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Social interaction effects in an inter-generational model of informal care giving

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Social interaction effects in an inter-generational model of informal care giving

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Abstract
We study jointly the health perception of the elderly and the care giving decision of their adult children. Social interactions play a crucial role: elder parents' health perception depends on relations with household members. On the other hand adult children make their care giving decisions strategically, meaning that each of them considers his siblings' decision. We find empirical evidence which support this claim using the 2004 wave of the SHARE survey. We estimate social interaction effects by means of methods taken from the spatial econometric literature. Health perception relation with care giving depends on the determinants of adult children's decision to care: Parents' health may be modelled as a common good for parents and children; the latter's decision may be driven by bequest motives or by pure altruism and/or cultural values. We test implications of the model thanks to the unique features of the SHARE dataset: it is trans--national, allowing to control for cultural and institutional differences, it contains information on health status of over-50 Europeans and details on their social and intergenerational relations.

Keywords
SHARE, care giving, social interactions, health, aging
JEL Codes
C31, D13, I11

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1 Introduction

Aging is one of the main concerns in most European Countries. While this process is the result of scientific development and improved economic living conditions, it rises several policy issues. First of all, pension systems are under revision in many countries, in order to be sustainable in societies with a shrinking labor force compared to an expanding number of retired people. Health care, and in particular long term care systems must adapt to this changing society as well. This is the focus of our paper: we are interested in the relation between formal and informal care, and in the strategic behavior of care–givers and care–receivers. This is a relevant topic from a policy perspective: institutions can change the cost and availability of formal care. Nevertheless the overall impact of different settings depend on the relation between formal and informal care provision. As an example: reducing the cost for formal care may reduce or increase the supply of informal one, depending on whether those services are substitutes or complements. Further, caring is a time–consuming activity which is not necessarily compatible with a full time occupation, thus time devoted to informal care and labor force participation are negatively related. we will formalize all these relations in a game–theoretic setting. In a nutshell: the amount of care provided by non co–residing siblings can be thought of as the equilibrium output between the supply and the demand for informal care in the 'family market'. This is not new in the literature, and such an output has been obtained from a bargaining process (Pezzin and Steinberg Schone (1999)). We will follow an alternative approach based on a non–cooperative game among altruistic players. Our aim is to study both sides of the market, devoting a particular attention to interactions among family members. Care supply has already been studied as an endogenous choice on the labor decisions of siblings, in particular to explain gender differences in labor market participation and wages (Ettner (1995), Ettner (1996), Wolf and Soldo (1994), Crespo (2007)). Usually the focus is not on care giving choices, which at most are considered as endogenous factors in the labor market decision. In the present paper we turn our attention to the care giving choice itself, controlling for endogenous labor supply. Such an approach allows us to concentrate on the strategic interaction among siblings: the choice to allocate hours to parent's care depend crucially on the same choice done by brothers and sisters.

Demand for health care depends on the health status of the elders. A structural model of the demand side is beyond the scope of the paper. Health status can be thought as the output of an accumulation process (Grossman (1972)). In such a setting, demand for informal care as well as for publicly provided health care services can be though of as an input in the health capital production function. Anyway, we are focusing on people older than 50: at that age, the accumulation process can be considered as finished: even if healthy behavior, such as not smoking or a proper diet still improve

objective health, important inputs in the health accumulation function as income, education, living arrangement depend on choices that can safely be assumed to be predetermined. Our focus then turns to a subjective measure of health, which is self reported perceived health.

Measuring perceived health is not the same as measuring objective health (see Jurges (2005) for a detailed discussion on health measures in SHARE). The self–perception of health status entails objective health conditions, but also individual preference or general attitude, social and family network determinants and cultural differences (Reher (1998); Silverstein and Bengtson (1997), Collins (2004)). Then, we claim that self reported health is a measure of well–being, not only a measure of physical health corrected by individual and sociological country differences. This is coherent with the World Health Organization[1] definition of health:

> [...] a state of complete physical, mental and social well–being and not merely the absence of disease or infirmity

The paper is structured as follows: the next section outlines the economic model; the third one describes the SHARE dataset. Next we move to the econometric specification and estimation procedure. Fifth section reports and comments on the results, conclusions are drawn in the last section.

2 The Economic model

We model the caring decision as a one–shot non cooperative game among parents, P_1, P_2, and their children, $S_1, S_2, \ldots, S_n$. Children choose how much time to spend caring for their parents, $I_1, \ldots, I_n$ and how much to spend in leisure, $L_1, \ldots, L_S$. Parents can choose how much of their income to buy formal care hours, F, but they can also transfer (or commit to transfer inthe future) an amount of money to their children as a bequest, B. Further on, they can choose how to split such a bequest amongst their children: β stands for the sharing rule applied by parents. Following Sloan et al. (1997), we chose not to model caring decisions as a cooperative game since in such a model players should face an infinite number of periods. We think this assumption is unrealistic: parent's death is an event that can't be neglected in caring choices.

Children's help is provided to parents' households, thus as a starting point we assume there is a single parent. We will discuss in the following section what decision rules among parents are consistent with our model and the relevance of the single parent assumption. Children are all equal and have the same strategies, thus we can assume without loss of generality there are just two of them. Again, we will discuss at lenght implications of this simplifying assumption.

[1] Constitution of the World Health Organization, Geneva 1946

Parent and sons are altruistic: children are worried about their parents' health, while P utility depend on children's utility derived from consumption. Formally, P, S_1, S_2 face the following maximization problems:

$$\begin{array}{l} P\text{'s problem:} \\ \max_{F,B,\beta} \quad \left\{U^Q(Q) + U^I(I_1) + V^C(C_1) + U^I(I_2) + V^C(C_2)\right\} \\ \qquad \text{s.t.} \quad \begin{array}{l} Q = F + I_1 + I_2 \\ p^F F + B \leq Y^P \end{array} \end{array} \tag{1}$$

Where p^F is the market price for formal care, C_i is ith son's consumption and Y^P is income. We model the decision process as a one–shot game, thus there are no savings and current and permanent income coincide. Parent's utility function is assumed to depend only on care and not on other goods' consumption. This is equivalent to assume separability of care from all other available goods in P's utility.

$$\begin{array}{rl} S_i \text{ problem: } \max\limits_{I_i, L_i} & \left\{U^Q(Q) + V^C(C_i)\right\} \\ & \begin{array}{l} Q = F + I_i + I_{-i} \\ Y^i + B_i(\beta) = C_i \\ Y^i = \omega(T - L_i - I_i) \\ L_i + I_i \leq T \\ L_i \geq 0 \\ I_i \geq 0 \end{array} \\ \text{s.t.} & \end{array} \tag{2}$$

ω is market wage and T is total available time. Such a model is similar to Bernheim et al. (1985) (assuming additively separable utility functions) and to Sloan et al. (1997) (assuming no income sharing and no cooperation within the family), but it considers as endogenous the labor force participation decision. The total amount of care, Q, is a public good (partly) produced within the family. Child i's utility is concave, first increasing and then decreasing in I_i. U^P has the same shape, but it depends also on the additional terms $U^I(I_i)$: these term allows us to formalize the idea that P attaches a higher a value to informal care per se, while S_i is indifferent on the type of care his parent receives as long as the amount Q is provided. Formally, these assumptions can be expressed in terms of utility's first derivatives:

$$\frac{\partial U^Q}{\partial Q} > 0; \quad \frac{\partial U^I}{\partial I} > 0; \quad \frac{\partial V^C}{\partial C} > 0$$

the shape of U^S and U^P together with positiveness of first derivatives implies that

$$\text{argmax}_{I_i} U^P > \text{argmax}_{I_i} U^S \tag{3}$$

U^S depends on F only through the public good U^Q. Then,

$$\frac{\partial U^S}{\partial F} = \frac{\partial U^S}{\partial U^Q} \cdot \frac{\partial U^Q}{\partial Q} \cdot \frac{\partial Q}{\partial F} = \frac{\partial U^Q}{\partial Q} > 0$$

Which implies that S utility function is always increasing in parent's choice variable F: if P do not commit to transfer any bequest B, children actually choose I_S independently of their parent's choice of F. Thus without bequest ith child's maximization problem can be rewritten as

$$\begin{aligned} S_i \text{ problem: } \max_{I_i, L_i, C_i} \quad & \left\{U^Q(Q) + V^C(C_i)\right\} \\ & Q = F + I_i + I_{-i} \\ & C_i = Y^i = \omega(T - L_i - I_i) \\ \text{s.t.} \quad & L_i + I_i \leq T \\ & L_i \geq 0 \\ & I_i \geq 0 \end{aligned} \tag{4}$$

Absence of a bequest implies that P do not participate to the game between children: parent's choice of F can only increase children utilities, thus S_1 and S_2 decide regardless of P's provision of formal care. In this setting child i utility is always positively affected by I_{-i}: i's sibling informal care augment the public good enjoyed by i at no price. Thus child i either does not react to a positive I_{-i}, or his supply of informal care is crowded out, since I_{-i} substitutes I_i and i can re–allocate part of his resources to consumption. Thus each child take parent and siblings decisions as given and maximize

$$\begin{aligned} \max_{I_i, L_i} \quad & \left\{U^Q(\bar{F} + I_i + \bar{I}_{-i}) + V^C(\omega(T - L_i) - \omega I_i)\right\} \\ & L_i + I_i \leq T \\ \text{s.t.} \quad & L_i \geq 0 \\ & I_i \geq 0 \end{aligned} \tag{5}$$

Non–negativity constraints are imposed since corner solutions are not ruled out, i.e. i can choose to work all his available time or to spend it all providing care. The Kuhn–Tucker conditions are

$$-\omega \frac{\partial V^C}{\partial C} - \lambda_1 + \lambda_2 = 0 \tag{6}$$

$$-\omega \frac{\partial V^C}{\partial C} + \frac{\partial U^Q}{\partial Q} - \lambda_1 + \lambda_3 = 0 \tag{7}$$

$$\lambda_1(T - L_i - I_i) = 0 \tag{8}$$

$$\lambda_2 L_i = 0 \tag{9}$$

$$\lambda_3 I_i = 0 \tag{10}$$

Together with

$$\lambda_1 \geq 0; \quad \lambda_2 \geq 0; \quad \lambda_3 \geq 0$$

The Kuhn–Tucker multipliers λ_1, λ_2 and λ_3 can be interpreted respectively as the opportunity costs of working, leisure and informal care. Solving the maximization problem we get the optimal allocation of time by each son: i allocates always all his time in the activity characterized by the lower opportunity cost. Further more, any optimal allocation involving informal care (i.e., if $I_i > 0$) does not involve leisure, since its opportunity cost is certainly higher than the informal care's one: I_i and L_i have the same cost in terms of forgone wages (i.e. they enter in the same way in V^C), but I_i has also a utility increasing effect since it increases U^Q, the altruistic part of U^S. Then regardless of λ_1, $\lambda_2 < \lambda_3$ and therefore we obtain an internal solution only if working and providing care have the same opportunity cost, i.e. if $lambda_1 = \lambda_2$.

As we already stated P do not enter the game since he can't influence I's choices with F, thus P's maximization is:

$$\begin{aligned} \max_{F} \quad & \left\{U^Q(F + \bar{I}_i + \bar{I}_{-i}) + U^I(\bar{I}_i) + U^I(\bar{I}_{-i}) + V^C(\bar{C}_i) + V^C(\bar{C}_{-i})\right\} \\ \text{s.t.} \quad & p^F F \leq Y^P \end{aligned} \tag{11}$$

Since U^Q is always increasing in F, the optimal choice for P is to allocate all his resources to F: $\bar{F} = Y^P/p^F$.

Those allocations are Pareto efficient, i.e. neither the sons nor the parent can modify their choice in such a way that either P, S_1 or S_2 are better off without reducing someone else's utility. Nevertheless since P prefers informal to formal care whatever is the choice of I by his sons, U^P as a function of I_i, I_{-i} is never maximized. This result motivates the introduction of strategic bequest as in Bernheim et al. (1985): P can 'substitute' formal care with informal one committing to transfer a bequest to his sons. The new maximization problems are:

$$\begin{aligned} \max_{F,B,\beta} \quad & \left\{U^Q(F + \bar{I}_i + \bar{I}_{-i}) + U^I(\bar{I}_i) + U^I(\bar{I}_{-i}) + V^C(\bar{C}_i) + V^C(\bar{C}_{-i})\right\} \\ \text{s.t.} \quad & p^F F + B_i(\beta) + B_{-i}(\beta) \leq Y^P \end{aligned} \tag{12}$$

B_i depends on β: the parents chooses how much to transfer to his sons, but also how to split it between them.

$$S_i \text{ problem: } \max_{I_i, L_i} \quad \left\{U^Q(Q) + V^C(C_i)\right\}$$
$$\text{s.t.} \quad \begin{array}{l} Q = \bar{F} + I_i + \bar{I}_{-i} \\ Y^i + \bar{B}_i(\bar{\beta}) = C_i \\ Y^i = \omega(T - L_i - I_i) \\ L_i + I_i \leq T \\ L_i \geq 0 \\ I_i \geq 0 \end{array} \tag{13}$$

The effect of the transfer B_i on i's decision depend crucially on the sharing rule adopted by P. If $B_i > 0$, but the sharing rule is such that B_i does not depend on $-i$'s choice (i.e. on care provided by siblings, I_{-i}), the bequest does not alter the effect of siblings' choices about care provision on i's choice. Then in this case the only effect of the bequest $B_i > 0$ is that it relaxes i's budget constraint, but it does not change the Kuhn–Tucker conditions and the relative prices of working, leisure and informal care: if the opportunity cost of $I_i$was higher then the one of working, bequest cannot induce the children to provide informal care. Nevertheless, if in equilibrium without bequest $\bar{I}_i > 0$, P can obtain extra care and therefore increase his utility transferring B to his child. The starting point is that $\bar{I}_i > 0$ implies that either the opportunity cost of providing care is lower or it is equal to the one of working. In the first case, P substitutes formal with informal care: he will buy $F^* = (\bar{F} - \delta)$ and induce i to allocate $I_i^* = \bar{I}_i + \delta$, where $\delta = B/p^F$. The new allocation does not alter i's utility: U^Q is unchanged since Q is the same; $V^C(C_i)$ is unchanged as well since the cost of the extra I_C is balanced by B_i. Parent's utility U^P increases since $\forall I \ \partial U^I/\partial I > 0$. Vice versa, if shadow prices are equal and therefore we start from an internal solution ($0 < \bar{I}_i < T$), the U^P growth due to a higher level of I_i and/or C_i does not necessarily compensate the parent's utility loss due to the income reduction $-B_i$. This is due to the fact that since players choose simultaneously P is not able to induce i to use B_i to maximize P's utility: i will use the extra income to augment his consumption if his marginal utility $\partial V^C/\partial C_i > \partial U^Q/\partial I_i$, vice versa he will increase the informal care provision. In other words, the children will provide an extra amount of I only if the altruisti motivation will prevail. Then we make the same assumption Bernheim et al. (1985) did: Parent selects the transfer subsequent to the child's choice of I_i. Since the transfer we are talking about is a bequest, this seems reasonable: the model involves just one period, results do not change with expected inter–vivos transfers[2]. Thus, given the timing of the decision and the fact that opportunity costs of working and providing care are the

[2]On the empirical part we will consider both expected bequest and past inter vivos transfers, but the latter are not included amongst the Parent's choice variables

same, i anticipates P's transfer and allocate B_i to extra care as in the corner solution's case.

This result does not necessarily lead to a global maximum for P: if his budget constraint is binding, he could be unable to provide B_i up to the point that maximizes $U^P(I)$. Results changes if P splits the overall bequest among his children proportionally to the care provided by each of them: P can set β in such a way he extracts an additional amount of informal care from each son at the same price as before. In the previous paragraphs the child had a 'monopoly' over B_i: i sets the price for the extra care at the level that maximizes his utility (i.e. the transfer B_i that leaves his utility unaltered compared to the non–bequest case). The presence of siblings can reduce i's market power over the bequest. In order to clarify this point, remeber we are assuming (without loss of generality) that there are two children. Bernheim et al. (1985) shows that if β assigns shares B_i proportional to I_i/I_1+I_2, then in equilibrium both I_1 and I_2 are greater or equal than without bequest. We now want to extend this result considering L_i as endogenous. Let's call I_i^* the informal care supplied by i at equilibrium without bequest. The sharing rule is the following: if both S_1 and S_2 provide a level of care which is higher or equal than I_i^*, each one will receive a bequest proportional to the relative amount of care provided:

$$B_i = \frac{I_i}{I_1 + I_2}$$

On the other hand, if one or both of them will provide an amount $I_i < I_i^*$, the whole amount B will be given to the 'most generous child':

$$\exists i : I_i < I_i^* \Rightarrow B_i = \begin{cases} B & \text{if } I_i > I\_i \\ 0 & \text{if } I_i < I\_i \\ 0 & \text{if } I_i = I\_i < \min_i I_i^* \end{cases}$$

This is an application of the Rotten Kid theorem which Bernheim et al. (1985) prove to hold with exogenous labor supply decision. In order to show that the result holds also in our model, we rewrite the Kuhn–Tucker conditions:

$$-\omega \frac{\partial V^C}{\partial C} - \lambda_1 + \lambda_2 = 0 \tag{14}$$

$$\left(\frac{\partial B}{\partial I_i} - \omega\right) \frac{\partial V^C}{\partial C} + \frac{\partial U^Q}{\partial Q} - \lambda_1 + \lambda_3 = 0 \tag{15}$$

$$\lambda_1(T - L_i - I_i) = 0 \tag{16}$$

$$\lambda_2 L_i = 0 \tag{17}$$

$$\lambda_3 I_i = 0 \tag{18}$$

Then, since $\partial B/\partial I_i > 0$, from the first two conditions it's easy to see that the opportunity cost of informal care λ_3 is still larger than the opportunity

cost of leisure λ_2 and the difference $(\lambda_3 - \lambda_2)$ increases with respect to the case of no bequest. Then λ's ordering is unchanged, which means that the bequest sharing rule does not alter the effect of the labor participation choice on the informal care one and Bernheim et al. (1985) still holds. What does change is the role of I_{-i} on S_i choice: while without such a sharing rule child i utility is always positively affected by I_{-i}, now it has also a negative effect, since B_i is decreasing in I_{-i}. Then if the strategic bequest motive is valid (and only in this case), an increase in I_{-i} could have a positive marginal effect on i's supply of informal care.

2.1 Relaxing the assumptions: one child, two parents

We assumed at the beginning of this section that there are at least two children. With a single child and no bequest, the altruistic feature of child's utility finction (can) lead to a positive provision of informal care, regardless of parent's choice of F. While it's meaningless speaking about sharing rules in this case, still P can induce an higher provision of I with respect to the 'altruistic' level committing to transfer a positive B to his child. From a welfare perspective, the presence of more than one child has the same effect as moving from a monopoly to an oligopoly: children - given the bequest amount and the sharing rule - compete á la Cournot on quantities of informal care to be sold to the unique client, the parent. Equilibrium characteristics are the usual one of Cournot–Nash outcomes, in particular the total amount $I_1 + I_2$ supplied is larger than in monopoly.

In other words the amount of informal care provided by each child depends crucially on the bargaining power of the parent. If there is only one child, P can increase the level of informal care only transferring part of his disposable income to his child. If there are two (or more) children he can make them compete for the bequest obtaining an extra amount of care from them. Nevertheless, if there is no bequest, there are no gains moving from one to a higher number of children. From the son's point of view what matters is the sharing rule: without bequest or if the bequest share is fixed, there is basically no interaction among children: each one can maximize his own utility on his own time allocation and their choices are not altered by the presence of siblings. This is not true if the bequest amount depends on the relative supply of informal care. In this case an increase in I_{-i} increases U^Q but reduces B_i: i must take it into account once he maximizes U_i^S.

The effect of the presence of a spouse depends on how parent's household decision process is modelled. A first choice (the so–called 'unitarian' model) is to assume that individuals have the same preferences and therefore the household as a whole can be considered the elementary decision unit with its own unique utility function. This approach is not fully satisfactory. An appealing alternative are models of 'collective' utility: they are characterized

by two different utility functions and some decision rule to split resources. Chiappori (1992) provides a common framework for those models. In particular, coherently with the previous sections, we assume individuals to be altruistic: the father's utility depends on his own care consumption and on his partner's utility. The decision rule can be thought of as a two–stage procedure: first, parents share their income and informal care provided by the children, then each of them optimally chooses his or her own consumption. Chiappori (1992) result is that with collective utility functions any allocation that respect this process is Pareto efficient. Which particular allocation is reached depends on the shape of each parent's utility. Within this framework a very simple utility specification is consistent with saving choices (see Browning (2000) for details on the model and Alessie et al. (2006) for an application). As long as children are altruistic toward parents' household as a whole, any collective utility is consistent with the model developed in the previous sections. We just need to assume that informal care is supplied to the parent's household and not to each member separately; bequest to children is a different good from bequest to the surviving spouse and parents have a common budget constraint to abide by.

2.2 Empirical implications

The economic model gives us a number of empirical implications. In particular, we have three features to test on children choices: first, endogeneity of labor supply decision in informal care; second, the interactions among children when choosing how much time to devote to caring; third, the relevance of the strategic bequest motive in children's choices.

While the first point is clear, some words should be spent on the following two points, which are related. If the bequest motive is purely altruistic, or in general if expected bequest do not depend on children's behavior, parent's expected bequest or potential future transfers should have no role on children decision. Further, each child i enjoys the public good made up of formal care and informal care provided by each of his siblings. Therefore i's help either is not affect by his siblings' help, or it is crowded out by them. A complementary relationship is not consistent with such an explanation. Vice versa if the bequest motive is strategic, the marginal effect of parent's expected bequest on informal care choice should be positive and informal care of each child can be in a complementarity relation, but there cannot be crowding out. Thus we can discriminate among bequest motives estimating the marginal effect on i's informal care supply of other sibling's help.

On the parent's side, the main hypothesis is that informal care increases utility derived from care. We can go further: the whole model holds also if parent's utility depends only on total informal care (i.e. $U^I(I_1) + \cdots + U^I(I_n)$ can be replaced by $U^I(I_1 + \cdots + I_n)$). Thus, we can test whether parents attach a different value to each child or if they value informal care

independently on the giver.

3 The SHARE dataset

We use data from the Survey of Health, Ageing and Retirement in Europe (SHARE[3]). It collects cross-national interdisciplinary data on socio–economic characteristics, health status, family and social networks of persons aged 50 and over. SHARE provides details about respondent's health and about the provision of formal and informal care to the elderly people. Moreover the survey contains specific information about individual and household income and about real and financial assets. SHARE dataset has a number of characteristics that fits our problem very well. First of all, the survey collects two different types of health status measures: self-reported perceived health and objective measures of health. In the physical health module individuals are asked to self report their current health status. Two scales are allowed: the European and the American version of the so–called 'perceived health[4]'. On the other hand, there are many variables that give us an objective measure of health: we consider two generated variables. The first describes the number of limitations with activities of daily living (ADL[5]). The second describes the number of chronic diseases reported by each individual[6]. We use both the subjective and the objective measures in our analysis: we claim that 'perceived health' is a measure of well–being that depends not only on the objective health status, but also on social supports and interactions between parents and children. In other words, we use perceived health as a measure of utility derived from caring, while controlling

[3]This paper uses data from 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^{th} framework programme (project QLK6-CT-2001-00360 in the thematic programme Quality of Life). Additional funding came from the US National Institute on Aging (U01 AG09740-13S2, P01 AG005842, P01 AG08291, P30 AG12815, Y1-AG-4553-01 and OGHA 04-064). Data collection in Austria (through the Austrian Science Fund, FWF), Belgium (through the Belgian Science Policy Office) and Switzerland (through BBW/OFES/UFES) was nationally funded. The SHARE data set is introduced in Börsh-Supan et al. (2005); methodological details are contained in Börsh-Supan and Jürgens (2005).

[4]Respondent is initially randomised to answer to the European or to the American scale of the self-perceived health. At the end of the health module the respondent answers to the same question, but on the other scale so that we collect both measures for each respondent . The European scale is: 1 Very good, 2 Good, 3 Fair, 4 Bad and 5 Very bad. American scale is: 1 Excellent, 2 Very good, 3 Good, 4 Fair and 5 Poor

[5]Six activities are included: dressing, walking, bathing or showering, eating, getting in and out of bed and using the toilet

[6]The variable corresponds to the followings diseases: hearth attack, high blood pressure or hypertension, high blood cholesterol, a stroke or cerebral vascular disease, diabetes, chronic bronchitis or emphysema, asthma, arthritis, osteoporosis, cancer or malignant tumour, stomach or duodenal ulcer, Parkinson disease, cataracts and hip fracture or femoral fracture

for objective health. This is not the only advantage of using SHARE: the dataset provides information on all our choice variables, hours of informal care, hours of payed job, formal care and expected bequest. Informal care is measured in hours of care received from every children of the respondent per week. SHARE reports three types of help: personal care, help in housekeeping and paperwork. Most of the hours of help provided falls in the second category. There is a wide heterogeneity across different Countries (see table 1): while Central and Northern Countries are those with the higher level of care, Southern ones are those were among those who provide care there is the higher share devoted to personal care. This second feature is in line with different institutional arrangements: Northern Countries, which have the most generous elders' support system, are those where children devote less time to personal care. Unfortunately the sample size do not allow us to exploit the differences among those three types of help: we are going to use the aggregate number of help hours across the three types of help. Thus, cross–country comparison, which is one of the main potentials of SHARE, will mix up institutional settings with cultural differences (see Reher (1998) for a discussion on North–South differences in family ties).

The second choice variable we need is hours of payed job, which are not directly surveyed in SHARE. Nevertheless this does not mean we do not have any information: we know whether each child does work or not, and if he/she works full time or part time. We used CESIFO tables on the average collectively agreed normal annual working time by Country (EIRO data) and on the part–time average hours of work as a percentage of full–time hours (OECD data) to build the working hours variable we need. Parent's first choice variable is formal care. Again, we have three measures of it: hours per week of professional nursing care, hours received of paid domestic help and number of weeks in which the respondent received meals on wheels. Even if we faced the same problem as with informal care data (i.e. too few observations to evaluate each type of help separately), we were not able to aggregate them due to the different units of measure. Thus we included the three variables separately despite the low number of observations.

Last but not least SHARE allows us to build a proper measure of expected wealth: individuals are asked whether they expect to leave more than 50.000 euros as a bequest. Conditional on this first question, they are asked whether they expect to leave any bequest, or if they expect to leave more than 150.000 euros. Using these answers we built an expected bequest measure. Thus, we have the 'perfect' measure: we do not have to rely on current wealth to infer expected bequest, thus the variable we use is exogenous by construction.

The last characteristic of SHARE we have to consider is that the data potentially provides information on three generations: respondents, their children and their parents. We focus on respondents and their children since health measures are available only for respondents. This choice may induce

Table 1: Types of Informal and Formal Care

	SE	DK	NL	DE	BE	FR	AT	CH	IT	ES	GR	Obs
	Informal care											
personal care	13	11	6	20	19	14	22	1	19	31	23	179
%	4.89	5.58	5.00	6.87	9.36	11.76	11.06	1.82	19.19	41.33	11.27	9.97
housekeeping	235	179	83	266	186	90	172	41	67	58	136	1513
%	88.35	90.86	69.17	91.41	91.63	75.63	86.43	74.55	67.68	77.33	66.67	82.77
paperwork	54	27	47	96	53	63	59	24	52	41	133	649
%	20.30	13.71	39.17	32.99	26.11	52.64	29.65	43.64	52.53	54.67	65.20	35.50
hours of help per week (hours>0)	1.93	2.74	2.12	4.80	5.73	10.82	5.73	3.86	17.65	14.62	7.21	
	Formal care											
nursing care	41	87	85	45	411	559	60	3	46	110	2	1449
%	1.35	5.10	2.86	1.53	10.84	17.72	3.23	0.30	1.82	4.79	0.07	5.14
hours per week	8.34	9.31	7.88	14.11	4.25	3.50	28.65	1.00	4.52	2.66	30.50	
paid domestic help	131	166	262	46	375	219	59	10	68	94	3	1433
%	4.30	9.72	8.80	1.56	9.89	6.94	3.17	1.00	2.70	4.09	0.10	5.09
hours per week	6.27	2.35	4.44	14.54	5.35	9.86	11.85	8.50	15.65	12.60	22.33	
meals on wheels	39	46	33	42	61	34	38	0	0	4	0	297
%	1.28	2.69	1.11	1.43	1.61	1.08	2.04	0.00	0.00	0.17	0.00	1.05
# of weeks	16.73	27.31	19.53	20.47	19.38	21.67	29.39	0.00	0.00	3.75	0.00	

Informal Care givers % refers to children who give help. Formal Care givers % to all sample

a bias: the sampling scheme is based on the respondents, thus results on respondent's children decision may not be representative for the whole children population. As far as we know the only author that tackled this issue in SHARE is Crespo (2007), who uses SHARE to analyse the role of informal care activity on female labor supply. She exploits information on both samples, finding qualitatively similar results.

4 The Econometric specification

Before going to the specification of the econometric model we set up to test the empirical implications, some words must be spent on a hidden assumption of the model: throughout the previous sections we didn't discuss the living arrangement choice of the children. Whether the child co–resides with his parents or not does change his caring choices. Living arrangements of the elderly has been previously studied by Börsh-Supan et al. (1988); Börsh-Supan et al. (1993) relate it to wealth and health while Alessie et al. (2006) relate it to saving choices. In the present paper we assume living arrangement to be predetermined with respect to the caring choice. This is clearly a simplifying assumption, nevertheless it is not unreasonable: the hypothesis is that living arrangement depend on marriage, education or early job market decisions, which can be safely considered as predetermined when individuals decide how to allocate time to elders' care. Co–residing children are on average younger than thirty years old, much less than non cohabiting ones[7]. Further on, they tend to help less. This difference in the two subsample may be due to the fact that cohabiting children still have to decide about their adult life living arrangement and, at the same time, they have younger parents which do not need care. Thus descriptive statistics provide indirect support to our assumption.

The main objective of the empirical analysis is to estimate simultaneously how children allocate time to informal care, IC_i and paid work WT_i, together with the effect on their parents' utility, Ph. The system of simultaneous equations we want to estimate is therefore the following:

$$\begin{array}{rcl} Ph & = & \beta_{1,1}IC_1 + \beta_{1,2}IC_2 + \beta_{1,3}IC_3 + \beta_{1,4}IC_4 + \\ & & +\beta_{1,5}Ph_{SP} + X\boldsymbol{\beta}_{1,6} + X_P\boldsymbol{\beta}_{1,7} + u_1 \\ IC_1 & = & \gamma_2 \sum_{i\neq 1} IC_i + X\boldsymbol{\beta}_{2,6} + X_{IC}\boldsymbol{\beta}_{2,8} + \beta_{2,9}WT_1 + u_2 \\ \vdots & & \vdots \\ IC_4 & = & \gamma_5 \sum_{i\neq 4} IC_i + X\boldsymbol{\beta}_{5,6} + X_{IC}\boldsymbol{\beta}_{5,8} + \beta_{5,9}WT_4 + u_5 \\ WT_1 & = & \beta_{6,1}IC_1 + X\boldsymbol{\beta}_{6,6} + X_{WT}\boldsymbol{\beta}_{6,14} + u_6 \\ \vdots & & \vdots \\ WT_4 & = & \beta_{9,1}IC_4 + X\boldsymbol{\beta}_{9,6} + X_{WT}\boldsymbol{\beta}_{9,14} + u_9 \end{array} \tag{19}$$

[7] descriptive statistics are reported in the appendix

Where X is a matrix of n observation over k_X exogenous variables common to all equations (as an example country dummies), X_P, X_{IC}, X_{WT} are exogenous variables which appear only on the parent's equation, informal care equations and working hours equations respectively. Ph_{SP} is the health status of the spouse. Since each spouse enters the sample, Ph_i is the dependent variable for the ith observation, while it is Ph_{SP}, a regressor, for the ith spouse observation. Then, we assume $u_{1,i}, u_{1,j}$ to be correlated if i, j belong to the same household.

The economic model imposes restrictions on the system which allow us to estimate the parameters in several steps:

1. First, the labor force participation choice of child i is endogenous only for i's informal care choice. In terms of system (19), WT_i appears as a regressor only on IC_i, while the only endogenous regressor in each WT_i equation is IC_i. Then if we assume $\boldsymbol{u}$ to be IID up to the household level, we can use the usual two step procedure: we instrument WT_i with years of education and gender, then we plug $\hat{WT}_i$s predictions in IC_i equations:

$$\begin{array}{rcl} Ph & = & \beta_{1,1}IC_1 + \beta_{1,2}IC_2 + \beta_{1,3}IC_3 + \beta_{1,4}IC_4 + \\ & & +\beta_{1,5}Ph_{SP} + X\boldsymbol{\beta}_{1,6} + X_P\boldsymbol{\beta}_{1,7} + u_1 \\ IC_1 & = & \gamma_2 \sum_{i \neq 1} IC_i + X\boldsymbol{\beta}_2, 6 + X_{IC}\boldsymbol{\beta}_2, 8 + \beta_{2,9}\hat{WT}_1 + u_2 \\ \vdots & & \vdots \\ IC_4 & = & \gamma_5 \sum_{i \neq 4} IC_i + X\boldsymbol{\beta}_{5,6} + X_{IC}\boldsymbol{\beta}_{5,8} + \beta_{5,9}\hat{WT}_4 + u_5 \end{array} \tag{20}$$

2. In each IC_i equation informal care provided by i's siblings (IC_js) enter only through $\sum_{j \neq i} IC_j$. From an economic point of view, this is so since what matters on each child's decision is the aggregate supply of care by his siblings. Endogeneity problem is still there since $\sum_{j \neq i} IC_j$ is a function of endogenous regressors. In order to solve it we can use the fact that children ordering is exogenous: children ordering is descending in age. Then, IC_i $\forall i$ can be thought of as sampled from the same population. This fact allows us to stack IC_i, WT_i and all the demographics in X which refers to each child. The last four equations of (20) can be rewritten as:

$$IC = \gamma \Pi IC + X\boldsymbol{\beta}_{2,6} + X_{IC}\boldsymbol{\beta}_{2,8} + \beta_{2,9}\hat{WT} + u_2 \tag{21}$$

Where $[\pi]_{ij} = 1$ if $i \neq j$ and i, j are siblings.

Equation (21) is linear in means and the endogeneity of ΠIC is due to the so called 'reflection problem' (see Manski (1993)): IC appears on both sides of the equation. We can use spatial econometrics methods

to estimate γ: Kelejian and Prucha (1998) suggest a GMM estimator, which has been used in a simultaneous equations setting in Pasini (2006). Since we assume u_2 to be IID, the GMM estimator turns out to be equal to a 2SLS estimator with instruments for ΠIC chosen among ΠX and ΠX_{IC}.

We have an additional problem at this step: a high number of children do not provide any help. Thus data are clearly censored and they may suffer of a sample selection problem. Therefore we estimate each equation with a Heckman twostep procedure (see Vella (1998) for a general discussion on models with sample selection), where individuals first choose whether to help or not, then they choose how much time to spend caring[8]. Consistently with the dependent variable, the total number of other siblings helping enters the set of first stage regressors, while the total number of hours provided by other siblings enter the second stage.

3. The previous step's result can be used again as a preliminary step: we obtain predicted value of $\Pi \hat{IC}_i$ and we use it to estimate the parameters in the first equation of (19)

Standard errors should be computed taking into account this procedure. We didn't want to impose further structure on the distribution of the $\boldsymbol{u}$ vector and at the same time we were worried to account for potential heteroskedasticity. Therefore, we used non parametric bootstrapping to obtain standard errors and p–values both at the second and at the last step. We can safely bootstrap on each step separately thanks to the simple residuals vector of the reduced form of (20).

5 Empirical Results

Results of the 'children' part of the estimation procedure are reported in the appendix, i.e. the Heckman estimates of children's choice, where three variables are treated as endogenous: in the first stage probit, hours of payed job and the number of siblings helping; in the second stage linear regression, hours of payed job and the total number of hours provided by other siblings.

The two main findings are that labor force participation effect is significant and negative on both stages, while social interaction's effect is significant only on the decision to care, but not on the care's intensity. Since both hours of work and social interaction parameters are instrumented, it's crucial that the chosen instruments are valid and relevant. All the instruments pass a Hansen J-test of over-identification run on the two stages separately (J–stat

[8]We chose not to use ML estimate because endogeneity of WT makes convergence hard to get

on first stage, 6.821, p–value 0.3378. J–stat on second stage, 9.749, p–value 0.1356). Years of education and gender are relevant and they have the expected signs on first stage regressions, while the number of children of each child is not significant. Both $\Pi hourshelp$ and $\Pi childhelp$ are instrumented with the sums over the gender dummy, age, proximity, year of education and a dummy for not being married. But for the sum of the gender dummy, all the other instruments are relevant on both first stage regressions. Further, instruments are chosen appropriately: those supposed to instrument work hours are not significant on the social interaction first stage equations, and vice versa[9]. Hausman test support reject exogeneity of other children's care variables and hours of work: test statistic is 51.27, the p–value lower than 0.001. Last thing to check about the estimation procedure is the relevance of sample selection: the Mills' λ is significant at 10% level.

Sign and significance suggest that time devoted to care–giving and to payed work are substitutes, as well as informal care provided by each child and informal care of the other siblings. The last finding is particularly relevant: interaction among children are significant and their magnitude is not negligible: an additional sibling helping induce a reduction of 78.6% on the probability of providing help, thus determinaning a large fraction of the selction. The marginal effect of an additional hour of payed work is quite small, but is one of the few regressors which is relevant on the second stage equation. Substitutability amnog children's help together with non–significance of expected bequest rejects the hypothesis of strategic bequest motive for care.

Country dummies[10] are in general significant. Signs are all negative in the selection equation, i.e. on the decision whether to help or not, coherently with the descriptive statistics' evidence. Marginal effects on the care intensity equation (thus corrected by the selection mechanism) have signs which are coherent with sociological explanations as in Reher (1998) and with institutional differences: Northern countries (Sweden, Denmark and The Netherlands) have lower intensity compared to Germany, southern Countries (Italy and Spain) a positive one. Signs of other Central European Countries are mixed. Nevertheless the non significance of Country dummies warn to interpret these results with caution.

Other controls have the expected sign: the provision of care depends positively on the number of parent's health diseases, and on age of the son. Single children provide more help than those who have siblings, and there's a positive and significant relation between care and proximity of children from parent's house: the nearest child helps more than the child who lives far from parents.

Table 4 reports the results of the second part of the estimation procedure:

[9] first stage equation results are again reported in the appendix

[10] Germany is the excluded one

2SLS estimates of the perceived health status of parent for both scales. The perceived condition worsen for older parents and for women[11]. Moreover, subjective health depends negatively on the years of education. As expected, there is a high positive correlation between the self–reported health and the objective health, both in terms of ADL and chronic diseases. We control for formal care–giving, for household income and expected bequest. With respect to income and wealth, the perception of health condition is better the higher the family income. Spouse's perceived health has a positive marginal effect, while the effect of the spouse's objective health is negative. This result provide indirect evidence on our claim that perceived health is a well–being measure: individual satisfaction grows with the spouse's one (which fits with an altruistic utility function), while the objective health effect may account for a 'comparison' effect: if the spouse suffer of chronic diseases, the individual tend to value more his relatively healthier status. Country dummies are all negative, again in line with the observation that a large fraction of children who help are from Germany. The main result is that there is a negative effect of informal care–giving, which is significant with the US scale: after controlling for objective health, parent's status is better when children helps him (remember that the dependent variables increase as health worsen). Furthermore, we tested whether parents value informal care from each child differently: we re–run the perceived health equation dividing help from each child and tested whether the parameters were equal or not. We accepted the test, thus supporting the hypothesis that parents value informal care more than formal one, but they do not discriminate among children.

Further on, our claim is that perceived health, Ph_i, is a good measure of utility derived by care consumption. SHARE provide us also a direct measure of well being, i.e. a measure of subjective overall satisfaction. Since subjective perception of well being and health status are logically and empirically positively correlated, as a robustness check we repeat our analysis on the well being measure, and we find qualitatively similar results with a lower significance, thus supporting the idea that perceived health is a more precise measure of satisfaction derived from health. The second possible objection to our choice of perceived health as a well being measure is the reverse: it may simply capture health status, with no link to well being perception. If this is the case, once controlling for objective measures of health and differences in response scales (captured by country dummies), other determinants of individual utility should not be significant. We showed that this is not the case, thus confirming that self reported health is not just another measure of health status.

[11]Gender is a dummy that takes value of 1 if women, 0 if man

6 Conclusions

We developed a model for the interaction among parents and their children facing caring decisions. Children decide how to allocate time to payed work, informal care to their parents and leisure. Decision is taken strategically, i.e. each child's choice depends on his siblings' behavior. The main finding for this first part of the model is that time devoted to informal care by child i and child j are substitutes. Parents' utility depends both on formal care bought on the market and informal care provided by his children. Parents value informal care more than children do, therefore at any equilibrium they would like to induce children to increase informal care supply. We tested for bequest as a possible mean for parents to induce such extra supply by children. Estimation results do not support the strategic bequest motive, therefore once the interaction effect among children is controlled for, then positive and heterogeneous informal care provision is due to altruism and sociological and cultural attitudes. Further on, we do not find evidence of substitutability of formal and informal care. While the first result is useful to understand the dynamic of choices within households, the second one provides an important policy implication: formal care is not an instrument to improve labor force participation. As an example, consider a mother of a baby that also has to take care of an elder disabled parent. We claim that her reservoir wage depends on both types of care, but the State cannot reduce it by providing formal care for the elderly.

We used self reported health as a measure of well being: after controlling for formal care and objective health status, such a measure is still informative and captures parent's utility derived from care consumption. This has a relevant empirical implication: the good news are that we can extract more information than just health conditions from subjective questions, the bad news are that, once we rely on those measures instead of objectively measured health, results may be biased.

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A Estimation results and Descriptive statistics

Table 3: First stage 2SLS regressions

	hours of job		other's help		other's hours of help	
years of education	0.658	***	-0.001	*	-0.016	
	(0.034)		(0.001)		(0.015)	
# of children	-1.290	***	-0.000		-0.124	
	(0.103)		(0.002)		0.045	
other children's gender	-0.305	**	-0.000		0.241	***
	(0.145)		(0.003)		(0.063)	
other children's age	-0.011	**	0.002	***	0.016	***
	(0.005)		(0.000)		(0.002)	
other's single condition	-0.892	***	-0.009	***	-0.019	
	(0.160)		(0.005)		(0.069)	
other years of education	0.062	***	-0.001	**	-0.048	***
	(0.017)		(0.000)		(0.007)	
other proximity	-0.921	***	0.024	***	0.584	***
	(0.195)		(0.004)		(0.084)	

Table 4: Two-stage Heckman with endogenous regressors

	Second stage			First stage		
	hours of help			help from child		
	m.eff	coeff		m.eff	coeff	
hours of work	0.180	0.117		-0.001	-0.009	**
		(0.167)			(0.005)	
# siblings helping				-0.106	-1.053	***
					(0.305)	
hours of help from other siblings	9.038	1.796				
		(1.351)				
gender	4.130	3.939	**	-0.003	-0.028	
		(1.761)			(0.048)	
age	-0.030	0.170	**	0.003	0.029	***
		(0.081)			(0.002)	
single	3.249	2.176	*	-0.015	-0.156	***
		(1.256)			(0.033)	
Austria	0.612	-0.136		-0.010	-0.109	**
		(1.080)			(0.055)	
Sweden	-0.372	-0.252	**	-0.023	-0.273	***
		(1.085)			(0.049)	
The Netherlands	-0.693	-3.728	***	-0.033	-0.441	***
		(1.348)			(0.061)	
Spain	8.330	1.822		-0.052	-0.946	***
		(3.900)			(0.073)	
Italy	11.593	6.250		-0.047	-0.777	***
		(4.100)			(0.068)	
France	5.525	1.583		-0.040	-0.573	***
		(2.624)			(0.062)	
Denmark	-0.406	-0.053		0.005	0.051	
		(1.241)			(0.055)	
Greece	2.629	-0.050		-0.030	-0.390	***
		(1.391)			(0.056)	
Switzerland	-0.664	-2.749		-0.024	-0.303	***
		(1.838)			(0.080)	
Belgium	1.574	-1.672		-0.036	-0.472	***

Table 4: Two-stage Heckman with endogenous regressors

	Second stage			First stage		
	hours of help			help from child		
	m.eff	coeff		m.eff	coeff	
		(1.680)			(0.055)	
# adl	-0.939	0.374		0.019	0.191	***
		(1.033)			(0.022)	
# spouse's adl	2.302	2.788		0.007	0.071	***
		(2.817)			(0.023)	
hours of nursing care	-0.062	-0.029		0.000	0.005	
		(0.150)			(0.003)	
hours of paid professional help	0.052	0.052		0.000	0.000	
		(0.283)			(0.002)	
weeks received meals-on-wheels	-0.071	0.011		0.001	0.012	***
		(0.028)			(0.002)	
proximity	7.054	9.280	***	0.033	0.323	***
		(2.946)			(0.050)	
only child	1.945	2.208	*	0.004	0.038	
		(1.206)			(0.053)	
expected bequest	-0.583	-0.540		0.001	0.006	
		(0.465)			(0.012)	
# of chronic diseases				0.009	0.091	***
					(0.010)	
# of spouse's chronic diseases				0.000	0.004	***
					(0.000)	
household income				-0.005	-0.052	***
					(0.008)	
household wealth	-0.080	-0.007		-0.001	-0.013	***
		(0.101)			(0.003)	
financial transfers	-1.743	0.961		0.018	0.165	***
		(1.146)			(0.036)	
costant		-15.793	*		-1.774	***
		(9.240)			(0.226)	
sample size	26,867					
uncensored obs	1,828					
λ	6.582		**			
	(2.771)					

Note: bootstrapped standard errors robust in parentheses.
(*) Significant at 10%. (**)Significant at 5%. (***)Significant at 1%
Germany is the excluded country

Table 5: Perceived health equation

	EU scale		US scale		Well-being	
age	0.004	***	0.006	***	-0.004	
	(0.001)		(0.001)		(0.001)	
gender	-0.005		0.021		0.022	*
	(0.012)		(0.014)		(0.012)	
years of education	-0.022	***	-0.025	***	-0.006	***
	(0.002)		(0.002)		(0.002)	
partner	-0.207	***	-0.311	***	-0.578	***
	(0.027)		(0.034)		(0.030)	
Austria	-0.144	***	-0.246	***	-0.044	*
	(0.027)		(0.032)		(0.024)	
Sweden	-0.326	***	-0.687	***	-0.071	***
	(0.025)		(0.027)		(0.002)	
The Netherlands	-0.264	***	-0.307	***	-0.263	***
	(0.023)		(0.028)		(0.022)	
Spain	-0.168	***	-0.225	***	-0.107	**
	(0.031)		(0.034)		(0.032)	
Italy	-0.087	***	-0.154	***	0.133	***
	(0.027)		(0.031)		(0.027)	
France	-0.248	***	-0.214	***	0.115	**
	(0.023)		(0.027)		(0.025)	
Denmark	-0.301	***	-0.553	***	-0.339	
	(0.028)		(0.033)		(0.024)	
Greece	-0.317	***	-0.322	***	-0.046	
	(0.024)		(0.027)		(0.024)	
Switzerland	-0.365	***	-0.343	***	-0.130	*
	(0.032)		(0.040)		(0.031)	
Belgium	-0.308	***	-0.341	***	-0.100	***
	(0.023)		(0.025)		(0.021)	
# adl	0.298	***	0.287	***	0.099	***
	(0.014)		(0.013)		(0.014)	
# spouse's adl	-0.009		0.000		0.022	
	(0.014)		(0.016)		(0.014)	
spouse's perceived health	0.150	***	0.162	***	0.292	***
	(0.012)		(0.011)		(0.016)	
# of chronic diseases	0.249	***	0.293	***	0.045	***
	(0.005)		(0.005)		(0.005)	
# of spouse's chronic diseases	-0.042	***	-0.051	***	-0.003	
	(0.006)		(0.007)		(0.005)	
help from children	-0.005	***	-0.008	***	-0.004	**
	(0.001)		(0.001)		(0.002)	
hours of nursing care	0.002		0.003	*	0.002	**
	(0.003)		(0.002)		(0.001)	
hours of paid professional help	0.002		0.003		-0.001	
	(0.002)		(0.002)		(0.002)	
weeks received meals-on-wheels	0.002		0.001		0.001	
	(0.002)		(0.002)		(0.001)	
household income	-0.012	***	-0.016	***	0.013	***
	(0.004)		(0.006)		(0.005)	

Table 5: Perceived health equation

	EU scale		US scale		Well-being	
household wealth	-0.007	***	-0.005	**	-0.002	
	(0.002)		(0.002)		(0.002)	
expected bequest	-0.026	***	-0.037	***	-0.025	***
	(0.005)		(0.006)		(0.005)	
only child	0.050	***	0.057	***	0.042	***
	(0.013)		(0.015)		(0.013)	
costant	2.583	***	3.262	***	2.581	***
	(0.101)		(0.123)		(0.105)	
sample size	16248		16242		10323	

Table 6: Sample characteristics of care-giving children

	SE	DK	NL	DE	BE	FR	AT	CH	IT	ES	GR
# of observations (tot 26867)	3,597	1,761	2,523	2,508	3611	2624	1832	945	2471	2270	2725
% co–residing	5.95	5.57	12.72	10.41	15.59	13.61	11.30	13.76	34.80	30.62	33.61
average age:											
co–residents	21.87	23.50	23.14	26.59	25.52	24.00	29.54	23.48	28.70	29.62	25.66
non co-resident	37.36	37.82	36.03	38.13	37.63	37.15	38.69	37.82	38.54	38.79	38.43
working hours:											
men	30.99	29.07	30.86	30.30	30.03	27.97	33.65	36.51	30.94	32.59	30.49
women	25.84	23.10	21.73	22.28	25.61	23.98	25.39	25.79	21.36	22.38	20.81
years of education	12.42	13.85	13.19	14.52	11.36	12.56	12.66	13.46	11.74	10.69	12.74
number of children	1.23	1.24	0.94	0.98	1.14	1.12	1.08	0.93	0.81	0.93	0.83
single (%)	33.53	49.12	38.92	46.05	34.89	48.93	46.29	52.06	43.18	40.79	48.51
Proximity to parents (%):											
same building	0.50	0.68	0.48	7.54	1.02	0.69	8.52	3.17	7.49	3.30	9.28
less than 1 km	8.59	7.50	10.74	8.81	12.85	8.00	11.52	8.99	12.71	21.06	11.71
less than 5 km	16.24	15.11	24.02	16.95	20.83	12.12	17.90	14.81	14.12	13.88	11.34
less than 25 km	22.02	25.55	22.00	20.57	27.31	20.12	22.54	25.08	14.20	11.94	12.51
less than 100 km	17.60	22.32	16.69	13.60	15.51	16.43	12.77	17.88	6.48	7.36	4.59
less than 500 km	18.71	18.80	10.82	15.15	4.26	13.99	11.08	11.32	3.04	6.17	10.02
more than 500 km	10.40	4.49	2.54	6.98	2.63	15.05	4.37	4.97	7.16	5.68	6.94
only child (%)	7.53	7.95	6.42	15.03	12.13	11.01	13.86	8.78	11.41	8.50	9.54
help to parents (%)	7.40	11.19	4.76	11.60	5.62	4.54	10.86	5.82	4.01	3.30	7.49
help from daughter	40.23	41.12	49.17	54.30	55.67	57.98	53.77	61.82	63.64	65.33	57.84