

# Caring for Parents and Employment Status of European Mid-Life Women\*

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## Abstract

In this paper we estimate the causal effect of providing "intensive" informal care to elderly parents on labour market participation decisions for European women who are themselves approaching retirement. In particular, we consider the frequency or intensity of this help and we focus on informal care provided in a daily or weekly basis. We use two different but comparable samples drawn from the Survey of Health, Ageing and Retirement in Europe (SHARE) that provide complementary detailed information about daughters and parents. We obtain evidence about this question for two groups of European countries that strongly differ in terms of informal caregiving intensity within the immediate family and the use of formal care: the northern countries (Sweden, Denmark and The Netherlands), and the southern countries (Spain, Italy and Greece). The results show that the estimated effect of providing "intensive" informal care to elderly parents on the probability of labour participation is negative and large for both groups of countries. Furthermore, a substantially stronger effect is found when the "intensive" caregiving variable is treated as endogenous in the labour participation equation. This shows that the potential

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opportunity costs in terms of (reduced) employment associated with the provision of informal care by women are seriously underestimated under the exogeneity assumption of the caregiving regressor.

Keywords: Binary choice, labour participation decisions, parental informal caregiving, endogenous variables, simultaneous estimation.

JEL: J2, C3, D1

## 1 Introduction

Nowadays, population ageing is one of the most important demographic changes and challenges in all European countries. As a result of the significant increase in life expectancy in the past fifty years together with the low birth rates exhibited by most modern societies, European population has been ageing progressively. Furthermore, since this trend is expected to continue, the number of elderly people will rise very intensively over the next decades. In particular, according to the projections provided by the Economic Policy Committee (2001), the number of people aged 65 and over in EU15 will increase from 61 million (16.1 percent of the total population) in 2000 to 103 million (27.5 percent) in 2050. For those aged 80 and over, the increase is projected to be from almost 14 million (3.6 percent) in 2000 to some 38 million (10 percent) in 2050. One of the most relevant effects of population ageing will be the increase in the demand for caregiving by the elderly. Even though this is a common phenomenon in all European countries, there are important differences among them in terms of the implementation of public policies that deal with this issue. In particular, the results provided by the Economic Policy Committee (2001) shows that long-term care<sup>1</sup> expenditure levels per head differ considerably between Member States. This reflects different traditions in the means of providing care for the elderly. On the one hand, in some Member States, mostly northern countries, care for the elderly is mainly formal,<sup>2</sup> with a large share of formal care provided by institutional means. On the other hand, the opposite extreme case is represented by the southern countries. Table 1 (Jacobzone (1999)) illustrates this interesting difference. In particular, we can see that the level of home care services provided to elderly people and the percentage of institutionalized elders are substantially higher in nordic countries and The Netherlands than in Mediterranean countries like Italy and Spain. In the latter, the informal provision of care is the most important source of help to elderly and is left to family members. Indeed, they are usually middle-aged women (spouses or daughters),

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<sup>1</sup>As the EPSCO/ECOFIN (2003) states, "...Long-term care consists of assistance to persons who are unable to live autonomously and are therefore dependent on the help of others in their every day lives. Their needs for assistance can range from facilitating mobility, shopping, preparing meals and other household tasks to washing and feeding in the most extreme cases..."

<sup>2</sup>In this paper, we define formal care as paid care (either provided in facilities or home-based) and informal care as non-institutional, unpaid care arrangements.

who become the main providers of long-term care in the family. Furthermore, the low relative importance of formal public or private long-term care systems in these countries may have been linked to the relatively high availability of informal carers. Where the elderly have traditionally relied upon an extensive informal system of help, supported mainly by children, usually daughters not in paid work, the need for formal public systems has been felt to be less urgent. However, it could be argued that nowadays assuming such responsibilities could imply increasing economic and non-economic costs.<sup>3</sup> In addition to this, the current ongoing demographic and economic trends such as the continuous increase in the female labour force participation and in population ageing, together with the changes in the family structure, raise some doubts about the future viability of this pattern of social support. Therefore, it is of interest to policy makers to evaluate the potential opportunity costs in terms of employment associated with informal eldercare faced by families. It is evident that any policy recommendation about to what extent public authorities should provide or finance formal care to elderly people or implement support programs to informal caregivers should account for this potential trade-off. In this respect, the comparison of countries that strongly differ in the patterns of female labour force participation and social support provided to elderly, could shed some light on this important question.

In spite of the relevance of this issue in Europe, most of the studies in the literature analysing the effect of informal caregiving to elderly parents on employment status for women refers to the US (i.e. Ettner (1995, 1996), Johnson and Lo Sasso (2000), Pezzin and Schone (1999), Wolf and Soldo (1994)). Furthermore, the evidence provided by these studies is mixed. On the one hand, some of them conclude that there exists a negative correlation between caregiving and labour supply decisions. For example, Ettner (1995) analyses the impact of parental care on the labour supply of women using data from the Survey of Income and Program Participation (SIPP) for the period from 1986 to 1988. Applying an instrumental variable (IV) technique to control for the potential endogeneity of caregiving, the results show that living with a dependent parent has a significantly negative effect on female labour supply. Ettner (1996) performs a similar analysis for men and women using data from the National Survey of Families and Households (NSFH) for the year 1987. She distinguishes between care provided to coresidential and non-coresidential parents. Her results show that caregiving activities do not have a significant negative effect in male labour supply whereas female labour supply is only significantly negative affected by the caregiving activities to parents not living at home. Similarly, Johnson and Lo Sasso (2000) explore time transfers to elderly parents and their impact on labour supply for men and women at mid-life. They estimate a simultaneous panel data model of annual hours of paid work and the provision of time assistance to parents. This model allows them to account not only for the potential simultaneity of these two decision vari-

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<sup>3</sup>An illustration of this is given by the preliminary statistics from the survey "Cuidados en la familia de personas mayores en situación de dependencia 2004" ("Caregiving in families with elderly dependents 2004") in Spain. This statistic summary was released by IMSERSO (Spanish Ministry of Employment and Social Affairs) in 2004. Specifically, they show that 62 percent of women with informal caregiving responsibilities admit that these responsibilities significantly reduce their leisure time or strongly affect their professional careers, that, in some cases, are even interrupted.

ables but also for unobserved heterogeneity. They use a sample of men and women aged from 53 to 65 drawn from the second and third waves of the Health and Retirement Study (HRS). Their results suggest that time devoted to parent caregiving significant and substantially reduces labour supply for both women and men. On the other hand, there are other researchers that do not find any statistically significant effect of caregiving on labour supply. For example, Wolf and Soldo (1994) adopt a similar approach to Ettner (1996) and estimate a simultaneous equations model of employment, hours of work, and the provision of care to an elderly parent. They also use data drawn from the 1987-88 National Survey of Families and Households (NSFH) but they focus on a sample of married women "at risk"<sup>4</sup> of providing care to an elderly parent or parent-in-law. Even though labour supply behaviour of married women is usually more elastic, they find no evidence of reduced propensity to be employed or reduced conditional hours of work due to the provision of care to frail parents. As Ettner (1996) states, this difference in their results could be driven by several factors such as the weaker attachment to the labour force of married women, the availability of a smaller sample size, and the fact of including caregiving to parents-in-law, and individuals who care for persons with disabilities other than parents and parents-in-law in the "non-caregiver" group. All these factors could contribute to obtain a smaller effect. Pezzin and Schone (1999) estimate a simultaneous, multi-equation, endogenous switching model of informal care to elderly parents, coresidence, and female labour supply using data from the 1986-1987 matched Hebrew Rehabilitation Center for the Aged (HRCA) Survey of the Elderly in Massachusetts and HRCA-NBER Child Survey. They find that the correlation between informal care and labour force participation was negative but small, which reflects a modest trade-off between both variables for adult daughters. However, the possibility of extending their results is limited since their data consist of only 424 parent-daughter pairs from a single state. Therefore, from all these findings, it seems that the empirical evidence obtained for the US about this issue is inconclusive.<sup>5</sup>

To the best of our knowledge, very little work has been conducted about this question in Europe. Spiess and Schneider (2002) use a sample of women aged between 43 and 57 years old drawn from the European Community Household Panel for 12 EU-countries. Using a descriptive approach, they find a negative association between starting or increasing informal caregiving and the change in weekly work hours but with some differences across countries. However, they do not take into account the potential simultaneity of these two decision variables what could lead to important biases in their estimates. Madden and Walker (1999) estimate a model of hours of work and hours of caring using a sample of married couples aged less than 65 years old from the Family Resources Survey

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<sup>4</sup>They define married women "at risk" of providing care as married women with one or more living parent, parent-in-law or step-parent aged 65 or older.

<sup>5</sup>There are other papers in the literature for the US that analyse the effect of children's characteristics such as employment on their decisions of providing parental care (i.e, Lang and Brody (1983), Stoller (1983), Stern (1995)). In particular, they look at the causal effect of labour participation on the provision of informal care to elderly parents since they are mainly interested in the determinants of parent care. However, we focus on the inverse causal effect since we are interested in analysing the opportunity costs in terms of employment associated with the provision of parent care by daughters.

1995 in UK. Using similar approaches to Wolf and Soldo (1994) and Ettner (1995), they find that caring for others has a significantly negative effect on hours of work for women. However, their work suffers from some limitations since they lack of data on relevant determinants of caregiving decisions such as siblings, or the financial or marital status of care recipients. Heitmueller and Michaud (2006) develop a multivariate dynamic panel data model to identify the causal link from informal care to employment for men who are aged 16 to 64 and women who are aged 16 to 59 in England. Using data from the British Household Panel Study (BHPS) from 1991 to 2003 they find that caring only reduces employment probabilities by up to 6 percentage points for individuals caring within their own homes and no significant effect is found for the extra-residential carers. These small effects could be driven by the fact that any information about the intensity of the care is considered in the analysis. Therefore, they may be including caregiving activities that are not very time consuming and do not represent a significant competing time use for caregivers. Finally, Casanova (2001) does not find any evidence that caregiving affects the labour supply decisions of Spanish women aged between 35 and 64 who coreside with at least one of their parents or parents-in-law. However, her measure of caregiving to elderly parents is not really precise given that even though she observes whether these women coreside with a parent or parent-in-law, she can not observe the person they take care of.

Given the scarce evidence for Europe, the aim of the present paper is to determine empirically whether mid-life women face a significant opportunity cost in terms of (reduced) employment of providing "intensive" informal care to elderly parents in several European countries. In particular, we focus on the northern countries and the Mediterranean countries. The comparison of these two areas is of relevance because they represent the two polar cases in terms of female labour force participation, the availability and use of formal care, and the informal caregiving intensity within the immediate family (Attias-Donfut, Ogg and Wolf (2005)). Furthermore, this introduces variation in the policy environment that could influence the relationship of interest.

With respect to the labour supply behaviour, we only focus on the labour participation decision. It is in the extensive margin where observed adjustments may be more important due to the prevalence of fixed working-schedules, specially in Mediterranean countries.<sup>6</sup> Regarding the decision of providing informal care, we define a discrete variable that accounts for the intensity or frequency of this care. In particular, we focus on informal care provided in a daily or weekly basis since this intensive care is much more likely to represent a significant burden associated with these activities. This is an advantage of the present paper with respect to other analysis that do not consider the intensity of the care (Casanova (2001), Ettner (1996), Heitmueller and Michaud (2006), Wolf and Soldo (1994)).

We develop an empirical specification that allows us to estimate the causal effect of providing "intensive" informal care to elderly parents on labour market participation accounting for the potential simultaneity of both binary decisions. In particular, we perform

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<sup>6</sup>For example, for the US, the descriptive evidence shown by the sample of married women analysed by Wolf and Soldo (1994) from the NSFH suggests that caregivers are somewhat less likely to be employed, but that employed caregivers do not work less hours than non-caregivers.

our estimation under two different assumptions about the nature of the relationship between these two variables. First, we assume that parent caregiving responsibilities are taken as given by the daughter and therefore we treat the caregiving status as exogenous in the labour participation equation. Second, we consider that both variables could be the result of a common decision process assuming that the caregiving indicator is a potential endogenous regressor. From the comparison of these alternative sets of results it is possible to evaluate the potential bias induced by the endogeneity of the informal caregiving variable when we do not account for it. As it is discussed in Ettner (1996), the apriori prediction of the direction of this bias is a difficult task. On the one hand, it could be that unobserved preference variables related to a strong labour attachment generate a negative correlation between the caregiving indicator and the error term in the labour participation equation. On the other hand, it could be also that there exists a prevalence of "active" women with strong preferences for both employment and caregiving to elderly parents which would give rise to a positive correlation. Apart from that, the existence of measurement errors in the caregiving indicator can also influence the direction of the bias.

We use data drawn from the Survey of Health, Ageing and Retirement in Europe (SHARE) because of its appealing features.<sup>7</sup> First, it provides detailed and specific information about respondents' labour market status and the provision of informal care to people from inside and outside the household. In addition to this, SHARE also contains data on other socio-economic characteristics of the respondents and their living parents that could influence the potential relationship between these two variables. Second, the cross-country comparability of the data makes possible to analyse the potential trade-off between employment and informal care to parents for the two groups of countries of interest. On the one hand, we consider Sweden, Denmark and the Netherlands for the northern group, and on the other hand, we consider Spain, Italy and Greece as representatives of the southern group. Finally, SHARE allows us to perform the analysis for two different but comparable samples of middle-aged women with living parents. In the first sample, all the information about daughters' and parents' characteristics is provided by the daughters and in the second sample similar information is provided by the parents. We perform the same analysis for each sample to check whether we obtain similar results using information provided from these two perspectives.

The results of this paper show two interesting findings. First, the provision of "intensive" informal care to elderly parents reduces the probability of labour market participation in both groups of countries. Second, this negative effect is much stronger when the

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<sup>7</sup>This paper uses data from the early release 1 of SHARE 2004. This release is preliminary and may contain errors that will be corrected in later releases. The SHARE data collection has been primarily funded by the European Commission through the 5<sup>th</sup> framework programme (project QLK6-CT-2001-00360 in the thematic programme Quality of Life). Additional funding came from the US National Institute on Ageing (U01AG09740-13S2, P01 AG005842, P01 AG08291, P30 AG12815, Y1-A G-4553-01 and OGHA 04-064). Data collection in Austria (through the Austrian Science Foundation, FWF), Belgium (through the Belgian Science Policy Administration) and Switzerland (through BBW/OFES/UFES) was nationally funded. The SHARE data set is introduced in Börsch-Supan et al. (2005); methodological details are contained in Börsch-Supan and Jürges (2005).

potential endogeneity of the caregiving indicator in the labour participation equation is taken into account. This shows that the endogeneity bias is positive and that the effect of interest is substantially underestimated under the exogeneity assumption. Specifically, we obtain that the decrease in the probability of labour participation is on average of 30 percent for the southern countries and from 30 to 40 percent for northern countries when we account for endogeneity.

This paper proceeds as follows. In section 2, we present the description of the data and a descriptive analysis of the daughters' characteristics related to labour participation and parental caregiving for both samples and groups of countries. Section 3 contains the empirical specification and the econometric methodology. In Section 4, we provide the estimation results and Section 5 concludes.

## 2 Data and Descriptive Analysis

### 2.1 Data

The data used in this analysis comes from SHARE Release 1, that was collected by personal interviews in 2004.<sup>8</sup> The main purpose of this survey is to provide detailed and specific information about the living conditions of people aged 50 and older for several countries in Europe.<sup>9</sup> SHARE collects information on demographics, employment and retirement, physical and mental health, social support and networks, housing, income and consumption, both at household and individual level. This gives the possibility to analyse a wide variety of questions related to population ageing and the quality of life of the elderly. In particular, it is specially suitable for the study of time allocation between market work and parental caregiving activities. Even though SHARE is planned to be longitudinal, so far there is only one release available and, therefore, only cross-sectional data can be used.

The population of interest in this study is the group of women that are more likely to be "at risk" of dealing with the burden associated with combining the provision of care to elderly parents and paid employment. Therefore, we will focus on women aged between 50 and 60 with at least one living parent at the moment of the interview. Women in this range of age are the most likely to have parents needing assistance or care and, at the same time, they can be still part of the labour force.<sup>10</sup> Furthermore, we perform this selection for two groups of countries that strongly differ in the patterns of social support to elderly people: the group of northern countries (NC hereafter), that is, Sweden, Denmark,

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<sup>8</sup>This survey was designed and developed by the SHARE project for several countries in Europe. For more specific information on this project, see [www.share-project.org](http://www.share-project.org).

<sup>9</sup>The Release 1 is available for Austria, Belgium, Denmark, France, Germany, Greece, Italy, Spain, Sweden, Switzerland and The Netherlands. Data have been also collected in Israel in 2005-06. Two EU member states-the Czech Republic and Poland- as well as Ireland have joined SHARE in 2006 and will participate in the second wave of data collection.

<sup>10</sup>We consider the maximum age restriction in 60 years old to minimize issues related to retirement decisions.

and The Netherlands, and the group of southern countries (SC hereafter), composed by Spain, Italy, and Greece. The comparison of these two groups of countries is of relevance to determine how differences in institutions and preferences could be related to our question of interest. First of all, there are remarkable institutional differences between these two areas regarding the provision of formal long-term care to elderly. On the one hand, Denmark, Sweden and The Netherlands have developed extremely generous and universal health care and social assistance systems and present the highest percentages of people at nursing homes and receiving home care services. On the other hand, the Mediterranean countries are characterized by scarce and expensive formal care means provided by mixed social assistance systems and have traditionally relied on the family as the main source of care to elderly and dependent people.<sup>11</sup> Secondly, differences in patterns in the provision of informal care to elderly people could be reflecting additionally significant differences in people's preferences, culture, and traditions. In particular, Bonsang (2005) shows using data from SHARE<sup>12</sup> that there exists a remarkable gradient from North to South regarding the opinion on "who" should be the main provider of support to elderly: whereas in the northern countries (Sweden, Denmark, and The Netherlands) the State is expected to assume this role, in the Mediterranean countries (Spain, Italy and Greece) people prefer the family to be in charge of these responsibilities.

In addition to the cross-country comparison, we perform the analysis for two different but comparable samples of women aged between 50 and 60 years old with at least one living parent. The first sample (sample (I) hereafter) is selected directly from the age-eligible respondents of the survey. In this case, we can exploit all the information provided by SHARE given by the daughters about themselves and their living natural parents (such as their age, last occupation, health status, and residence closeness). The second sample (sample (II) hereafter) is built from the respondents with at least one daughter aged between 50 and 60. Therefore, in this case, the respondents are the elderly parents. This sample can be identified since each respondent at the couple level provides the number of living children<sup>13</sup> and some basic information about all of them (gender, age and residence closeness). However, more detailed information (type of children, marital status, frequency of contact, occupation status, education and number of children) is only asked about up to four children. When there are more than four children, the selection is not random but follows a set of criteria.<sup>14</sup> As a result, sample (II) presents some

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<sup>11</sup>For a deeper discussion and picture on long-term care systems across European countries, see Bonsang (2005).

<sup>12</sup>In fact, he uses a sample of women and men very similar to the sample used in the present paper.

<sup>13</sup>It includes natural children, stepchildren, adopted or fostered children. In the case of couples, this information is reported by only one respondent in the couple, the "family respondent", and this number includes all these types of children of either or both members. For couples, a natural child is defined as a child of both members. As Martínez-Granado and Mira (2005) state, it is important to collect information on all types of living children given that we are interested in social relationships and in sources of support of elderly people.

<sup>14</sup>In particular, the program selects the four children as follows. First, it sorts children in ascending order by minor, proximity, and birth year, where minor is defined as 0 for all children aged 18 and over and 1 for all others. Second, it picks the first four. When all sorting variables are equal, the program

problems. First, it is not a random sample because of the way of selecting the children. Second, we can not make the sample nationally representative since individual weights for these observations are not available (given that these women are not respondents of the survey).<sup>15</sup> Finally, the observations belonging to the same family or household will not be cross-sectional independent.<sup>16</sup> Even though these limitations, we perform the analysis for each of the samples. Given that observations in each sample belong to the same generation and population, this comparison allows us to check the robustness of the results obtained using information provided from these two perspectives.

Table A1 in the Data Appendix presents the size of both samples for each of these countries after dropping out observations with missing data, "extreme" responses<sup>17</sup> and inconsistencies in the variables considered in the analysis. Since the sample sizes for each country are not very large, we will perform the empirical analysis "pooling" the samples for all the countries in the same group and controlling for potential unobserved heterogeneity using country dummies.

Next, we define the variables used to measure the objects of interest: the daughters' decisions about market work and caregiving activities. Regarding participation decisions, SHARE respondents are asked about their current job situation. Even though those who are working are also asked about the number of contracted and usual weekly hours of work and the number of months worked in all jobs,<sup>18</sup> we will only focus on the labour force participation decision. The main reason for this is that changes or adjustments induced by caregiving responsibilities may be more observed and important in the extensive margin of the labour supply decision rather than in its intensive margin. This is specially the case for the Mediterranean countries given the prevalence of full-time jobs with fixed working-schedules and the difficulties to access to part-time positions. In this situation, as Arellano and Meghir (1992) note, observed or reported hours are not desired hours and therefore, the individual's choice is restricted to the decision of whether to participate. Then, the extensive margin becomes the relevant dimension to analyse.<sup>19</sup> The labour market participation decision is defined by a reduced-form participation indicator function, *Labour Participant*. For sample (I), this function is equal to one if the daughter reports a positive number of weekly hours of work at the moment of the interview and zero otherwise. For the case of sample (II), the function is equal to one if the family respondent reports that the daughter was working at the moment of the interview as a full-time employed, part-time employed, self-employed or working for own business, and zero otherwise.

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chooses a child randomly.

<sup>15</sup>Given that we do not have individual weights for the second sample, we will perform the descriptive analysis using the unweighted observations for both samples.

<sup>16</sup>The cluster structure of this sample will be taken into account when performing our estimation.

<sup>17</sup>The "extreme" responses are "Don't Know" and "Refusal".

<sup>18</sup>These questions are also asked to individuals that report to be temporarily away from work, or that even though they are not working in the moment of the interview, they have done some paid work during the last four weeks.

<sup>19</sup>A second reason for not considering the intensive margin of labour supply is that for sample (II) we only have available information about the daughters' employment status but not about the number of hours of work.

Regarding caregiving responsibilities, SHARE respondents are asked about any help (i.e. personal care, practical household help, and help with paperwork) given to or received from a person from inside or outside the household during the last twelve months prior to the interview and the identity of this person.<sup>20</sup> From this information, we can identify for sample (I) if each daughter provided care to an elderly parent during the last twelve months. For sample (II), we can identify if each selected daughter gave care to an elderly parent during the last twelve months prior to the interview from outside or inside the household.<sup>21</sup> As we did for the participation decisions, we define a reduced-form caregiving indicator function, *Caregiver*, to analyse parental caregiving activities.<sup>22</sup> For sample (I), this indicator is equal to one if the daughter reports to have taken care of an elderly parent in the last twelve months and zero otherwise. For sample (II), it is equal to one if at least one parent reports to have been taken care of by the corresponding selected daughter and zero otherwise.

Apart from the potential simultaneous relationship between the daughters' decisions about labour market participation and caregiving activities, both kind of decisions are functions of variables that account for preferences, other daughters' characteristics and parents' characteristics. However, sample (I) and sample (II) do not provide exactly the same information regarding these factors. In particular, for sample (I), we observe information on the daughter's age, education, current marital status, health, income, living children and siblings. With respect to the information about natural parents' characteristics given by the daughters, we observe each parent's age, residence closeness, and health status. However, there is not available information on parents' income<sup>23</sup> or the potential use of different sources of formal care, that could definitely influence the provision of care by the daughters. On the contrary, more detailed information about these issues can be derived from the sample where the parents are the respondents (sample (II)). In particular, we observe each parent's age, health status, income and information about the potential access to different sources of formal care.<sup>24</sup> Besides, we have information given by the parents on the selected daughters' age, education, current marital status, children, siblings and residence closeness. However, we can not measure their health status or financial situation.

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<sup>20</sup>However, questions of help received by members of a couple from people not living in the household are only asked to the family respondent.

<sup>21</sup>However, since the question of help received by members of a couple from people not living in the household is only asked to the family respondent, we can not exactly identify which member was taken care of in this case.

<sup>22</sup>Regarding caregiving activities we also focus exclusively on the extensive margin. This is because there is not available information about hours of help provided to or received from a person living in the same household as the respondent (given the difficulties to correctly identify hours of caring in this context). Besides, some potential errors were found in the report of hours of caring provided to or received from a non-coresident.

<sup>23</sup>To have a proxy of the parents' financial situation, we plan to include also a variable indicating parents' last occupation when the ISCO standardised occupation variables appear in SHARE Release 2.

<sup>24</sup>Theoretically, both members of a couple should be interviewed even though both of them are not 50 or older. However, in practice, it could be the case that the couple/partner has not been interviewed and, therefore, there is not information about this parent.

Definitions and more specific details about these variables for each sample are provided in the Data Appendix.

## 2.2 Descriptive Analysis

Table A2 and Table A3 in the Data Appendix present the mean of the variables used in the analysis at group and country level for the two samples. These results show the most remarkable differences between the North and the South with respect to the characteristics of women in their middle-aged. The results for sample (I) presented in Table A2 show that northern middle-aged women participate, on average, much more in the labour market (77.7 percent) than southern middle-aged woman (40.9 percent), are more educated (the percentage of women with the lowest level of education is 7.4 in the northern area and 39.7 in the southern area. Additionally, the percentage of the highest educated women is 40.2 in the northern area and 16.3 in the southern area),<sup>25</sup> and have higher non-wage income. In addition to this, we can see that even though women in the southern countries live, on average, much closer (less than 5 kilometers away) to an elderly parent<sup>26</sup> a substantially lower percentage reports to have taken care of an elderly parent during the last twelve months. This last finding seems very surprising since Spain, Italy and Greece are countries where family ties in this sense are traditionally stronger than in the northern countries given that formal care services tend to be rather scarce and very expensive. The results for sample (II) presented in Table A3 are in general quite similar to the results for sample (I).<sup>27</sup> However, they differ considerably in the value of the percentage of caregivers.<sup>28</sup> For the southern countries, these percentages are rather similar in both samples. However, this is not the case for northern countries. We can see that the percentage of caregivers is substantially lower for all them in sample (II) (16 percent in the northern pool) than in sample (I) (44.8 percent). Therefore, this descriptive difference for northern countries may suggest that parents are more strict or rigorous when they think about informal care and that, consequently, they feel that they receive much less help than what their daughters report. With respect to other parents' characteristics that are only observable

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<sup>25</sup>Notice that the percentage of Greek middle-aged women that has completed the first stage of secondary education is surprisingly low compared to the percentage of women that has completed the second stage. Given the characteristics of the sample, we would expect a higher percentage of middle-aged women in the first stage, similarly to the cases of Spain and Italy. So far, we did not find any reasonable explanation for this result although we think that it is likely that there is a codification mistake in the data.

<sup>26</sup>Specially in Spain, where the rate of cohabitation and residence closeness is considerably higher than in other Mediterranean countries.

<sup>27</sup>Notice that from the information about Greek daughters' education given by their parents, we also obtain that the percentage of daughters that has completed the first stage of secondary education is considerably lower than the percentage of women that has completed the second stage. As we noted before, we think that there has been a mistake in the standardisation of the education variables according to the ISCED-97 classification.

<sup>28</sup>Remember that, in sample (I), a daughter is a caregiver if she reports to have taken care of at least one living parent during the last twelve months. For sample (II), a daughter is a caregiver if at least one parent reports to have been taken care by her during the last twelve months.

in sample (II), we can see that elderly parents in northern countries have, on average, a higher gross annual household income and that they receive more formal care than elderly parents in southern countries.

Next, we compare the labour market status and other individual characteristics between the sub-samples of caregivers and non-caregivers drawn from sample (I) (Table 2 and Table 3) and sample (II) (Table 5 and Table 6). Through this descriptive comparison we might have a first insight about what are the main factors that could influence women's decisions about the provision of informal care to their elderly parents. Since our samples are considerably small, we perform the comparisons at group level in some cases even though we are aware of the potential heterogeneity within each group.

For sample (I), the comparison between results provided by Table 2 and Table 3 shows the following findings. First of all, in the southern countries, the relationship between living arrangements and patterns of family caregiving is clearly reflected by the difference in the percentages of daughters living in the same household or living less than 5 kilometers away from an elderly parent (*Resident1 and Resident2*, respectively) between carers and non-carers. In particular, these percentages are higher for the sample of caregivers than for the sample of non-caregivers. This is specially the case in Spain where 31.25 of caregivers co-resides with an elderly parent and only 4.7 percent of non-caregivers does. This shows that children within the household are very involved in elder parental care. In fact, as Attias-Donfut, Ogg and Wolff (2005) state, in the Mediterranean countries the expectations placed on co-resident daughters to provide personal care to an elderly parent may be even higher than the expectations placed on spouses.

Regarding labour market participation, we can see that there is not a clear pattern in the difference in the proportion of labour market participants between carers and non-carers along countries. In particular, only in The Netherlands and Spain, the percentage of working daughters is considerably higher for non-carers than for carers suggesting that care could negatively affect labour market participation decisions. Regarding variables reflecting parental needs such as parent's health status, it can be clearly seen that the proportion of daughters with at least one elderly parent in a bad or very bad health is much higher in the sample of carers than in the sample of non-carers for all the countries with the exception of Greece.<sup>29</sup>

The availability of alternative sources of parental care are measured by the variable *Both (Living parents)*, that indicates if both natural parents are alive, and the variables *DBrothers* and *DSisters*, that indicate if the respondent has any brother or sister, respectively. In general, it seems that the proportion of daughters with both living parents is lower in the sample of carers. This suggests that daughters are more likely to take care of an elderly parent if the spouse is not alive.<sup>30</sup> In addition to this, it is evident that sisters

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<sup>29</sup>This puzzling result for Greece could be due to the small sample of caregivers.

<sup>30</sup>However, this result is somewhat limited given that both natural parents do not have to be necessarily living together. Furthermore, we do not observe their corresponding marital status in order to know if they have a spouse or a partner. In addition to this, we should mention that the variable *Both(Living parents)* refers to the moment of the interview whereas the variable *Caregiver* refers to the twelve months prior to the interview.

are better substitutes than brothers since the percentage of daughters with sisters is lower for the sample of caregivers in all the countries.

As we saw above, given our definition of caregiver, northern countries present higher rates of caregiving daughters than southern countries in sample (I). However, we can not infer from this result that the probability of providing parental care regularly at mid-life is larger for northern women than for southern women since this definition of caregiver is rather weak and includes individuals that have provided help to an elder parent less often than monthly.<sup>31</sup> Table 2 provides the percentages of carers that reported to have taken care of at least one elder parent during the last twelve months in a daily basis (*Daily*) and the percentage of carers that have done it in a daily or weekly basis (*Daily/Weekly*).<sup>32</sup> From these results, it can be seen that when the frequency of this informal care is considered, a different story emerges. Specifically, the gradient from low to high percentages of daily and daily/weekly elder parental care runs from the northern to the southern countries. Among caregiving daughters, Spanish daughters are more than twenty times as likely to be involved in elder parental care in a daily basis than Danish daughters. This evidence suggests that in order to have a more precise idea about to what extent these activities represent a competing demand on daughters' time, the "intensive" caregiving should become the relevant concept in the analysis. Therefore, we incorporate a specific measure of the intensity or frequency of this care in our analysis and we define as "intensive" caregiver a daughter that have been taken care of at least one elderly parent in a daily or weekly basis during the last twelve months. This represent an advantage of this paper with respect to Casanova (2001), Ettner (1996), Heitmueller and Michaud (2006), and Wolf and Soldo (1994) where the caregiving measure does not contain any information about the frequency or intensity of the care. Table 4 and Table 3 for sample (I) provide the sample characteristics of the "intensive" caregivers and non-caregivers, respectively.<sup>33</sup> The most remarkable difference between these two sub-samples for both groups of countries is that "intensive" caregivers daughters live much closer to their elderly parents. As we remarked above, the cohabitation rate and the provision of care to elderly parents are strongly related. Other interesting results show that "intensive" caregivers are less likely to be at work than non-caregivers, specially in northern countries (70 percent of "intensive" caregivers are in paid employment whereas this rate increases to near 80 percent among non-caregivers). They are also more likely to have parents in a poorer health status. This indicates that the likelihood of providing informal care to elderly

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<sup>31</sup>Remember that in our analysis a daughter is a caregiver in sample (I) if she reports to have taken care of at least one living parent during the last twelve months and we do not impose any condition of the intensity or frequency of this care.

<sup>32</sup>Respondents who report to have provided care to or received care from a person from outside the household are then asked about the frequency of this care (i.e. almost daily, almost every week, almost every month, and less often). Since the question about the help given to or received from a person within the household refers to care or assistance provided regularly (i.e. daily or almost daily during at least three months), we will assume that daughters that provided this type of help did it in a daily or almost daily basis.

<sup>33</sup>Given the extremely small size of this new sub-sample, we will only focus on the two pools of countries and we do not perform the analysis at the country level.

parents increases as parental health status worsens off. Finally, "intensive" caregivers are less likely to have sisters in both groups of countries, suggesting that sisters are close substitutes to each other in the provision of parent care. The same result is obtained for the existence of brothers for the group of southern countries.

Next, we focus on the same analysis for sample (II). The results provided in Table 6 and Table 7<sup>34</sup> show very similar differences between the sub-samples of non-caregivers and "intensive" caregivers to those shown by sample (I) regarding employment status, residence closeness, health status of the parent and alternative caregiving sources. With respect to this last issue, it is also possible to observe for sample (II) if elderly parents receive formal care. We can see that the percentage of women with at least one parent that has received formal care during the last twelve months is much higher in the sample of "intensive" carers than in the sample of non-caregivers. This is the case for both groups of countries although this percentage is considerably higher in the northern area. However, from this result we can not draw really any conclusion about the complementarity/substitutability degree between informal and formal care since we do not know if they are perceived simultaneously.

To conclude this section, we should remark that the descriptive evidence shown by both samples seems rather consistent and robust. In particular, it reflects most of the well-known and established differences in middle-aged women's characteristics between the North and the South of Europe regarding the variables of interest. Additionally, the descriptive comparison between caregivers and non-caregivers for both samples shows that it could exist a negative relationship between labour market participation and elder parental caregiving activities.

Finally, it is also very important to keep in mind that these results are descriptive and, therefore, merely indicative.<sup>35</sup> To study the issue of interest from a more serious and rigorous statistical perspective, we explain in the next section the empirical strategy and methods that we implement to identify and estimate the effect we are interested in.

### 3 Empirical Strategy

As we pointed out above, the goal of the present paper is to estimate the causal effect of providing "intensive" care to elderly parents on labour force participation behaviour for middle-aged women. Therefore, two important issues arised in the empirical analysis of this question. First, our empirical model has to be based on a structural framework that characterizes the nature of the relationship between caregiving of elderly parents and labour market participation decisions. As Ettner (1996) states, the simplest but less realistic option would be to treat these caregiving responsibilities as exogenously predetermined with respect to the woman's labour participation decision. This is the case

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<sup>34</sup>Again, given the small sample sizes, we will only perform this descriptive comparison for the country pools.

<sup>35</sup>Besides, some of them, specially those ones that do not look like very intuitive or clarifying, could be affected by the extremely small sizes of some samples.

if we impose the following assumptions. First, the intrafamily allocation of the parental help does not depend on other decision variables of the children as the employment status or time devoted to childcare. Second, there are not alternative sources of help like market-based care services or, at least, these are not substitutes of informal care. Third, parental needs can not be left unfulfilled. As a result, the children would take the parental demand of help as given and the division of this task among them would only depend on exogenous characteristics of the siblings such as sex, marital status, education, age, and health status. Therefore, in the empirical model consistent with this framework the caregiving indicator would enter the labour participation equation directly as an exogenous variable. However, all of these assumptions are very extreme and likely to fail and it seems more realistic and appropriate to consider that both children's decision variables, employment and the provision of care, could be the result of the same decision process. In this situation, both variables would be simultaneously determined within the model.<sup>36</sup> If this is the case, the exogeneity assumption on the caregiving indicator would bias the estimated effect of caregiving on labour participation. The direction this bias is a priori difficult to predict. There could be unobservable factors related to stronger preferences for working as opposed to care for elderly parents that generate a negative correlation between the caregiving indicator and the error term. On the contrary, it could be also that components of the error term reflect high propensities of women to both work and provide parent care inducing a positive correlation. In addition, the existence of measurement errors in the caregiving indicator could also influence the direction of the bias. Therefore, our empirical problem is to estimate jointly the combination of labour force participation and informal care resulting from the daughter's decision making. These two binary outcomes give rise to four possible choice combinations or states. The advantage of this joint estimation is that we explicitly consider the simultaneity or interdependency of these two decision variables. Thus, our empirical analysis will be based on the following bivariate Probit

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<sup>36</sup>Notice that we assume that other sources of help provision (from the spouse, siblings or by the purchase of market-based services) are given exogenously to the daughter. However, it would be very interesting to formally place the decision regarding the care of older parents in a family-network context. This will imply to use a multi-person household model in which several decision makers (parents and children) with potential different preferences interact among each other when making decisions. In particular, Pezzin and Schone (1999) develop and estimate a bargaining model of intergenerational living and care arrangements for pairs composed by a daughter and her parent using detailed information of both individuals' socioeconomic situation. Following this structural approach, Engers and Stern (2002) and Byrne, Goeree, Hiedemann and Stern (2006) develop a more realistic and ambitious model of family decision making based on game-theoretical tools where the decision makers include the parent, the spouse, and all children. However, this introduces an important complexity in the analysis and requires very detailed information about the characteristics of all participants in the family. Given that our purpose is to estimate the causal effect of informal caregiving to parents on labour participation of daughters and we are not particularly interested in how children interact among each other to decide about parent care, the development of a structural model of these characteristics is beyond the scope of this paper.

Regarding the purchase of formal care services, it would be interesting to consider the possibility that daughter chooses a certain level of cash transfers to the parent at the same time as or instead of providing care directly. However, so far, we ruled out the consideration of financial transfers to parents as an additional decision variable for the daughter because of the low relevance of this kind of transfers shown in SHARE data (see Bonsang (2005) for a quantitative analysis of this information).

model of labour market participation and informal caregiving decisions that allows us to deal with the presence of endogenous discrete regressors:

$$\begin{aligned}
LP_i^* &= \alpha_1 IC_i + \beta_1' X_{1i} + \varepsilon_i \\
LP_i &= I(LP_i^* > 0), \\
IC_i^* &= \beta_2' X_{2i} + \nu_i \\
IC_i &= I(IC_i^* > 0).
\end{aligned} \tag{1}$$

where  $i$  indexes daughters,  $LP_i^*$  is the daughter's propensity to work in the market,  $IC_i^*$  is the daughter's propensity to provide informal care to an elderly parent in a weekly or daily basis,<sup>37</sup> and  $LP_i$  and  $IC_i$  are the corresponding observed variables of labour market participation and "intensive" caregiving decisions. The latter are defined by the indicator function  $I(\cdot)$ , that is equal to one if the condition in parenthesis holds and zero otherwise. Specifically, they are given by the indicator functions *Labour Participant* and *(Daily/Weekly) Caregiver*, respectively, that we defined for each sample. The vectors  $X_{1i}$  and  $X_{2i}$  contain the exogenous observable variables that potentially affect each decision variable,<sup>38</sup> and  $(\varepsilon_i, \nu_i)'$  is the vector of unobservable characteristics of the daughters or parents that could also potentially influence them. These error terms are assumed to be *iid* and follow a bivariate normal distribution with mean  $(0, 0)'$ , and covariance matrix  $\Sigma$

$$\Sigma = \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix}$$

where  $\rho$  is the correlation of the errors and the variances are normalized to 1.<sup>39</sup>

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<sup>37</sup>From now on, we will consider as caregivers only those daughters that provide help to an elder parent in a weekly or daily basis. As we have seen in the empirical analysis, they are the ones that have more difficulties to be involved in labour market and caregiving activities simultaneously.

<sup>38</sup>Notice that the vector  $X_2$  could contain  $X_1$  and additional variables that affect  $LP^*$  only through  $IC$ .

<sup>39</sup>This specification is a restricted version of the one used by Manski et al. (1992), Carrasco (2001) and Ariza et al. (2005) for different contexts. In particular, all of them propose a Generalized Switching Probit Model:

$$\begin{aligned}
LP_{i0} &= I(\beta_1' X_{1i} + \varepsilon_{0i} > 0) \\
LP_{i1} &= I(\alpha_1 + \beta_1' X_{1i} + \varepsilon_{1i} > 0)
\end{aligned}$$

where  $LP_{i0}$  indicates the outcome if woman  $i$  has not taken care of at least one parent, and  $LP_{i1}$  indicates the outcome if woman  $i$  has provided parental care. Therefore, the participation outcome is

$$LP_i = LP_{i0}(1 - IC_i) + LP_{i1}IC_i$$

and

$$IC_i = I(\beta_2' X_{2i} + \nu_i > 0)$$

The second important issue refers to the identification of a causal link running from the provision of informal care to the participation in the labour market. Notice that in our specification, this effect is based on the parameter  $\alpha_1$ . As Manski et al. (1992) state, identification of the parameters of the model is guaranteed by the non-linearity of equations and the normality assumptions. However, this identification is reinforced by the presence of exclusion restrictions or variables that are assumed to be correlated with the "intensive" caregiving decision but not to have a direct effect on the labour participation decision. In this sense,  $X_2$  includes covariates with a high explanatory power of the intensive caregiving indicator but that could be excluded from the labour participation equation. In particular, results from the previous descriptive comparison between intensive caregivers and non-caregivers clearly document the relationship of parents' health status, the existence of both parents and siblings and the use of formal care with daughters' caregiving activities. Specifically, given the available information in each sample, we have seen that intensive daughters are more likely to have parents in a worst health status and receiving formal care but less likely to have sisters and both living parents. Thus, we use the variables referring to parents' characteristics, siblings and the existence of both parents<sup>40</sup> to identify the relationship of interest.

For each of the four different choices for each daughter,  $D_{i(LP,IC)}$ , there is a corresponding probability,  $P_{i(LP,IC)}$ , that the daughter is in this particular state. Therefore, the log-likelihood function is given by:

$$\ln L = \sum_{i=1}^N D_{i(LP,IC)} \ln P_{i(LP,IC)} \quad (2)$$

where the corresponding probabilities for each state have the following form:

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with  $(\varepsilon_{0i}, \varepsilon_{1i}, \nu_i)$  jointly normally distributed with zero mean and covariance matrix

$$\Sigma = \begin{pmatrix} 1 & \rho_{01} & \rho_{0\nu} \\ \rho_{01} & 1 & \rho_{1\nu} \\ \rho_{0\nu} & \rho_{1\nu} & 1 \end{pmatrix}$$

Our bivariate probit model is a particular case of this Generalized when  $\rho_{0\nu} = \rho_{1\nu}$ . In the present context, this more general specification would allow us to consider the possibility that a mid-life woman participates in the case of taking care intensively of an elderly parent but not participate when not having to do it. However, this is not a very plausible situation. In fact, we reject this general specification for both samples and both groups of countries by performing a LM test of  $\rho_{0\nu} = \rho_{1\nu}$ . This suggests that women in these samples do not have such behaviour.

<sup>40</sup>In particular, for sample (I) we use as instruments for the intensive caregiving indicator the age of the oldest parent, the dummies for the health status of the parent that is in the worst health status, the dummies for the existence of sisters and brothers and the dummy for both living parents. For sample (II), we use additionally the income of parents. Even though the relationship between residence closeness and informal caregiving responsibilities was also well-documented in the descriptive analysis, we decide not to include this variable as an instrument because of its potential endogeneity in the caregiving equation. In fact, results considerably change when estimating the bivariate Probit model using the variable *Resident2* as an instrument, which points to a potential endogeneity problem. The same could be argued for the dummy variable *Formalcare* in sample (II) that indicates whether at least one of the parents has received formal care services in the last twelve months.

$$\begin{aligned}
P_{(0,0)} &= \Pr(LP_i = 0, IC_i = 0) = \Phi(-\beta'_1 X_{1i}, -\beta'_2 X_{2i}; \rho) \\
P_{(0,1)} &= \Pr(LP_i = 0, IC_i = 1) = \Phi(-\alpha_1 - \beta'_1 X_{1i}) - \Phi(-\alpha_1 - \beta'_1 X_{1i}, -\beta'_2 X_{2i}; \rho) \\
P_{(1,0)} &= \Pr(LP_i = 1, IC_i = 0) = \Phi(-\beta'_2 X_{2i}) - P_{(0,0)} \\
P_{(1,1)} &= \Pr(LP_i = 1, IC_i = 1) = 1 - P_{(0,0)} - P_{(0,1)} - P_{(1,0)}
\end{aligned}$$

where  $\Phi(., ., \Sigma)$  is the cumulative distribution function of a bivariate normal with vector of means  $(0, 0)'$ , and variance-covariance matrix  $\Sigma$ . We estimate the model for each of our samples using Full Information Maximum Likelihood (FIML) techniques.<sup>41</sup> Results from the estimation of this model are provided in the following section.

## 4 Estimation Results

In this section, we present the estimate of the effect of the provision of "intensive" informal care on the probability of labour participation under the two different assumptions on the caregiving indicator. First, we consider that caregiving responsibilities are taken as given and we estimate a standard probit model of labour participation where the caregiving regressor is assumed exogenous. However, if this assumption did not hold, the estimates would suffer from an endogeneity bias that would depend on the sign of the correlation between the unobservables in the labour participation equation and the caregiving variable and the potential existence of measurement errors. Second, we estimate the bivariate probit model that accounts for the endogeneity of this decision variable. The comparison of both alternative sets of results will shed some light on the importance and the direction of the endogeneity bias.

Table 8 presents the estimation results under the exogeneity assumption for both samples and for both pools of countries. First of all, we focus on the parameter  $\alpha_1$ . In particular, we can see that, for all the regressions, this parameter estimate is negative. This shows that the variable (*Caregiver (Daily/Weekly)*) negatively affects the probability of participating in the labour market. However, this effect is only significant for the northern group in sample (I), and for the southern group in sample (II). Regarding other daughters' characteristics that could influence their labour participation decisions, we obtain that, for sample (I), the set of dummies that measures the self-perception of health is very significant in both groups of countries. Furthermore, their coefficients exhibit the expected sign and size since both are positive and show that daughters in the best health situation are more likely to participate in the labour market. With respect to the education level, both the secondary and tertiary education dummy variables are highly significant

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<sup>41</sup>We should remark that the assumption of independence of the observations is not appropriate for sample (II) since, due to its selection process, it is composed by daughters that, in some cases, are siblings. It is evident that in these situations there will be a correlation in their decisions about caring for parents. Therefore, for this sample, we assume that the observations are independent across families (clusters), but not necessarily within families. As a result, we use in the estimation a robust variance matrix to account for any within-cluster correlation due, say, to unobserved cluster effects.

for almost all the cases with positive sign. This means that higher educated daughters are more likely to perform labour market activities. Non-wage income appears to have a significant and negative effect for both groups of countries in sample (I). Regarding other competing time uses, to be married or engaged in a partnership only affects significant and negatively labour participation in southern countries and for sample (I). In addition to this, having children aged 16 years old and younger does not have a significant impact on labour market participation decisions of mid-life daughters. This result seems very reasonable in this particular case since very few of them have children in this age. Finally, we can see that country dummies are significant and positive in the northern group for both samples showing that mid-life daughters are more likely to participate in the labour market in Sweden and Denmark compared to The Netherlands. For southern countries, we obtain that only the dummy that corresponds to Spain is significant with positive sign for sample (I).

Table 9 and Table 10 summarize for sample (I) and sample (II) respectively the results obtained from the estimation of the bivariate model.<sup>42</sup> In particular, they show that assuming "intensive" caregiving responsibilities to elderly parents significantly reduces the probability of participating in the labour market. For both samples, we can see that this effect is negative in both groups of countries. However, even though this was also the case when the caregiving variable was treated as exogenous, this effect is much stronger when endogeneity is taken into account. Specifically, the effect of "intensive" caregiving becomes more negative and highly significant in all cases. Table 11 provides the sample mean and median of the estimated marginal effect of this variable on the probability of participation in the labour market under these two assumptions. In particular, this average effect is computed as the mean of  $E(LP_{i1} - LP_{i0}) = \Phi(\alpha_1 + \beta'_1 X_{1i}) - \Phi(\beta'_1 X_{1i})$  where  $LP_{i1}$  indicates the outcome if woman  $i$  has taken care of at least one parent and  $LP_{i0}$  indicates the outcome if the woman has not provided care. This expression represents the policy effect of interest since it measures the effect on labour participation of changing from not having provided parental care to having provided care for a particular woman  $i$  with observables  $X_{1i}$  and unobservables  $\varepsilon_i$ . This causal effect is estimated by the sample mean or median of  $\Phi(\hat{\alpha}_1 + \hat{\beta}'_1 X_{1i}) - \Phi(\hat{\beta}'_1 X_{1i})$ . The results show that for sample (I) considering "intensive" caregiving as exogenous reduces on average the probability of participating

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<sup>42</sup>The validity and explanatory power of the variables used as "instruments" for the caregiving indicator have been checked by altering the basic set of exclusion restrictions and including alternatively each of them in the labour market equation. However, any of these variables appear to have a significant economic direct effect on labour participation decisions. Besides, the estimation results for the rest of regressors remained almost unchanged. In addition to this, we have performed the estimation of the model without using exclusion restrictions, that is, including all "instruments" also in the labour participation equation. The comparison of both sets of results allows us to determine if these exclusion restrictions improve the identification of the causal effect. We should remark that any of these variables are significant in the labour equation. Besides, they are not jointly significant either. For the northern countries, the estimated marginal effect do not considerably change. However, for southern countries, the variable of intensive caregiving is not significant anymore and the estimated marginal effect varies substantially. These results suggest that the variables used as exclusion restrictions reinforce the identification of the causal effect of interest specially in the southern countries.

by about 6 percent for northern countries and 4 percent for southern countries. However, when endogeneity is accounted for, this reduction is substantially much larger for both groups of countries. In particular, the probability of participating in the labour market decreases around 28 percent for the northern group and 32 percent for the southern group. Therefore, the difference between these two estimates suggests the existence of a positive endogeneity bias that induces to underestimate the effect of interest under the exogeneity assumption. This reflects the existence of a positive correlation between the unobservables in the error term of the labour force equation and the caregiving regressor.<sup>43</sup> An additional check of this hypothesis is given by the fact that the correlation coefficient between the error terms in both equations  $\rho$  is positive and even very significantly different from zero in some cases. In the case of sample (II), the same type of qualitative results are obtained. The fact that the negative effect of caregiving on employment status is stronger when accounting for the endogeneity is in line with the evidence shown by Ettner (1996) and Madden and Walker (1999) for data from the US and UK, respectively.

The large and significant effects of parent care on labour participation obtained for both groups of countries differ from those shown by Wolf and Soldo (1994) and Casanova (2001) for the US and Spain, respectively. One of the main reasons for this could be the fact that they do not account for the "intensity" of caregiving. Therefore, they do not have an adequate measure of to what extent these responsibilities are more likely to represent a competing demand on women's time. This could become a relevant issue as long as a large proportion of women in the sample reports to be caregiver but does not face an important burden due to this activity. In this case, the problem of combining paid employment and parent care might be insignificant. In fact, this is the case for northern countries when we perform our analysis using our first measure of caregiving decisions (*caregiver*). Specifically, ignoring the intensity of parent care, we do not find evidence that caregiving to elderly parents reduces significantly the probability of labour participation even when accounting for endogeneity in sample (I). For sample (II), the estimated negative effect is significant but substantially smaller. However, for the southern countries, we still find a significant and similar effect given that, as we remarked in the descriptive analysis, a substantially larger proportion of caregivers provide care in a daily or weekly basis. These results show the importance of using a measure that incorporates the intensity of care.<sup>44</sup>

With respect to the rest of the covariates in the labour participation equation,<sup>45</sup> we obtain very similar results to those shown under the exogeneity assumption for both samples. Regarding the "intensive" caregiving equation or the first-stage equation, we obtain the following. In the case of sample (I), results in Table 9 show that mid-life women with the highest level of education are significantly less likely to take care intensively

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<sup>43</sup>This positive correlation that generates a downward bias in the estimated negative effect may be also induced by the presence of measurement errors in the caregiving indicator.

<sup>44</sup>Results of these estimations are available upon request.

<sup>45</sup>We have also computed the estimated marginal effects of each of the covariates in the regressions on the probability of a woman being working and having been intensively caring to an elderly parent. Even though they are not included in the paper, they are available upon request.

of an elderly parent in northern countries. However, this is not the case in southern countries. With respect to other competing time uses, having children less than 16 years old has a positive effect on the probability of "intensive" caregiving in these countries whereas being married or engaged in a partnership negatively affects this probability in southern countries. In addition to this, it is important to analyse the effect of the variables that define the exclusion restrictions and that reinforce the identification of the causal relationship. As we can see, most of them are very significant and with a very high explanatory power of the intensive caregiving indicator. In particular, the age of the parent always has a significant and positive effect. With respect to the set of dummies that measures the health status of the parent that is less healthy, their effect is significant and with negative sign. Furthermore, this effect is larger in absolute value for the *Very Good/Good* category which shows that daughters with elderly parents in good health are less likely to be involved frequently in parental care activities. With respect to other sources of care, we should remark that, for northern countries, only sisters seem to be close substitutes for the daughters in the provision of parental care. This is consistent with the evidence in Wolf, Freedman and Soldo (1997) that show that the higher the number of sisters of a potential caregiver, the less likely this caregiver is to undertake parent care. However, they do not find a similar effect for the number of brothers. For the southern group, both the dummy for the existence of brothers and the dummy for the existence of sisters are highly significant and with negative sign. This result could suggest that not only daughters but also daughters-in-law assume these parental caregiving responsibilities which is a very usual phenomenon in this area. Apart from that, we can see that the dummy variable that indicates if both parents are alive (*BothParents*) has a non-significant effect on the probability of taking care intensively of an elderly parent. Nevertheless, this result is not completely informative and should be taken with caution since we do not observe if both parents are living together. Finally, country dummies are only significant and with a negative sign in the northern group. This shows that mid-life women are less likely to take care intensively to an elderly parent in Sweden and Denmark than in The Netherlands. For sample (II), the most significant results in Table 10 show that mid-life women from both groups of countries are more likely to take care intensively of their elderly parents as these parents become older and their health status worsens off. In this case, the fact of having sisters is only significant for the northern group whereas having brothers significantly reduces the probability of being caregiver only in southern countries. For both groups of countries daughters are significantly less likely to be involved in intensive parent caregiving when both parents are living together.<sup>46</sup> Regarding country dummies, we obtain that Italian middle-aged daughters tend to take care of elderly parents significantly less in a daily/weekly basis than in Spain and Greece. However, this evidence was not found for Sample (I).

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<sup>46</sup>Remember that for sample (II), the variable *BothParents* is equal to one if both parents are interviewed, or if there is only one respondent and he/she reports to be married or have a partner. The important point is that the corresponding parent is not living alone.

## 5 Conclusions

The purpose of this paper is to estimate the causal effect of the provision of "intensive" informal care to elderly parents on labour participation status for mid-life women in northern and southern European countries. Given the ongoing demographic and economic trends such as the continuous increase in female labour participation and population ageing, policy makers are particularly concerned about the potential burden associated with combining these two activities.<sup>47</sup> In particular, this question is of interest because the potential opportunity costs in terms of (reduced) employment associated with informal care faced by these women should be taken into account in the design of public policies dealing with the assistance to elderly people. However, the empirical evidence about this issue for Europe is really scarce. Therefore, this paper tries to shed some light on this important question for northern and southern European countries. The focus on these two areas is of relevance to determine whether middle-aged women in countries that strongly differ in female participation rates, the availability and use of formal care and the role of the family as the main provider of informal care face a significant trade-off between employment and informal care to elderly parents.

Results from the estimation of our model show two interesting findings. First, we obtain that assuming "intensive" caregiving responsibilities to an elderly parent decreases the probability of participating in the labour market in both groups of countries. Furthermore, this evidence is obtained from both samples, what documents the robustness of this result. The second remarkable finding shows that the effect of "intensive" informal caregiving on labour participation is significant and much stronger when we account for the endogeneity of the "intensive" caregiving regressor. This suggests that the exogeneity assumption induces a downward bias in absolute value in this estimated negative effect. Both findings are somehow in line with the evidence shown in Ettner (1996) and Madden and Walker (1999) although these analyse the variation in weekly hours of work due to caring activities. In particular, Ettner (1996) obtains under the exogeneity assumption a non-significant reduction of 2.14 weekly hours of work due to caring for a non-coresidential parent for the US. However, when accounting for the endogeneity, this reduction is of 12.6 hours of work and very significant. For UK, Madden and Walker (1999) obtains that the decrease in weekly hours of work due to informal caregiving to adults is of 0.589 hours under the exogeneity assumption and of 3.2 hours when controlling for endogeneity. Given our results, under the non-exogeneity assumption, the reduction of the probability of labour participation is around 30 percent for southern countries in both samples whereas in the northern area this probability reduces by around 30 and 40 percent for sample (I) and sample (II), respectively.

Therefore, this paper shows that in southern and northern European countries middle-

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<sup>47</sup>For example, the concerns about the burden associated with combining the provision of care to an elderly parent and paid employment has motivated new legislation in Spain trying to alleviate it. In particular, the Spanish Government has just approved the preliminary project about the so-called "Law about Dependence". This law will manage the first national long-term care benefits system, which is considered the fourth pillar of the welfare state system.

aged women face a large trade-off between labour participation and parent caregiving. This result is of interest in any policy debate about who and how should care for elderly people in European societies.

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## TABLES

Table 1. Formal Care System Indicators  
Percentage of population aged 65 and over

	In institutions	Receiving formal help at home
Sweden	8.7	11.2
Denmark	7	20.3
Finland	5.3 to 7.6	14
Norway	6.6	17
The Netherlands	8.8	12
Spain	2.9	1.6
Italy	3.9	2.8

Source: Jacobzone (1999).

Table 2. Sample Characteristics of Caregiver<sup>(1)</sup> Daughters. Sample (I)

Percentages	<i>NC</i>	Sweden	Denmark	Netherlands	<i>SC</i>	Spain	Italy	Greece
Inside Household	0.583	0.699	0	0.775	12.838	31.250	3.571	4.545
Outside Household	99.417	99.301	100	99.225	87.838	68.750	98.214	95.454
Caregiving Frequency								
Daily	8.455	7.692	2.817	12.403	45.270	58.333	41.071	36.364
Daily/Weekly	53.936	45.454	46.478	67.442	69.594	75	69.643	63.636
Labour Participant	77.259	89.510	84.507	59.690	39.865	35.417	35.714	50
Age								
50-55	58.892	48.951	57.746	70.543	63.513	58.333	58.928	75
56-60	41.108	51.049	42.253	29.457	36.486	41.667	41.071	25
Married/Partnership	80.758	77.622	71.831	89.147	79.054	77.083	91.071	65.909
Education								
Educ1	7.872	15.385	0	3.876	35.135	45.833	30.357	29.545
Educ2	25.364	20.979	5.634	41.085	18.919	29.167	21.428	4.545
Educ3	28.863	25.874	42.253	24.806	24.324	14.583	25	34.091
Educ4	37.901	37.762	52.113	30.232	21.622	10.417	23.214	31.818
Health								
Very Good	37.318	47.552	40.845	24.031	17.567	22.917	7.143	25
Good	45.189	33.566	40.845	60.465	51.351	47.917	53.571	52.273
Fair	14.869	16.783	12.676	13.953	26.351	27.083	32.143	18.182
Bad	1.749	2.098	1.408	1.550	4.730	2.083	7.143	4.545
Very Bad	0.875	0	4.225	0	0	0	0	0
DChildren16	9.621	11.888	8.451	7.752	8.784	6.250	8.928	11.364
Living parents								
Both	22.449	23.776	16.901	24.031	29.054	25	33.928	27.273
Only Mother	64.723	65.035	71.831	60.465	61.486	62.500	58.928	63.636
Only Father	12.828	11.189	11.268	15.504	9.459	12.500	7.143	9.091
Health of Parent								
Very Good	9.038	13.287	7.042	5.426	4.054	4.167	0	9.091
Good	19.242	15.385	23.944	20.930	25	29.167	25	20.454
Fair	42.274	38.461	36.620	49.612	35.811	27.083	25	59.091
Bad	23.615	27.273	21.127	20.930	25	22.917	37.500	11.364
Very bad	5.831	5.594	11.268	3.101	10.135	16.667	12.500	0
Residence								
Resident1	0.875	0.699	0	1.550	12.162	31.250	1.786	4.545
Resident2	43.440	41.259	45.070	44.961	71.622	83.333	69.643	61.364
DBrothers	73.469	70.629	74.648	75.969	69.594	77.083	71.428	59.091
DSisters	63.557	59.440	52.113	74.419	60.811	75	53.571	54.545
Sample Size	343	143	71	129	148	48	56	44

Note: (1) We define caregiver as the individual that reports to have provided help to an elderly parent during the last twelve months in personal care, practical household help, and help with paperwork.

Table 3. Sample Characteristics of Non-Caregiver Daughters. Sample (I)

Percentages	NC	Sweden	Denmark	Netherlands	SC	Spain	Italy	Greece
Labour Participant	78.014	82.703	82.979	68.750	41.355	48.649	36.646	38.655
Age								
50-55	62.175	62.162	61.702	62.500	64.486	66.892	59.627	68.067
56-60	37.825	37.838	38.298	37.500	35.514	33.108	40.373	31.933
Married/Partnership	76.596	75.135	63.830	86.805	83.177	85.135	88.820	73.109
Education								
Educ1	7.092	11.351	0	6.250	41.355	45.270	40.373	37.815
Educ2	28.369	21.622	18.085	43.750	24.065	31.081	28.571	9.244
Educ3	22.459	20.540	27.659	21.528	20.093	11.486	18.633	32.773
Educ4	42.080	46.486	54.255	28.472	14.486	12.162	12.422	20.168
Health								
Very Good	31.206	36.757	29.787	25	20.093	17.567	11.801	34.454
Good	44.917	31.351	53.191	56.944	51.168	52.027	54.037	46.218
Fair	19.385	23.243	14.894	17.361	22.897	23.649	27.329	15.966
Bad	3.782	7.027	2.128	0.694	5.374	6.757	5.590	3.361
Very Bad	0.709	1.622	0	0	0.467	0	1.242	0
DChildren16	7.801	9.730	4.255	7.639	8.645	10.811	10.559	3.361
Living parents								
Both	27.187	29.730	21.277	27.778	27.103	26.351	26.708	28.571
Only Mother	59.338	57.838	63.830	58.333	62.850	64.865	60.248	63.865
Only Father	13.475	12.432	14.894	13.889	10.047	8.784	13.043	7.563
Health of Parent								
Very Good	13.239	16.757	14.894	7.639	8.645	9.459	8.696	7.563
Good	25.532	20	29.787	29.861	29.906	36.486	18.633	36.975
Fair	38.771	36.757	34.042	44.444	37.383	33.108	42.857	35.294
Bad	18.440	23.784	12.766	15.278	17.523	17.567	20.497	13.445
Very bad	4.019	2.703	8.511	2.778	6.542	3.378	9.317	6.723
Residence								
Resident1	0.473	0.540	1.064	0	2.804	4.730	1.863	1.681
Resident2	21.986	14.594	30.851	25.694	50.467	59.459	49.068	41.176
DBrothers	71.631	67.567	65.957	80.555	72.196	77.703	69.565	68.907
DSisters	71.868	63.784	72.340	81.944	73.131	77.027	71.428	70.588
Sample Size	423	185	94	144	428	148	161	119

Table 4. Sample Characteristics of Intensive<sup>(1)</sup> Caregiver Daughters

Sample (I)		
Percentages	Northern Countries	Southern Countries
Inside Household	1.081	18.447
Outside Household	98.919	82.524
Labour Participant	69.730	37.864
Age		
50-55	55.676	58.252
56-60	44.324	41.747
Married/Partnership	81.622	75.728
Education		
Educ1	9.189	37.864
Educ2	31.351	20.388
Educ3	30.270	25.243
Educ4	29.189	16.505
Health		
Very Good	31.351	16.505
Good	49.730	49.514
Fair	16.216	28.155
Bad	1.621	5.825
Very Bad	1.081	0
DChildren16	10.811	7.767
Living parents		
Both	22.703	28.155
Only Mother	63.243	64.078
Only Father	14.054	7.767
Health of Parent		
Very Good	7.567	5.825
Good	19.459	19.417
Fair	42.162	34.951
Bad	24.324	28.155
Very bad	6.486	11.650
Residence		
Resident1	1.621	17.475
Resident2	55.676	83.495
DBrothers	74.054	65.048
DSisters	63.784	60.194
Sample Size	185	103

Note: (1) We define "intensive" caregiver as the individual that has taken care of an elderly parent during the last twelve months in a daily or weekly basis.

Table 5. Sample Characteristics of Caregiver<sup>(1)</sup> Daughters.

Sample (II)		
Percentages	Northern Countries	Southern Countries
Inside Household	2.299	23.622
Outside Household	97.701	76.378
Caregiving Frequency		
Daily	10.345	56.693
Daily/Weekly	47.126	80.315
Labour Participant	80.460	37.795
Age		
50-55	42.529	64.567
56-60	57.471	35.433
Married/Partnership	67.816	80.315
Education		
Educ1	9.195	40.945
Educ2	20.690	20.472
Educ3	31.034	23.622
Educ4	39.080	14.961
DChildren16	2.299	7.087
Living parents		
Both	27.586	23.622
Only Mother	62.069	66.142
Only Father	10.345	10.236
Health of Parent		
Very Good	3.448	0.787
Good	18.391	18.110
Fair	49.425	38.583
Bad	21.839	32.283
Very bad	6.896	10.236
FormalcareParent	57.471	18.898
Residence		
Resident1	2.299	24.409
Resident2	44.827	81.890
DBrothers	64.368	62.205
DSisters	48.276	62.992
Sample Size	87	127

Note: (1) We define caregiver as the individual that reports to have provided help to an elderly parent during the last twelve months in personal care, practical household help, and help with paperwork.

Table 6. Sample Characteristics of Non-Caregiver Daughters.

Sample (II)		
Percentages	Northern Countries	Southern Countries
Labour Participant	78.509	44.058
Age		
50-55	72.807	69.855
56-60	27.193	30.145
Married/Partnership	77.193	83.188
Education		
Educ1	5.263	35.652
Educ2	25	28.696
Educ3	27.851	22.319
Educ4	41.886	13.333
DChildren16	13.816	8.985
Living parents		
Both	43.640	41.739
Only Mother	41.228	51.594
Only Father	15.131	6.667
Health of Parent		
Very Good	12.281	2.609
Good	35.746	25.217
Fair	40.131	49.275
Bad	8.991	19.420
Very bad	2.851	3.478
FormalcareParent	29.605	7.536
Residence		
Resident1	0.439	9.565
Resident2	26.316	58.261
DBrothers	66.009	68.406
DSisters	66.447	66.377
Sample Size	456	345

Table 7. Sample Characteristics of Intensive<sup>(1)</sup> Caregiver Daughters

Sample (II)		
Percentages	Northern Countries	Southern Countries
Inside Household	4.878	29.412
Outside Household	95.122	71.569
Labour Participant	70.732	31.372
Age		
50-55	36.585	60.784
56-60	63.415	39.215
Married/Partnership	65.854	77.451
Education		
Educ1	9.756	46.078
Educ2	21.951	20.588
Educ3	29.268	19.608
Educ4	39.024	13.725
DChildren16	0	3.921
Living parents		
Both	14.634	22.549
Only Mother	78.049	66.667
Only Father	7.317	10.784
Health of Parent		
Very Good	2.439	0
Good	12.195	18.627
Fair	58.536	35.294
Bad	24.390	35.294
Very bad	2.439	10.784
FormalcareParent	73.171	20.588
Residence		
Resident1	4.878	28.431
Resident2	68.293	86.274
DBrothers	53.658	61.765
DSisters	48.780	61.765
Sample Size	41	102

Note: (1) We define "intensive" caregiver as the individual that has taken care of an elderly parent during the last twelve months in a daily or weekly basis.

Table 8. Univariate Probit Model of Labour Participation<sup>(1)</sup>

	Sample (I)		Sample (II)	
	Northern Countries	Southern Countries	Northern Countries	Southern Countries
Constant	-36.833* (19.244)	-4.746 (19.145)	-26.301 (22.625)	-5.572 (21.186)
Caregiver (Daily/Weekly)	-0.241* (0.125)	-0.133 (0.150)	-0.101 (0.237)	-0.361** (0.154)
Health				
Very Good/Good <sup>(2)</sup>	1.725** (0.310)	0.763** (0.296)	-	-
Fair	1.473** (0.326)	0.614** (0.310)	-	-
Educ2	0.414** (0.209)	0.228 (0.150)	0.015 (0.283)	-0.143 (0.156)
Educ3	0.759** (0.218)	0.664** (0.158)	0.438 (0.288)	0.345** (0.163)
Educ4	0.950** (0.217)	1.186** (0.181)	0.599** (0.281)	1.124** (0.198)
Age	13.331* (7.035)	1.912 (7.026)	10.297 (8.315)	2.175 (7.807)
Age <sup>2</sup>	-1.256* (0.642)	-0.230 (0.642)	-1.005 (0.762)	-0.223 (0.718)
Non-wage Income	-0.003* (0.002)	-0.005* (0.003)	-	-
DChildren16	-0.194 (0.198)	0.126 (0.207)	-0.295 (0.210)	0.153 (0.231)
Married/Partnership	-0.119 (0.161)	-0.258* (0.150)	0.134 (0.154)	-0.107 (0.161)
Sweden	0.848** (0.138)	-	0.955** (0.166)	-
Denmark	0.468** (0.153)	-	0.601** (0.171)	-
Spain	-	0.395** (0.154)	-	0.119 (0.155)
Italy	-	0.118 (0.148)	-	0.192 (0.160)
Pseudo-R <sup>2</sup>	0.1741	0.135	0.134	0.088
Sample Size	766	576	543	472

Note: Standard errors robust to heteroskedasticity and within-family correlation in parentheses. (\*) Significant at 10%. (\*\*) Significant at 5%. Age has been divided by 10. Non-wage income is expressed in thousands of 2003 gross ppp-adjusted euros. The default dummies are Educ1 for the highest education level completed, the Bad/Very Bad category for health status, and The Netherlands and Greece for the northern and southern countries, respectively. (1) Assuming exogeneity of the "intensive" caregiving decision. (2) The Very Good and Good categories in health status have been pooled together.

Table 9. Simultaneous Bivariate Probit Model<sup>(1)</sup>

	Sample (I)			
	Northern Countries		Southern Countries	
	Labour Participant	"Intensive" Caregiver	Labour Participant	"Intensive" Caregiver
Constant	-37.194** (18.468)	-3.431** (1.151)	-1.494 (17.661)	-3.416* (1.434)
Caregiver (Daily/Weekly)	-0.970* (0.527)	- -	-1.070** (0.400)	- -
Health				
Very Good/Good <sup>(2)</sup>	1.692** (0.325)	0.341 (0.311)	0.663** (0.301)	-0.032 (0.277)
Fair	1.433** (0.337)	0.193 (0.320)	0.578* (0.311)	0.036 (0.289)
Educ2	0.358 (0.220)	-0.161 (0.214)	0.207 (0.147)	-0.010 (0.175)
Educ3	0.711** (0.231)	-0.110 (0.217)	0.672** (0.154)	0.238 (0.181)
Educ4	0.814** (0.249)	-0.512** (0.218)	1.130** (0.190)	0.189 (0.201)
Age	13.471** (6.753)	0.186 (0.203)	0.728 (6.472)	-0.051 (0.220)
Age <sup>2</sup>	-1.259** (0.615)	- -	-0.113 (0.591)	- -
Non-wage Income	-0.0036* (0.0019)	-0.0027 (0.0018)	-0.004 (0.003)	0.001 (0.003)
DChildren16	-0.098 (0.211)	0.435** (0.185)	0.106 (0.203)	-0.070 (0.233)
Married/Partnership	-0.098 (0.158)	0.066 (0.140)	-0.316** (0.140)	-0.356* (0.167)
AgeParent	- -	0.300** (0.117)	- -	0.431** (0.123)
HealthParent <sup>(2)</sup>				
Very Good/Good	- -	-0.454** (0.137)	- -	-0.523** (0.173)
Fair	- -	-0.322** (0.128)	- -	-0.267* (0.151)

(Continued)

(Continued)  
Table 9. Simultaneous Bivariate Probit Model<sup>(1)</sup>  
Sample (I)

	Northern Countries		Southern Countries	
	Labour Participant	"Intensive" Caregiver	Labour Participant	"Intensive" Caregiver
DBrothers	-	-0.042 (0.115)	-	-0.315** (0.129)
DSisters	-	-0.269** (0.109)	-	-0.278** (0.134)
BothParents	-	-0.126 (0.123)	-	-0.097 (0.144)
Sweden	0.721** (0.175)	-0.501** (0.126)	-	-
Denmark	0.373** (0.166)	-0.363** (0.145)	-	-
Spain	-	-	0.403** (0.150)	0.216 (0.166)
Italy	-	-	0.137 (0.143)	0.088 (0.165)
$\rho$	0.438 (0.308)		0.579** (0.237)	
Log-likelihood	-729.303		-586.813	
Sample Size	766		576	

Note: Standard errors robust to heteroskedasticity in parentheses. (\*) Significant at 10%. (\*\*) Significant at 5%. Age has been divided by 10. Non-wage income is expressed in thousands of 2003 gross ppp-adjusted euros. The default dummies are Educ1 for the highest education level completed, the Bad/Very Bad pooled category for health status and health status of the parent, and The Netherlands and Greece for the northern and southern countries, respectively. (1) We treat the caregiving decision as endogenous. (2) The Very Good and Good categories in health status and health status of the parent have been pooled together.

Table 10. Simultaneous Bivariate Probit Model<sup>(1)</sup>

	Sample (II)					
	Northern Countries			Southern Countries		
	Labour Participant	"Intensive" Caregiver		Labour Participant	"Intensive" Caregiver	
Constant	-21.641 (22.462)	-8.049** (2.337)		-3.810 (20.365)	-2.283 (1.694)	
Caregiver (Daily/Weekly)	-1.310** (0.499)	-		-0.981** (0.417)	-	
Educ2	-0.012 (0.280)	-0.425 (0.374)		-0.192 (0.154)	-0.308 (0.191)	
Educ3	0.406 (0.284)	0.083 (0.359)		0.287* (0.168)	-0.200 (0.198)	
Educ4	0.536* (0.276)	-0.048 (0.337)		1.066** (0.204)	-0.049 (0.219)	
Age	8.473 (8.260)	0.610* (0.325)		1.534 (7.509)	-0.144 (0.257)	
Age <sup>2</sup>	-0.822 (0.758)	-		-0.157 (0.690)	-	
DChildren16 <sup>(2)</sup>	-0.282 (0.203)	-		0.091 (0.232)	-0.564* (0.310)	
Married/Partnership	0.093 (0.150)	-0.166 (0.193)		-0.130 (0.160)	-0.175 (0.178)	
AgeParent	-	0.575** (0.200)		-	0.442** (0.161)	
IncomeParent	-	-0.001 (0.0017)		-	-0.0004 (0.0010)	
HealthParent <sup>(3)</sup>						
Very Good/Good	-	-1.235** (0.275)		-	-0.764** (0.191)	
Fair	-	-0.239 (0.243)		-	-0.763** (0.164)	

(Continued)

(Continued)  
Table 10. Simultaneous Bivariate Probit Model<sup>(1)</sup>  
Sample (II)

	Northern Countries		Southern Countries	
	Labour Participant	"Intensive" Caregiver	Labour Participant	"Intensive" Caregiver
DBrothers	-	-0.168 (0.195)	-	-0.343** (0.154)
DSisters	-	-0.424** (0.184)	-	-0.108 (0.146)
BothParents	-	-0.796** (0.218)	-	-0.481** (0.161)
Sweden	0.900** (0.163)	-0.281 (0.237)	-	-
Denmark	0.554** (0.166)	-0.133 (0.257)	-	-
Spain	-	-	0.131 (0.154)	0.125 (0.171)
Italy	-	-	0.114 (0.167)	-0.496** (0.191)
$\rho$	0.729** (0.193)		0.423 (0.265)	
Log-likelihood	-351.559		-500.316	
Sample Size	543		472	

Note: Standard errors robust to heteroskedasticity and within-family correlation in parentheses.<sup>48</sup> (\*) Significant at 10%. (\*\*) Significant at 5%. Age has been divided by 10. Non-wage income is expressed in thousands of 2003 gross ppp-adjusted euros. The default dummies are Educ1 for the highest education level completed, the Bad/Very Bad pooled category for health status and health status of the parent, and The Netherlands and Greece for the northern and southern countries, respectively. (1) We treat the caregiving decision as endogenous. (2) We do not include the regressor DChildren16 in the informal caregiving equation for northern countries in sample (II) since there is perfectly prediction of caregiver equals to zero when DChildren16 equals to one. (3) The Very Good and Good categories in health status of the parent have been pooled together.

<sup>48</sup>See Wooldridge (2002) for more details on the computation of a variance matrix robust to heteroskedasticity and within-cluster correlation.

Table 11. Marginal Effect of "Intensive" Caregiver on the Probability of Participating (Probit Models)

	Sample Mean (Median)	
	Exogenous "Intensive" Caregiver	Endogenous "Intensive" Caregiver
Sample (I)		
Northern Countries	-0.062 (-0.063)	-0.282 (-0.296)
Southern Countries	-0.044 (-0.047)	-0.316 (-0.339)
Sample (II)		
Northern Countries	-0.026 (-0.024)	-0.423 (-0.436)
Southern Countries	-0.125 (-0.125)	-0.316 (-0.316)

Note: The marginal effect for individual  $i$  is computed as  $\Phi(\hat{\alpha}_1 + \hat{\beta}'_1 X_{1i}) - \Phi(\hat{\beta}'_1 X_{1i})$  where  $X_{1i}$  is the value of vector  $X_1$  for individual  $i$ .

## DATA APPENDIX

Table A1. Middle-Aged Women with Living Parents<sup>(1)</sup>

<i>Country</i>	Sample sizes	
	(I)	(II)
Sweden	328	226
The Netherlands	273	156
Denmark	165	161
<i>Northern Countries</i>	766	543
Spain	196	177
Italy	217	136
Greece	163	159
<i>Southern Countries</i>	576	472

Note: (1) Women aged between 50 and 60 with at least one living parent and available information for all the variables considered in the analysis. (I) refers to the sample obtained selecting women directly from the respondents of the survey. (II) refers to the sample of women obtained from the information given by their parents in the CHILDREN module. In this case, the elderly parents are the respondents of the survey.

*SAMPLE (I)*: Women aged between 50 and 60, respondents of the survey, and with at least one living parent at the moment of the interview.

*Variables*:

1. *Daughters' characteristics*: The variables *labour participant* and *caregiver* indicate if the daughter reports a positive number of weekly hours of work at the moment of the interview and if the daughter reports that she has taken care of an elderly parent in the last twelve months, respectively. We additionally define the variable "*intensive caregiver*" that refers to a daughter that has taken care of at least one elderly parent during the last twelve months prior to the interview in a daily or weekly basis. We also use information on the daughter's age, current marital status, education, health, income, children, living parents and siblings. The dummy variable *Married/Partnership* is equal to one if the woman is married or engaged in a registered partnership. We measure education by four dummy variables (*Educ1*, *Educ2*, *Educ3*, and *Educ4*) generated from the highest level of education completed according to the ISCED-97 code.<sup>49</sup> The first dummy corresponds to none schooling, still in school or primary education (ISCED-97 code 1), the second one refers to the lower secondary education (ISCED-97 code 2), the third corresponds to (upper) secondary education (ISCED-97 code 3) and, the last one reflects graduate, undergraduate or second level of professional studies (post-secondary, non-tertiary, first stage of tertiary and second stage of tertiary. ISCED-97 code 4-6). We measure health by the respondent's self-perceived health status<sup>50</sup> and we generate

<sup>49</sup>ISCED stands for International Standard Classification of Education.

<sup>50</sup>The SHARE data survey provides two different versions of the respondent's self-perceived health: the European version with categories *Very Good*, *Good*, *Fair*, *Bad* and *Very Bad*, and the US version with categories *Excellent*, *Very Good*, *Good*, *Fair* and *Poor*. In particular, we use the first one.

one dummy variable for each of the categories (*Very Good, Good, Fair, Bad, and Very Bad*). We measure non-wage income (*Non-wage Income*) as the difference between the gross annual total household income and the gross annual individual income derived from employment and self-employment, expressed in thousands of 2003 ppp-adjusted euros.<sup>51</sup> We also consider in the analysis variables reflecting other family responsibilities as the number of children aged less or equal than 16 and living in the household (*Children16*),<sup>52</sup> and alternative potential sources of informal care for elderly parents as the number of the respondent's siblings (*Brothers, Sisters*) and the fact that only one or both parents are alive at the moment of the interview (*Living Parents: Both, Only Mother, Only Father*).<sup>53</sup>

2. *Parents' characteristics*: With respect to the information about natural parents' characteristics given by the daughters, we observe each parent's age, health status, and residence closeness. Specifically, when both natural parents are alive, we will measure parental age by the age of the oldest parent (*AgeParent*), and we will consider the health of the parent that exhibits the worst health status (*HealthParent* with the categories *Very Good, Good, Fair, Bad, and Very Bad*). The residence closeness is measured by two dummies (*Resident1, Resident2*) that state if the woman has at least one parent living in the same household, and if she has at least one parent living less than 5 kilometers away (that includes in the same household), respectively.

*SAMPLE (II)*: Women aged between 50 and 60 with at least one living parent in the year of the interview. This sample has been built from an initial sample of individuals with at least one daughter aged between 50 and 60 using the information about up to four selected children given by the family respondent in the Children module. Therefore, the elder parents are the respondents of the survey in this case.

*Variables*:

1. *Daughters' characteristics*: It is important to remark that the information about daughters has been provided by the family respondent. The variable *labour participant* indicates if the family respondent reports that the daughter is working at the moment of the interview as a full-time employed, part-time employed, self-employed or working for own business. The variable *caregiver* indicates if the selected daughter has taken care of at least one parent during the last twelve months. This indicator has been computed using the information given by the family respondent about the help received from a person living outside the household and the information given by every respondent about the help received from a person living inside the household.<sup>54</sup> We also use informa-

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<sup>51</sup>The amounts of euros have been corrected for PPP to control for the differences in the price levels among countries.

<sup>52</sup>It is important to remark that these children could be natural, fostered, adopted or stepchildren. For couples, they could be from one member of the couple or from both of them.

<sup>53</sup>For sample (I), this sequence has been computed from the information given by each woman about the living status of her parents at the moment of the interview. The dummy variable *Both* indicates whether both parents are alive but we do not observe whether both of them are living together. The variables *Only Mother* and *Only Father* indicate whether only the mother and the father is alive, respectively, but we do not observe the marital status of them.

<sup>54</sup>The sequence of variables used to identify if each of the selected daughters has provided help to their parents from inside the household is sp021d01-sp021d33. Since the sequence provided by SHARE

tion given by each family respondent about each selected daughter's age, current marital status, education, children, living parents and siblings. However, there is not information about daughters' health status and income. The dummy variables for marital status and education, *Married/Partnership*, *Educ1*, *Educ2*, *Educ3*, and *Educ4* are given by the same definitions as in Sample (I). The residence closeness is measured by two dummies (*Resident1*, *Resident2*) that state if the daughter lives in the same household as the parents, and if she lives less than 5 kilometers away (that includes in the same household), respectively. As indicators of other family responsibilities and the existence of alternative sources of informal caring for elderly parents, we use the number of children (*Children*),<sup>55</sup> and the number of siblings (*Brothers*, *Sisters*),<sup>56</sup> respectively. In addition to this, we also consider the fact that only one or both parents are alive at the moment of the interview (*Living Parents: Both*, *Only Mother*, *Only Father*).<sup>57</sup>

2. *Parents' characteristics*: With respect to the information about elder parents' characteristics, that in this case are given by themselves, we use each parent's age, health status, income, and formal care received in the last twelve months. Specifically, when both parents are interviewed,<sup>58</sup> we will measure parental age by the age of the oldest parent (*AgeParent*), and we will consider the health of the parent that exhibits the worst health status (*HealthParent* with the categories *Very Good*, *Good*, *Fair*, *Bad*, and *Very Bad*). Parents' income (*IncomeParent*) is measured by the gross annual household income expressed in thousands of 2003 ppp-adjusted euros. Finally, the variable *FormalcareParent* indicates whether at least one parent has been in a nursing home<sup>59</sup> overnight or has received home care<sup>60</sup> in the last twelve months prior to the interview.

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Release 1 was incorrectly computed, we use the corrected sequence that has been fixed on the basis of the raw data. This information has been kindly provided by the CentERData and it will be included in the updating of SHARE Release 1.

<sup>55</sup>For sample (II), we can only compute from the Children module the total number of children (natural, fostered, adopted and stepchildren, including those of spouse or partner) of each daughter since there is not information about their ages. However, we can compute a dummy variable that indicates whether each of them has at least one children aged less than 16 since there is information about the year of birth of the youngest child.

<sup>56</sup>In these variables, we are also including siblings that may be non-biological. In addition to this, we can not know whether the daughter has other natural brothers or sisters in the case that her parents are not living together and have had children with other partners.

<sup>57</sup>Specifically, in sample (II), the dummy variable *Both* is equal to one if both parents (that could be natural or not) are interviewed or if there is only one respondent but reports to be married or have a partner. The dummy variables *Only Mother*, and *Only Father* are equal to one if there is only a female respondent or a male respondent, respectively, that reports not to have a spouse or partner.

<sup>58</sup>We should note that, in sample (II), the variables *AgeParent*, *HealthParent*, and *FormalcareParent* present some limitations. In particular, it is possible that only one member of the couple has been interviewed. In this case, we do not have information about the age, health status, and formal care received of the other member. Therefore, in these cases, these variables reflect the age, the health status and the potential receipt of formal care of the interviewed parent.

<sup>59</sup>A "nursing home" is defined in SHARE as an institution sheltering older persons who need assistance in activities of daily living, in an environment where they can receive nursing care, for short or long stays.

<sup>60</sup>This is professional or paid nursing or personal care, professional or paid home help for domestic tasks that the individual could not perform himself due to health problems, and meals-on-wheels.

Table A2. Descriptive Statistics for Sample (I)<sup>(1)</sup>

	<i>NC</i>	Sweden	Denmark	Netherlands	<i>SC</i>	Spain	Italy	Greece
Labour Participant	0.777	0.857	0.836	0.645	0.410	0.454	0.364	0.417
Caregiver	0.448	0.436	0.430	0.472	0.257	0.245	0.258	0.270
Age	54.475 (3.034)	54.802 (3.117)	54.491 (3.103)	54.073 (2.849)	54.224 (3.040)	54.163 (3.035)	54.543 (2.975)	53.871 (3.105)
Married/Partnership	0.784	0.762	0.673	0.879	0.821	0.832	0.894	0.712
Education								
Educ1	0.074	0.131	0	0.051	0.397	0.454	0.378	0.356
Educ2	0.270	0.213	0.127	0.425	0.227	0.306	0.267	0.080
Educ3	0.253	0.229	0.339	0.231	0.212	0.122	0.203	0.331
Educ4	0.402	0.427	0.533	0.293	0.163	0.117	0.152	0.233
Health								
Very Good	0.339	0.415	0.345	0.245	0.194	0.189	0.106	0.319
Good	0.450	0.323	0.479	0.586	0.512	0.510	0.539	0.478
Fair	0.174	0.204	0.139	0.157	0.238	0.245	0.286	0.166
Bad	0.029	0.049	0.018	0.011	0.052	0.056	0.060	0.037
Very Bad	0.008	0.009	0.018	0	0.003	0	0.009	0
Non-wage Income <sup>(2)</sup>	32.831 (31.299)	27.306 (25.711)	30.304 (28.180)	40.997 (37.070)	21.564 (19.568)	17.382 (16.486)	25.818 (21.210)	20.930 (19.656)
Children16	0.106 (0.366)	0.134 (0.414)	0.066 (0.273)	0.095 (0.351)	0.097 (0.335)	0.112 (0.376)	0.115 (0.361)	0.055 (0.229)
Living Parents								
Both	0.251	0.271	0.194	0.260	0.276	0.260	0.286	0.282
Only Mother	0.617	0.610	0.673	0.593	0.625	0.643	0.599	0.638
Only Father	0.132	0.119	0.133	0.146	0.099	0.097	0.115	0.079
AgeParent	81.864 (5.141)	81.908 (5.594)	81.261 (4.771)	82.176 (4.759)	82.196 (5.221)	82.117 (5.126)	82.134 (5.029)	82.374 (5.600)
HealthParent								
Very Good	0.113	0.152	0.115	0.066	0.075	0.082	0.064	0.080
Good	0.227	0.180	0.273	0.256	0.286	0.347	0.203	0.325
Fair	0.403	0.375	0.351	0.469	0.370	0.316	0.382	0.417
Bad	0.207	0.253	0.164	0.179	0.194	0.189	0.249	0.129
Very bad	0.048	0.040	0.097	0.029	0.075	0.066	0.101	0.049
Residence								
Resident1	0.006	0.006	0.006	0.007	0.052	0.112	0.018	0.024
Resident2	0.316	0.262	0.370	0.348	0.559	0.653	0.544	0.466
Brothers	1.158 (0.960)	1.009 (0.890)	1.030 (0.865)	1.414 (1.043)	1.187 (0.995)	1.388 (1.014)	1.161 (1.003)	0.981 (0.919)
Sisters	1.185 (1.048)	1 (0.986)	0.976 (0.930)	1.535 (1.098)	1.200 (1.023)	1.388 (1.049)	1.157 (1.033)	1.031 (0.945)
Sample Size	766	328	165	273	576	196	217	163

Note: (1) Means of the variables considered in the analysis for sample (I) and standard deviations in parentheses. (2) Non-wage income is expressed in thousands of 2003 gross ppp-adjusted euros.

Table A3. Descriptive Statistics for Sample (II)<sup>(1)</sup>

	<i>NC</i>	Sweden	Denmark	Netherlands	<i>SC</i>	Spain	Italy	Greece
Labour Participant	0.788	0.885	0.838	0.596	0.424	0.412	0.463	0.402
Caregiver	0.160	0.203	0.137	0.122	0.269	0.288	0.154	0.346
Age	53.961 (2.996)	54.208 (3.103)	53.596 (2.880)	53.981 (2.935)	53.881 (3.019)	54.215 (3.022)	53.62 (2.944)	53.729 (3.064)
Married/Partnership	0.757	0.765	0.720	0.782	0.824	0.768	0.875	0.843
Education								
Educ1	0.059	0.093	0.006	0.064	0.371	0.373	0.316	0.415
Educ2	0.243	0.203	0.149	0.397	0.265	0.328	0.331	0.138
Educ3	0.284	0.226	0.335	0.314	0.227	0.164	0.220	0.302
Educ4	0.414	0.478	0.509	0.224	0.138	0.135	0.132	0.145
Children	1.941 (1.097)	1.903 (1.131)	1.969 (0.996)	1.968 (1.149)	1.949 (1.075)	2.034 (1.296)	1.823 (1.088)	1.962 (0.737)
Living Parents								
Both	0.411	0.469	0.317	0.423	0.369	0.446	0.412	0.245
Only Mother	0.446	0.403	0.484	0.468	0.555	0.491	0.5	0.673
Only Father	0.144	0.128	0.199	0.109	0.076	0.062	0.088	0.082
AgeParent	80.858 (5.349)	80.982 (5.674)	79.739 (5.379)	81.833 (4.600)	81.144 (5.779)	81.774 (5.883)	80.610 (5.164)	80.899 (6.120)
HealthParent								
Very Good	0.109	0.102	0.168	0.058	0.021	0.022	0.007	0.031
Good	0.330	0.314	0.335	0.346	0.233	0.220	0.228	0.251
Fair	0.416	0.416	0.373	0.461	0.464	0.469	0.441	0.478
Bad	0.110	0.119	0.086	0.122	0.229	0.226	0.250	0.214
Very bad	0.035	0.049	0.037	0.013	0.053	0.062	0.073	0.025
IncomeParent	57.876 (419.552)	30.952 (36.265)	98.518 (760.180)	54.937 (119.626)	24.690 (61.683)	33.207 (94.128)	26.342 (34.337)	13.796 (16.200)
FormalcareParent	0.341	0.230	0.391	0.449	0.106	0.186	0.118	0.006
Residence								
Resident1	0.007	0.013	0.006	0	0.135	0.265	0.095	0.025
Resident2	0.293	0.257	0.242	0.397	0.646	0.729	0.625	0.572
Brothers	0.983 (0.942)	0.867 (0.822)	0.901 (0.937)	1.237 (1.060)	1.131 (1.138)	1.248 (1.208)	1.162 (1.200)	0.975 (0.980)
Sisters	1.112 (1.184)	1.026 (1.254)	1.031 (0.904)	1.320 (1.310)	1.036 (1.067)	1.124 (1.136)	1.037 (1.138)	0.937 (0.912)
Sample Size	543	226	161	156	472	177	136	159

Note: (1) Means of the variables considered in the analysis for sample (II) and standard deviations in parentheses. (2) IncomeParent is expressed in thousands of 2003 gross ppp-adjusted euros.