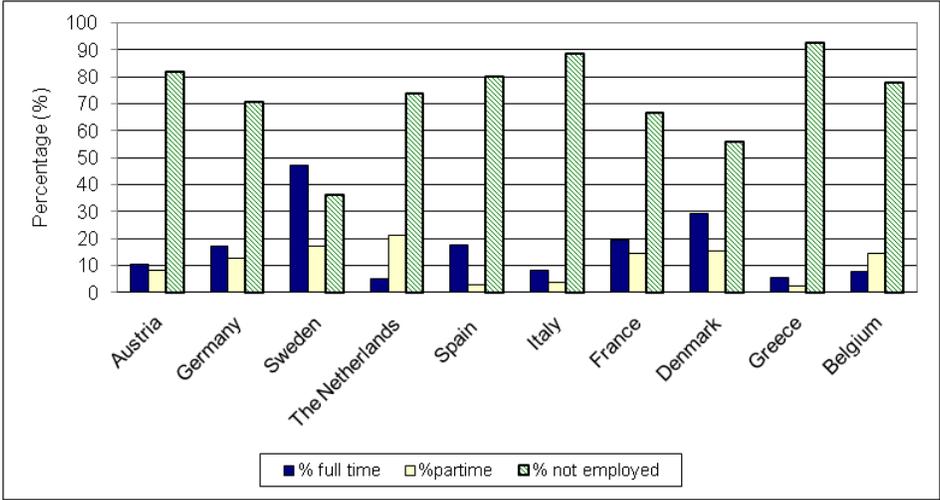
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Figure 1. Percentage of grandmothers who take care of their grandchildren (weekly)



Source: SHARE 2004 release2

Figure 2. Current job situation for women in between 50-65 who have grandchildren.



Source: SHARE 2004 release2

Table 1. *Public Social Expenditure in Family Policies and Proportion of Children (aged under 3) in Formal Care*

<b>Country</b>	<b>Soc. Expen. (% of GDP 2001)</b>	<b>% Child. in F. care</b>
Austria	2.9	4
Belgium	2.3	30
Denmark	3.8	64
France	2.8	29
Germany	1.9	10
Greece	1.8	3
Italy	1.0	6
Netherlands	1.1	6
Spain	0.5	5
Sweden	2.9	48
United Kingdom	2.2	34
United States	0.4	54

Source: OECD (2004) Social Expenditure Database and OECD (2001).

Table 2. *Family Leave Policies, Cost of Child Care and Labor Market Characteristics*

<b>Country</b>	<b>Effective Parental Leave</b> <sup>1</sup> (weeks)	<b>Fees charged by child care centers</b> <sup>2</sup> (% of Average Wage)	<b>Incidence of part time employment</b> <sup>3</sup> (% of Total Employment)
Austria	71	10	17.3
Belgium	18	20	19.3
Denmark	36	8	18.1
France	48	25	13.3
Germany	64	9	21.9
Greece	12	4	7.5
Italy	24	N.A	14.9
Netherlands	11	17	35.5
Spain	48	30	11.1
Sweden	119	5	13.4

Notes: N.A means Not Available. 1. Source: Plantenga and Siegel (2004); 2. Refers to a full time fee for a 2 years old. Source: OECD (2007); 3. Source: OECD Factbook 2009. Data refers to 2006.

Table 3. *Early Childhood Education Systems*

<b>Country</b>	<b>Starting Age of Compulsory Education</b> <sup>1</sup>	<b>Starting Age of Pre-school in Public School Centers</b> <sup>2</sup>	<b>Opening Hours for Pre-school Public Education</b> <sup>3</sup>
Austria	6	4	Part-time
Belgium	6	2.5	Part-time
Denmark	7	5	Full-time
France	6	2	Part-time
Germany	6	3	Part-time
Greece	6	3.5	N.A
Italy	6	3	Varies
Netherlands	5	4	Part-time
Spain	6	3	Full-time
Sweden	7	6	Full-time

Notes: N.A means not available. 1. Source: Eurydice at Nfer: [www.nfer.ac.uk/eurydice](http://www.nfer.ac.uk/eurydice); 2. and 3. Source: OECD (2001) and The clearinghouse for international developments in child, youth and Family policies at Columbia University. A full time place is defined as a minimum of 30 weekly hours.

Table 4. Distribution of observations by number of children.

<b>Number of children</b>	<b>Freq.</b>	<b>Percent</b>
<b>1</b>	1001	39.33
<b>2</b>	1072	42.12
<b>3</b>	408	16.03
<b>4</b>	64	2.51
<b>Total</b>	2545	100

Source: SHARE 2004 release2

Table 5. Descriptive statistics grandmothers

<b>Variable</b>	<b>Mean</b>	<b>Variable</b>	<b>Mean</b>
Labor Participation (%)	31.32	Other household income (millions of Euros)	0.0052
Age	58.54	Austria (%)	5.98
High Education Level (%)	16.70	Germany (%)	9.59
Medium Education Level (%)	30.91	Sweden (%)	14.98
Married (%)	72.82	Netherlands (%)	13.91
Less than Good Health (%)	32.15	Spain (%)	6.22
2+ Chronic Conditions (%)	39.85	Italy (%)	7.93
Limited Mobility (%)	49.32	France (%)	11.78
Maximum Grip (kg/100)	0.29	Denmark (%)	8.58
Partner L. Participation (%)	16.04	Greece (%)	6.10
High Educated Partner (%)	9.35	Belgium (%)	14.92
Medium Educated Partner (%)	14.62	N. obs	1689

Source: SHARE 2004 release2

Table 6. Descriptive statistics offspring

<b>Variable</b>	<b>Daughter</b>	<b>Son</b>
	<b>Mean</b>	<b>Mean</b>
Care received (%)	46.14	33.58
Labor participation (%)	71.28	96.07
Age	33.74	34.82
High education (%)	25.62	26.03
Medium education (%)	56.40	54.62
N. of children	1.86	1.82
Age of youngest child	4.40	3.97
Married (%)	82.71	83.07
Living further than 25 km (%)	24.38	24.89
N. obs	1452	1093

Source: SHARE 2004 release2

Table 7. Probit estimates of the labor participation decision of the daughter

Variable	Coef.	Variable	Coef.
Age	0.033*** (0.010)	Germany	-0.73 (0.47)
Number of Children	-0.18*** (0.047)	Netherlands	-2.44** (1.04)
High Education Level	0.81*** (0.13)	Spain	-4.49** (1.75)
Medium Education Level	0.39*** (0.10)	Italy	0.24 (0.31)
Married	0.0088 (0.11)	France	-4.01*** (1.43)
<u>Child Younger Preschool Age</u>		Greece	-0.87** (0.40)
Parental leave	-0.00046 (0.0035)	Belgium	-3.05** (1.21)
Fees child care	-0.16** (0.062)	<u>Care Received</u>	
<u>Child Preschool Compulsory Age</u>		Austria	0.20 (0.31)
Austria	-0.83 (0.65)	Germany	0.38 (0.23)
Germany	-0.85* (0.49)	Sweden	-0.051 (0.21)
Netherlands	-2.84*** (1.071)	Netherlands	0.87*** (0.23)
Spain	-4.93*** (1.75)	Spain	0.39 (0.30)
Italy	0.62* (0.32)	Italy	0.28 (0.27)
France	-4.35*** (1.43)	France	0.38* (0.22)
Greece	-0.57 (0.47)	Denmark	0.095 (0.38)
Belgium	-3.07** (1.21)	Greece	0.69** (0.34)
<u>Child Older Compulsory Age</u>		Belgium	0.49** (0.23)
Austria	-3.03 (0.55)	Constant	-0.0026 (0.41)

Note: (i) Country controls are also included, N. obs: 1452 (ii) Source: SHARE , (iii) Cluster robust-Standard errors in parenthesis \*\*\* shows significance at a 99% , \*\* at 95% and \* at 90% level.

Table 8. *Probit estimates of the labor participation decision of the son*

<b>Variable</b>	<b>Coef.</b>
Age	-0.013 (0.020)
Number of Children	0.033 (0.097)
High Education Level	0.82*** (0.26)
Medium Education Level	0.28 (0.17)
Married	0.56*** (0.17)
Age Youngest Child	0.015 (0.027)
<b>Child Care Received</b>	0.22 (0.17)
Germany	-0.64*** (0.21)
Constant	1.40 (0.63)

Note: (i) N. obs: 1093 (ii) Source: SHARE , (iii) Cluster robust-Standard errors in parenthesis \*\*\* shows significance at a 99% , \*\* at 95% and \* at 90% level.

Table 9. Random effect probit estimates of the care giving decision

Variable	Coef.	Variable	Coef.
Age 50-55	0.10 (0.10)	Spain	0.54** (0.26)
Age 56-60	-0.056 (0.089)	Italy	1.27*** (0.27)
Labor Participation	-0.28*** (0.096)	France	0.30 (0.19)
Number of Grandchildren	-0.15*** (0.043)	Greece	0.63* (0.35)
Married Child	0.023 (0.093)	Belgium	0.58*** (0.19)
Less than Good Health	-0.13* (0.082)	<u>GC. Older Compulsory Age</u>	
Living Further than 25 km	-1.53*** (0.12)	Austria	0.32 (0.22)
Daughter	0.52*** (0.076)	Germany	0.31 (0.20)
<u>GC. Younger Preschool Age</u>		Netherlands	-0.23 (0.21)
Parental leave	-0.00066 (0.0012)	Spain	0.010 (0.28)
Fees child care	0.018*** (0.0058)	Italy	1.16*** (0.25)
Italy	0.64** (0.25)	France	0.26 (0.21)
<u>GC. Preschool_Compulsory Age</u>		Greece	0.94*** (0.26)
Austria	0.64* (0.38)	Belgium	0.21 (0.19)
Germany	0.36 (0.24)	Constant	-0.19 (0.17)
Netherlands	0.20 (0.27)	$\sigma_\alpha$	0.79*** (0.096)

Note: (i) N. obs: 2545 (ii) Source: SHARE , (iii) Cluster robust-Standard errors in parenthesis \*\*\* shows significance at a 99% , \*\* at 95% and \* at 90% level.

Table 10. A. *Maximum Likelihood estimates. Labor participation decision of the grandmother*

<b>Variable</b>	<b>Coef.</b>	<b>Variable</b>	<b>Coef.</b>
Age 50-55	1.17*** (0.20)	Over Early Retirement Age	-0.36** (0.16)
Age 56-60	0.75*** (0.17)	Other Household Income	-0.96 (1.85)
High Education Level	0.51*** (0.11)	Austria	-1.31*** (0.20)
Medium Education Level	0.14 (0.089)	Germany	-0.84*** (0.14)
Married	-0.19** (0.095)	Netherlands	-1.02*** (0.12)
Less than Good Health	-0.44*** (0.095)	Spain	-1.33*** (0.19)
2+ Chronic	-0.18** (0.083)	Italy	-1.65*** (0.22)
Limited Mobility	-0.10 (0.086)	France	-0.79*** (0.13)
Maximum Grip	0.34 (0.61)	Greece	-1.83*** (0.24)
Partner L. Participation	0.29*** (0.11)	Belgium	-1.22*** (0.12)
High Educated Partner	-0.26** (0.13)	Constant	-0.54** (0.27)
Medium Educated Partner	-0.22* (0.12)		

Table 10. B. *Maximum Likelihood estimates. Care giving decision*

<b>Variable</b>	<b>Coef.</b>	<b>Variable</b>	<b>Coef.</b>
Age 50-55	0.45*** (0.14)	Italy	1.03*** (0.30)
Age 56-60	0.16 (0.11)	France	0.19 (0.20)
Labor Participation	-1.14*** (0.25)	Greece	0.33 (0.35)
Number of Grandchildren	-0.14*** (0.045)	Belgium	0.38* (0.20)
Married Child	-0.0060 (0.095)	<u><i>GC. Older Compulsory Age</i></u>	
Less than Good Health	-0.26*** (0.092)	Austria	0.10 (0.24)
Living Further than 25 km	-1.52*** (0.12)	Germany	0.19 (0.23)
Daughter	0.52*** (0.079)	Netherlands	-0.42* (0.22)
<u><i>GC. Younger Preschool Age</i></u>		Spain	-0.23 (0.30)
Parental leave	0.00052 (0.0013)	Italy	0.92*** (0.26)
Fees child care	0.0077*** (0.0066)	France	0.14 (0.22)
Italy	0.29 (0.29)	Greece	0.67*** (0.27)
<u><i>GC. Preschool_ Compulsory Age</i></u>		Belgium	0.00098 (0.20)
Austria .	0.44 (0.33)	Constant	0.088 (0.19)
Germany	0.23 (0.26)	$\sigma_{\alpha\varepsilon}$	-0.57*** (0.15)
Netherlands .	0.022 (0.30)	$\sigma_{\alpha}$	0.77*** (0.19)
Spain	0.32 (0.29)		

Note: (i) N. obs: 2545 (ii) Source: SHARE , (iii) Log-likelihood: -2151.786423. Standard errors in parenthesis \*\*\* shows significance at a 99% , \*\* at 95% and \* at 90% level.