Aging Parents, Long-Term Care, and the Family [1]

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Preliminary

Abstract

We develop a structural model of inter-sibling decision making to analyze the process of informal care provision by adult children to their parents. Each child chooses the number of visits paid to parents and the amount of time actually spent on providing care, taking into account opportunity costs in terms of time and money, and the behavior of siblings. A key element in the analysis is the distinction between cooperative and non-cooperative equilibria.

A tentative data exploration using SHARE reveals that the stylized empirical facts are consistent with qualitative predictions from the model: children provide more care the larger the difficulties their parents experience in daily life; children provide less care when they live farther away and when they are more involved in paid work; and the occurrence of conflicts in families is associated with less care provided.

We indicate how the model can be used to assess the effects of a variety of policy measures aimed at encouraging the provision of low-cost informal care, such as compensating travel expenses, compensating informal care, changing the price of formal care, and promoting cooperative sibling behavior.

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1 Introduction

When parents age, their adult children usually face deteriorating parental health and their increased need for care. For the children, the question arises how to balance the goal of appropriately caring for parents with other goals in life, such as work and own family. Governments also face the challenge how to reconcile the conflicting goals of encouraging the provision of care for the elderly by families, and encouraging (female) participation in the labor market.

A prerequisite for designing effective policies in this area is to understand the complex decision making process at the level of individual families. Key issues in this decision process is how much non-family care to purchase in the market, possibly from a nursing home, and how much each child contributes to caring. The outcome of the decision making process depends on a large number of factors, including the labor market potential and the own family situation of each child, the costs and quality of market alternatives, the distances between the parental home and each child's home, and the nature of interactions between siblings (cooperative versus non-cooperative).

The purpose of this paper is to analyze this complex process by developing a structural model of sibling decision making. In the model, each sibling's preferences are characterized by a utility function defined over own consumption, own leisure, the number of visits paid to the parents, and the total amount of care the parents receive. Each sibling faces a time constraint and a budget constraint, which depend on the sibling's (potential) wage in the labor market, the price and quality of market alternatives for care, and the time and monetary costs of traveling to the parental home. Our model builds on Hiedemann and Stern (1999), but is fully structural, with an explicit focus on the role of (and potential welfare gains from) coordination and cooperation between siblings (Hiedemann and Stern only consider non-cooperative equilibria).

We bring the model to the data using the SHARE survey (Survey of Health, Ageing and Retirement in Europe). In the empirical part of the current, preliminary version of the paper we verify whether the stylized empirical facts in the SHARE data are consistent with a number of qualitative predictions from the model. In the next version of the paper, we will use SHARE to estimate the structural parameters of the model. SHARE includes information on the distances between the parental and children's homes, labor market participation, number of visits to parents, amount of time spent on caring for parents, and on the nature of the relationships between parents and siblings, like the occurrence of conflicts. Sources of identification of the econometric model will include shocks in the health condition of parents between the two SHARE waves, and variation in co-payment rates for government subsidized care across and within countries and between waves. Unlike earlier literature on intrahousehold decision making, we will be able to exploit the availability of survey information on family conflicts to help distinguishing between cooperative and non-cooperative equilibria.

The model allows to assess the effects of various policies, such as changes in co-payment rates for formal care, and various types of subsidies to support child provided care to parents (like reimbursement of travel costs).

The paper proceeds as follows. In section 2 we specify the structural model. Section 3 discusses the data that are used in this study, and informally tests some of the predictions of the model. Section 4 considers the social planner's problem. Section 5 presents preliminary conclusions.

2 A Structural Model

We specify a structural model to predict the number of visits an adult child pays his/her parent, and the amounts of time he or she spends on caring and on paid work. Thus we distinguish between visiting and caring; a child can also choose to visit and not provide any care. The child derives utility from leisure, consumption, the number of contacts with his parents, and the amount of care his parent receives. The utility function is maximized subject to a time and budget constraint. In subsection 2.1 we consider the model with one adult child. In subsection 2.2 we extend the model such that two (adult) siblings are involved.

2.1 One (adult) child

Consider an adult child without siblings. The utility function and the time and budget constraints are specified as:

$$U^k = \alpha_l \log(t_l - \gamma_l) + \alpha_y \log(c - \gamma_c) + \alpha_{sf} \log(t_s + t_f - \gamma^*_{sf}) + \alpha_k \log(k - \gamma_k) \quad (1)$$

subject to

$$t_l + t_h + t_s + (\tau d + v)k = T \quad (2)$$

$$c + kp_d d = wt_h + \mu \quad (3)$$

where

$$t_l = \text{leisure (hours)}$$

$$c = \text{consumption}$$

$$t_s = \text{informal care, social support (hours)}$$

$$t_f = \text{formal care (hours)}$$

$$k = \text{number of visits (per week)}$$

$$t_h = \text{labour time (hours)}$$

$$d = \text{distance to parent (return trip, km)}$$

$$\tau = \text{travel time per kilometer (hours)}$$

$$v = \text{time per visit (not spent on informal care, hours)}$$

$$T = \text{total time (\# hours in one week)}$$

$$p_d = \text{travel costs (per kilometer)}$$

$$w = \text{wage (per hour)}$$

$$\mu = \text{nonlabor income}$$

The Stone-Geary functional form is restrictive, but allows (with some exceptions) for explicit solutions of the behavioral equations and captures the key issues of the analysis. In a future version of the paper we will also consider more flexible functional forms.

While the amount of formal care is beyond direct control of the adult child, it depends on the amount of time he/she spends on informal care. Assume that if the child does not provide any care the parent purchases or receives F hours of formal care. If the child provides t_s hours of informal care, formal care is reduced by δt_s. So

$$t_f = F - \delta \cdot t_s, \quad 0 \leq \delta < 1 \tag{4}$$

$$\tag{5}$$

(Note that if $\delta \geq 1$ the child would not have an incentive to provide any care.) Substitution of (4) into (1) and rewriting shows that maximizing (1) is equivalent to maximizing

$$U^k = \alpha_l \log(t_l - \gamma_l) + \alpha_y \log(c - \gamma_c) + \alpha_{sf} \log(t_s - \gamma_{sf}) + \alpha_k \log(k - \gamma_k) \quad (6)$$

with $\gamma_{sf} = (\gamma^*_{sf} - F)/(1-\delta)$.[2] Utility is maximized subject to the time and budget constraints, and the non-negativity contraints on t_l, t_s, t_h, c, and k. We solve the maximization problem by first determining the maximum utility for each k. For $k > 0$ the optimal solution can be a corner solution ($t_s = 0$, with maximal utility Ψ^k_c) or an interior solution ($t_s > 0$, with maximal utility Ψ^k_i). (We denote a corner solution by c and an interior solution by i). If $k = 0$ only the corner solution is possible, as t_s has to be zero in case $k = 0$. The corresponding maximum utility is Ψ^0_c.

In summary:
If $k = 0$, maximum utility is $\Psi^0 = \Psi^0_c$.
If $k > 0$, maximum utility is $\Psi^k = \max(\Psi^k_c, \Psi^k_i)$.
In case of the corner solution ($t_s = 0$), optimal time use and consumption is given by:

$$\left\{ \begin{array}{lll} t_l & = & \gamma_l + \frac{\alpha_l}{\alpha_l+\alpha_y}\left(T + \frac{\mu}{w} - \gamma_l - \frac{\gamma_c}{w} - k(\frac{p_d d}{w} + \tau d + v)\right) \\ c & = & \gamma_c + w\frac{\alpha_y}{\alpha_l+\alpha_y}\left(T + \frac{\mu}{w} - \gamma_l - \frac{\gamma_c}{w} - k(\frac{p_d d}{w} + \tau d + v)\right) \\ t_s & = & 0 \\ t_h & = & \frac{\gamma_c + k p_d d - \mu}{w} + \frac{\alpha_y}{\alpha_l+\alpha_y}\left(T + \frac{\mu}{w} - \gamma_l - \frac{\gamma_c}{w} - k(\frac{p_d d}{w} + \tau d + v)\right)) \end{array} \right. \quad (7)$$

with utility

$$\begin{aligned} \Psi^k_c =& \alpha_l \log(\alpha_l) + \alpha_y \log(w\alpha_y) \\ & + (\alpha_l + \alpha_y)\log(\frac{1}{\alpha_l+\alpha_y}\left(T + \frac{\mu}{w} - \gamma_l - \frac{\gamma_c}{w} - k(\frac{p_d d}{w} + \tau d + v)\right)) \quad (8) \\ & + \alpha_{sf}\log(-\gamma_{sf}) + \alpha_k \log(k - \gamma_k) \end{aligned}$$

[2] We assume that the wage rate is not affected by the provision of informal care. In an empirical reduced form study, Bolin *et al.* do not find any statistically signficant wage effects of informal care provision.

To obtain that $t_h \geq 0$, in case

$$\mu > \gamma_c + kp_d d + w\frac{\alpha_y}{\alpha_l}(T - \gamma_l - k(\tau d + v))$$

(7) has to be replaced by

$$\begin{cases} t_l &= T - k(\tau d + v) \\ c &= \mu - kp_d d \\ t_s &= 0 \\ t_h &= 0 \end{cases} \tag{9}$$

and (8) has to be replaced by

$$\begin{aligned} \Psi_c^k =& \alpha_l \log(T - (\tau d + v)k - \gamma_l) + \alpha_y \log(\mu - kp_d d - \gamma_c) \\ &+ \alpha_{sf} \log(-\gamma_{sf}) + \alpha_k \log(k - \gamma_k) \end{aligned} \tag{10}$$

For the interior solution it holds that

$$\begin{cases} t_l =& \gamma_l + \frac{\alpha_l}{1-\alpha_k}(T + \frac{\mu}{w} - \gamma_l - \frac{\gamma_c}{w} - \gamma_{sf} - k(\frac{p_d d}{w} + \tau d + v)) \\ c =& \gamma_c + w\frac{\alpha_y}{1-\alpha_k}\left(T + \frac{\mu}{w} - \gamma_l - \frac{\gamma_c}{w} - \gamma_{sf} - k(\frac{p_d d}{w} + \tau d + v)\right) \\ t_s =& \gamma_{sf} + \frac{\alpha_{sf}}{1-\alpha_k}\left(T + \frac{\mu}{w} - \gamma_l - \frac{\gamma_c}{w} - \gamma_{sf} - k(\frac{p_d d}{w} + \tau d + v)\right) \\ t_h =& \frac{\gamma_c + kp_d d - \mu}{w} + \frac{\alpha_y}{\alpha_l + \alpha_y + \alpha_{sf}}(T + \frac{\mu}{w} - \gamma_l - \frac{\gamma_c}{w} - \gamma_{sf} \\ & - k(\frac{p_d d}{w} + \tau d + v)) \end{cases} \tag{11}$$

The corresponding utility is

$$\begin{aligned} \Psi_i^k =& \alpha_l \log(\alpha_l) + \alpha_y \log(w\alpha_y) + \alpha_{sf} \log(\alpha_{sf}) + \alpha_k \log(k - \gamma_k) \\ &+ (1-\alpha_k) \log\left(\frac{1}{1-\alpha_k}(T + \frac{\mu}{w} - \gamma_l - \frac{\gamma_c}{w} - \gamma_{sf} - k(\frac{p_d d}{w} + \tau d + v))\right) \end{aligned} \tag{12}$$

To obtain that $t_h \geq 0$, in case

$$\mu > \gamma_c + kp_d d + w\frac{\alpha_y}{\alpha_l + \alpha_{sf}}(T - \gamma_l - \gamma_{sf} - k(\tau d + v))$$

(11) has to be replaced by

$$\begin{cases} t_l =& \gamma_l + \frac{\alpha_l}{\alpha_l + \alpha_{sf}}(T - \gamma_l - \gamma_{sf} - k(\tau d + v)) \\ c =& \gamma_c + w\frac{\alpha_y}{\alpha_l + \alpha_{sf}}(T - \gamma_l - \gamma_{sf} - k(\tau d + v)) \\ t_s =& \gamma_{sf} + \frac{\alpha_{sf}}{\alpha_l + \alpha_{sf}}(T - \gamma_l - \gamma_{sf} - k(\tau d + v)) \\ t_h =& 0 \end{cases} \tag{13}$$

and (12) has to be replaced by

$$
\begin{aligned}
\Psi_i^k =& \alpha_l \log(\alpha_l) + \alpha_y \log(w\alpha_y) + \alpha_{sf} \log(\alpha_{sf}) + \alpha_k \log(k - \gamma_k) \\
&+ (1-\alpha_k) \log \left(\frac{1}{\alpha_l + \alpha_{sf}} (T - \gamma_l - \gamma_{sf} - k(\tau d + v)) \right)
\end{aligned}
\tag{14}
$$

Next, k can be chosen such that the utility is maximal. The optimal k is:

$$
k = \underset{k \in \{0,1,2,\ldots\}}{\operatorname{argmax}} (\Psi^k)
$$

As we now know the optimal k, we also know the optimal values of the endogenous variables t_l, c, t_s and t_h.

We end this section with an example. In this example the parameter values are: $p_d = 0.4, \tau = 0.025, v = 1, \alpha_l = 0.25, \alpha_y = 0.30, \alpha_{sf} = 0.15, \alpha_k = 0.30, \gamma_l = 110, \gamma_c = 400, \gamma_k = -1, \gamma_{sf}^* = 10, \delta = 0, F = 11, T = 168, \mu = 0$. In Figure 1 we let the distance between the child and the parents vary between 5 and 200 kilometers. As can be seen, the number of contacts decrease from 9 to 1. Further, when the distance increases, the hours of social support decrease. The jumps can be explained by the number of contacts. At the distances where the number of contacts decrease, the spared travel time is (partly) invested in more social support. In this figure wage is assumed to be equal to 15 euros per hour

In Figure 2 we let the wage of the (adult) child vary and investigate the number of contacts and the hours of social support the child gives to his parents. As can be seen, an increasing wage results in more contacts and more social support. The drops in social support at the wage of 11, 21, and 38 euro per hour can be explained by the increase in the number of contacts at these wage rates. Extra contacts demand extra resources, such that the hours of social support drop. The distance between the parents and the child in this figure is assumed to be 100 kilometers.

Figure 1: One adult child

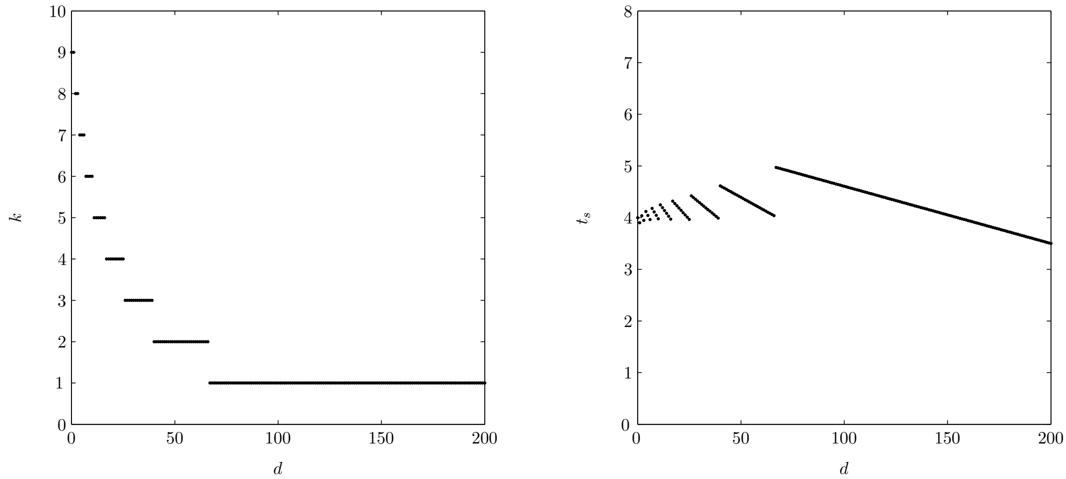
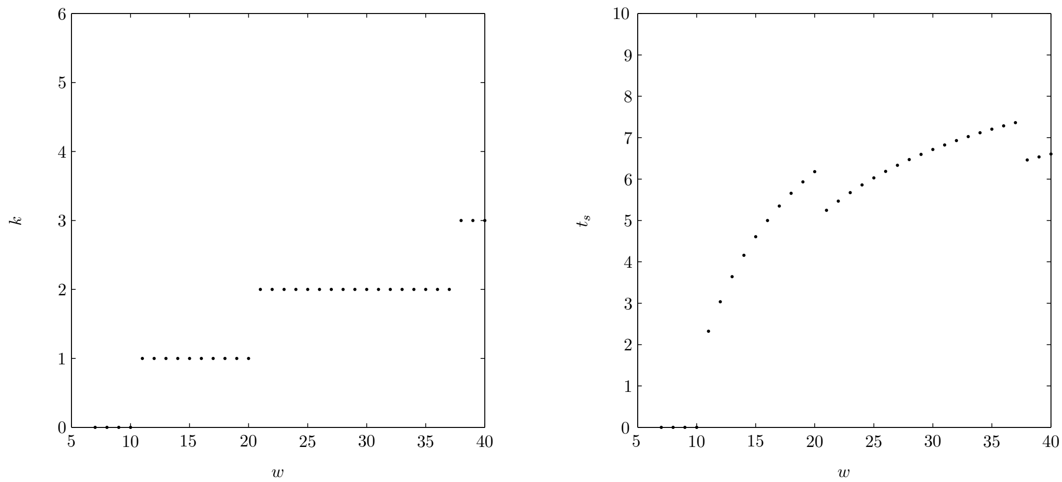


Figure 2: One adult child



2.2 Two (adult) children

In this section we extend the model in section 2.1, such that two adult children are involved. As in section 2.1, the child derives utility from leisure, consumption, and the number of contacts and amount of care his parents receive. The main difference with section 2.1 is that now also the sibling can provide social support, which generates utility but does not affect the child's own time and budget constraint. The utility sibling *1* derives from his own actions and his siblings actions is denoted by $U_1(k_1, t_{s1}, k_2, t_{s2})$. The maximization problem of child *1* becomes:

$$\begin{aligned}\max\, U_1(k_1, t_{s1}, k_2, t_{s2}) =& \alpha_{l1} \log(t_{l1} - \gamma_{l1}) + \alpha_{y1} \log(c_1 - \gamma_{c1}) \\ &+ \alpha_{sf1} \log(t_{s1} + t_{s2} + t_f - \gamma^*_{sf}) + \alpha_{k1} \log(k_1 + k_2 - \gamma_{k1})\end{aligned} \tag{15}$$

subject to

$$t_{l1} + t_{h1} + t_{s1} + (\tau d_1 + v)k_1 = T \tag{16}$$

$$c_1 + k_1 p_d d_1 = w_1 t_{h1} + \mu_1 \tag{17}$$

As in the previous section, the amount of formal care is given by

$$t_f = F - \delta \cdot (t_{s1} + t_{s2}), \quad 0 \leq \delta < 1 \tag{18}$$

$$\tag{19}$$

Substitution of (18) into (15) and rewriting shows that maximizing (15) is equivalent to maximizing

$$\begin{aligned}\max\, U_1(k_1, t_{s1}, k_2, t_{s2}) =& \alpha_{l1} \log(t_{l1} - \gamma_{l1}) + \alpha_{y1} \log(c_1 - \gamma_{c1}) \\ &+ \alpha_{sf1} \log(t_{s1} + t_{s2} - \gamma_{sf}) + \alpha_{k1} \log(k_1 + k_2 - \gamma_{k1})\end{aligned} \tag{20}$$

with $\gamma_{sf} = (\gamma^*_{sf} - F)/(1 - \delta)$.

For child 2 the same holds, with the underscripts *1* and *2* interchanged. We focus on the maximization problem for sibling *1*. Solving the maximization problem we get that, given k_1, k_2, t_{s1} and t_{s2}, it is optimal for sibling *1* to choose

$$\begin{cases} t_{l1} =& \gamma_{l1} + \dfrac{\alpha_{l1}}{\alpha_{l1} + \alpha_{y1}} \left(T + \dfrac{\mu_1}{w_1} - \gamma_{l1} - \dfrac{\gamma_{c1}}{w_1} - k_1(\dfrac{p_d d_1}{w_1} + \tau d_1 + v) - t_{s1} \right) \\ c_1 =& \gamma_{c1} + w_1 \dfrac{\alpha_{y1}}{\alpha_{l1} + \alpha_{y1}} \left(T + \dfrac{\mu_1}{w_1} - \gamma_{l1} - \dfrac{\gamma_{c1}}{w_1} - k_1(\dfrac{p_d d_1}{w_1} + \tau d_1 + v) - t_{s1} \right) \\ t_{h1} =& \dfrac{\gamma_{c1} + k_1 p_d d_1 - \mu_1}{w_1} + \dfrac{\alpha_{y1}}{\alpha_{l1} + \alpha_{y1}} \left(T + \dfrac{\mu_1}{w_1} - \gamma_{l1} - \dfrac{\gamma_{c1}}{w_1} - k_1(\dfrac{p_d d_1}{w_1} + \tau d_1 + v) - t_{s1} \right) \end{cases} \tag{21}$$

The utility for sibling *1* is then equal to

$$\begin{aligned}\Psi_1(k_1,t_{s1},k_2,t_{s2}) =&\alpha_{l1}\log(\alpha_{l1})+\alpha_{y1}\log(w_1\alpha_{y1})\\&+\alpha_{sf1}\log(t_{s1}+t_{s2}-\gamma_{sf})+\alpha_{k1}\log(k_1+k_2-\gamma_{k1})\\&+(\alpha_{l1}+\alpha_{y1})\log(\frac{1}{\alpha_{l1}+\alpha_{y1}}(T+\frac{\mu_1}{w_1}-\gamma_{l1}-\frac{\gamma_{c1}}{w_1}\\&-k_1(\frac{p_d d_1}{w_1}+\tau d_1+v)-t_{s1}))\end{aligned}\tag{22}$$

Note that in case $k_1=0$ and/or $k_2=0$, t_{s1} and/or t_{s2} have to be zero.

To obtain that $t_{h1}\geq 0$, in case

$$\mu_1>\gamma_{c1}+k_1p_dd_1+w_1\frac{\alpha_{y1}}{\alpha_{l1}+\alpha_{y1}}(T+\frac{\mu_1}{w1}-\gamma_{l1}-\frac{\gamma_{c1}}{w_1}-k_1(\frac{p_dd_1}{w_1}+\tau d_1+v)-t_{s1})$$

(21) has to be replaced by

$$\begin{cases}t_{l1}=&T-t_{s1}-k_1(\tau d_1+v)\\c_1=&\mu_1-k_1p_dd_1\\t_{h1}=&0\end{cases}\tag{23}$$

and (22) has to be replaced by

$$\begin{aligned}\Psi_1(k_1,t_{s1},k_2,t_{s2}) =&\alpha_{l1}\log(T-t_{s1}-k_1(\tau d_1+v)-\gamma_{l1})+\alpha_{y1}\log(\mu-k_1p_dd_1-\gamma_{c1})\\&+\alpha_{sf1}\log(t_{s1}+t_{s2}-\gamma_{sf})+\alpha_{k1}\log(k_1+k_2-\gamma_{k1})\end{aligned}\tag{24}$$

The maximization problem of sibling *2* is solved analogously.

In the Nash equilibrium, both siblings maximize their utility given the action of the other player. The number of contacts (k_1 and k_2) are discrete. The number of hours of social support (t_{s1} and t_{s2}) are not, however, to find the overall Nash equilibrium we consider t_{s1} and t_{s2} to be discrete. We can narrow the steps as small as we want.

With the purpose to clarify the model, we continue this section with some examples.

Table 1 gives an example of a game between two siblings. In this game the Nash equilibrium is $k_1 = 0$, $t_{s1} = 0$, $k_2 = 0$ and $t_{s2} = 0$, hereby denoted with (0, 0, 0, 0).

Sometimes the prisoner's dilemma is present. In the game proposed in Table 1 this is the case. Here, the Nash equilibrium is (0,0,0,0) with utility 2.05 for each sibling. However, both siblings should be better off in (1,1,4,4), the utility for both siblings is then 2.21.

To see what happens to the Nash equilibria when the distance or the wage of one of the siblings change, we have made figures where we let the distance and the wage of sibling *1* vary. In the figures it is assumed that $p_d = 0.4, \tau = 0.025, v = 1, d_2 = 100, w_2 = 15, \alpha_{li} = 0.25, \alpha_{yi} = 0.3, \alpha_{sfi} = 0.15, \alpha_{ki} = 0.3, \gamma_{li} = 110, \gamma_{ci} = 400, \gamma_{ki} = -1, \gamma_{sf}^{*} = 10, \delta = 0, T = 168, \mu_i = 0, F = 11$ for $i = 1, 2$. Further, in Figure 3 to 5 it is assumed that the wage of sibling *1* is 15 euro per hour (the same as w_2), and in Figure 6 to 8 it is assumed that the distance of sibling *1* to his parents is 100 kilometer (the same as d_2).

In case the distance of sibling *1* increases, the number of contacts of this sibling with his parent decreases (Figure 3). Sometimes, there is more than one Nash equilibrium. In the figure only one equilibrium is shown (where each equilibrium has an equal chance to be shown). In Figure 3 it can also be seen how the number of contacts of sibling *2* with his parent are influenced by the distance of sibling *1*.

Figure 4 shows how the hours of social support changes with d_1. In general it can be concluded that the hours of social support of sibling *1* decreases when the distance to his parents increases. On the other hand, sibling *2*, then, increases the hours of social support. Upward jumps in the hours of social support for sibling *1* (such as at a distance of 26 and 40 kilometers) can be explained by the drop in the number of contacts which takes place at the same moment. The resources spared by the reduction of the number of contacts are (partly) spend to more social support. Figure 5 gives the total number of contacts and total hours of social support the parents receive. Suprisingly, the total hours of social support is higher at a distance of 80 then at the distance of for example 20 kilometers. Herewith, one has to take into account that the distance of sibling *2* is assumed to be 100 kilometer. At $d_1 = 20$ sibling *1* is the only child who provides social care. At the distance of 80 (where the difference between d_1 and d_2 is less), both children provide social support, and totally this results in more hours.

Figure 6 shows how the number of contacts of sibling *1* and *2* evolve when the wage of sibling *1* increases. Also here, at some wages there is more than one Nash equilibrium. Under the specified parameter values, the number of contacts of sibling *1* increases from zero to three when his wage rate increases from 5 to 40 euros per hour. The number of contacts of sibling *2* with his parents decrease from one to zero. Figure 7 shows that as long $w_1 < w_2$, sibling *2* provides all social support. When $w_1 > w_2$ the opposite occurs. The total number of contacts and hours of social care are presented in Figure 8.

Figure 3: Nash equilibria, number of contacts

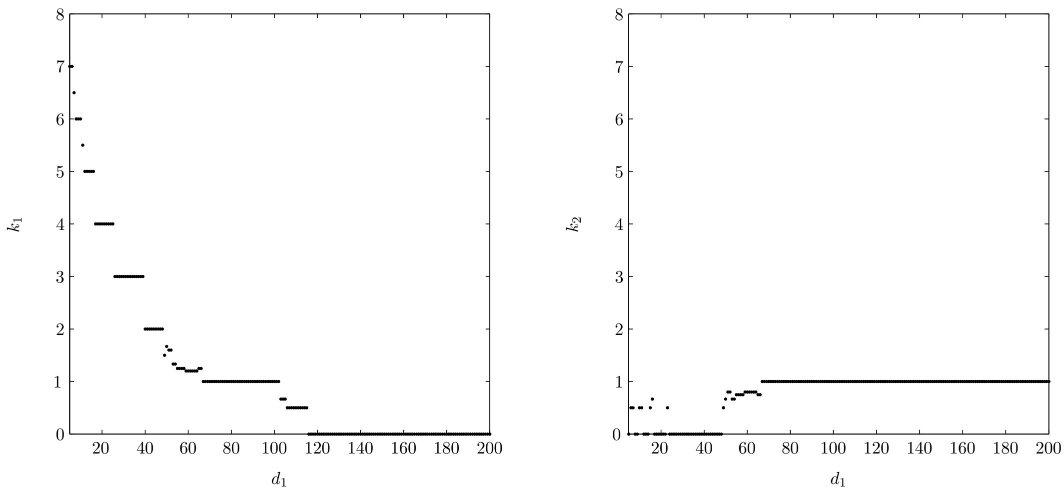


Figure 4: Nash equilibria, hours of social support

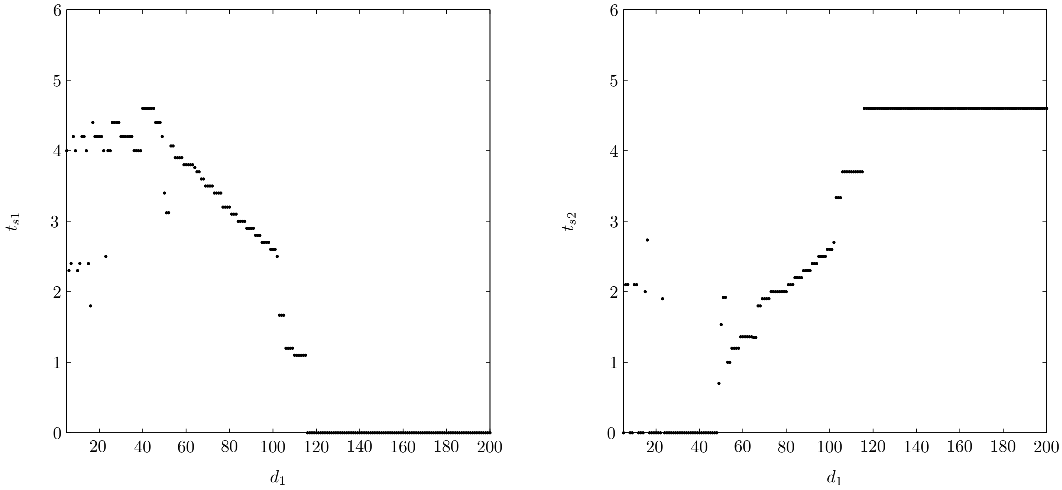


Figure 5: Nash equilibria, total number of contacts and hours of social support

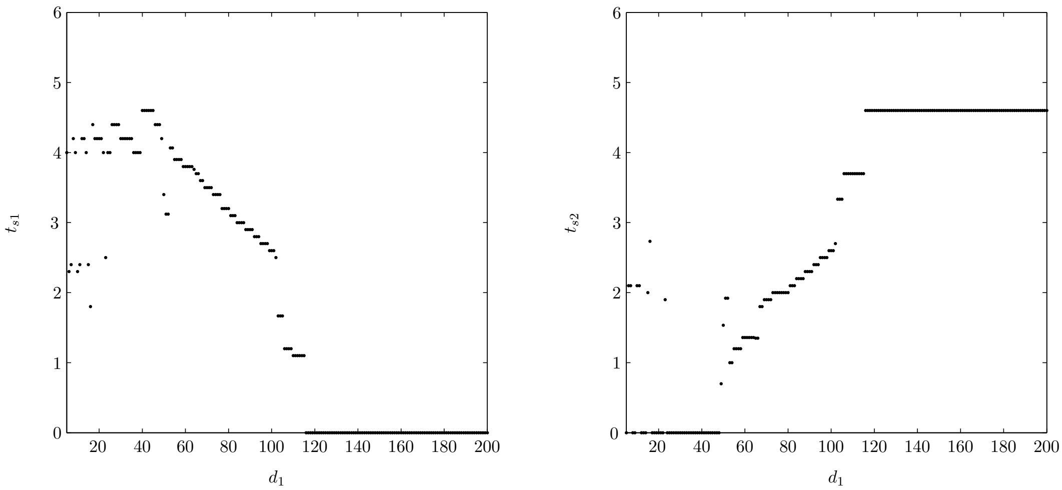


Figure 6: Nash equilibria, number of contacts

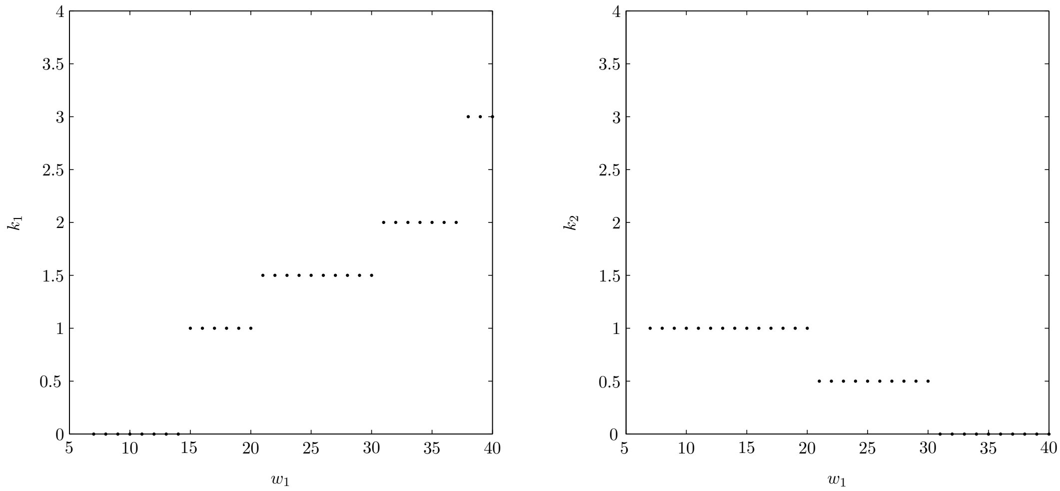


Figure 7: Nash equilibria, hours of social support

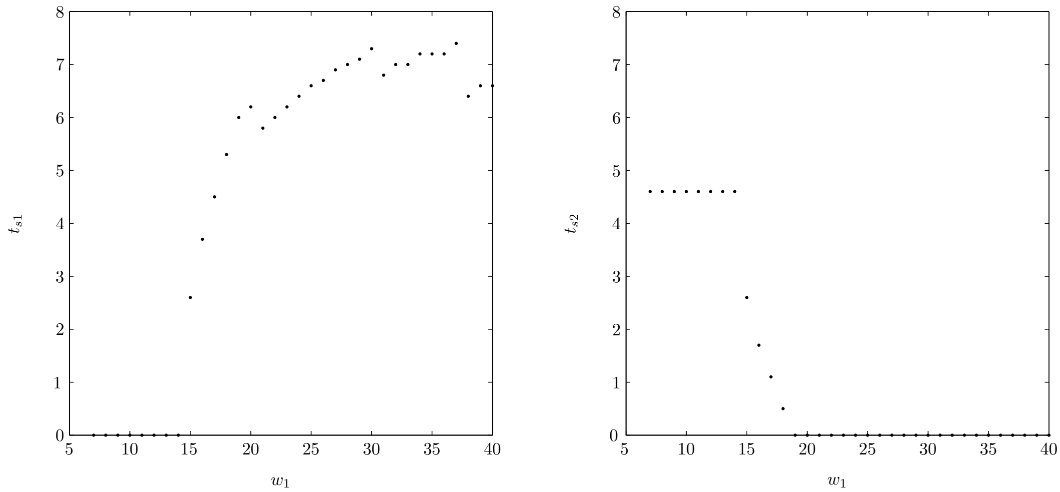
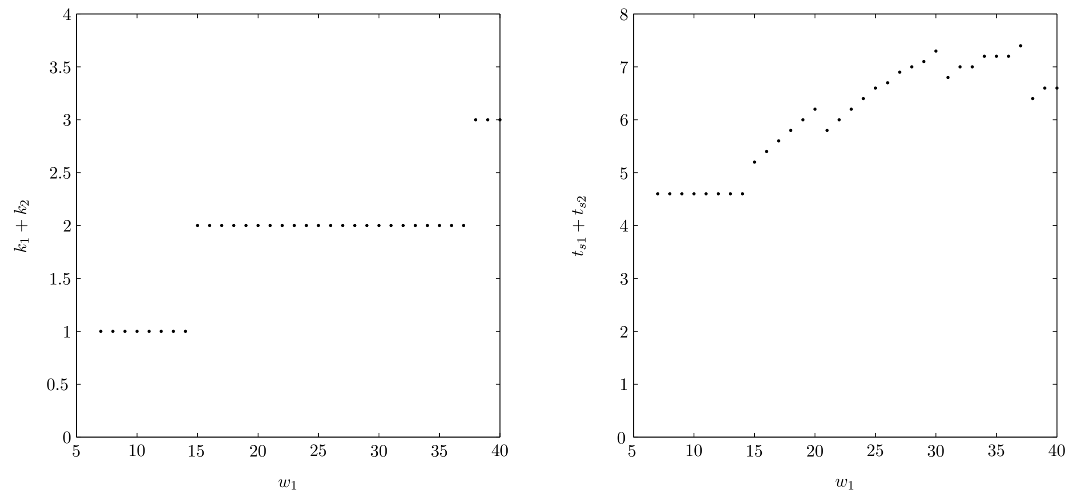


Figure 8: Nash equilibria, total number of contacts and hours of social support



Instead of the noncooperative Nash equilibrium, siblings may behave cooperatively. We are interested in the comparison of the noncooperative and cooperative results. In order to visualize the difference we make figures 3 to 8 again, with the same parameter values, but now with a cooperative equilibrium.

Let's assume that the siblings maximize

$$U_1(k_1, t_{s1}, k_2, t_{s2}) + U_2(k_1, t_{s1}, k_2, t_{s2})$$

.

subject to

$$t_{li} + t_{hi} + t_{si} + (\tau d_i + v)k_i = T \tag{25}$$

$$c_i + k_i p_d d_i = w_i t_{hi} + \mu_i \tag{26}$$

for $i = 1, 2$.

Figures 9 to 11 show the results.

From comparing figures 9 to 14 with figures 3 to 8, we can conclude that (as expected) the number of contacts and the hours of social support are higher when siblings behave cooperatively. Further, when we compare the figures for one child with the Nash equilibria for two siblings, parents do not receive much more care with two siblings (this is due to the fact that for both siblings the care given by the sibling is a perfect substitute for their own care).

Figure 9: Cooperative equilibrium, number of contacts

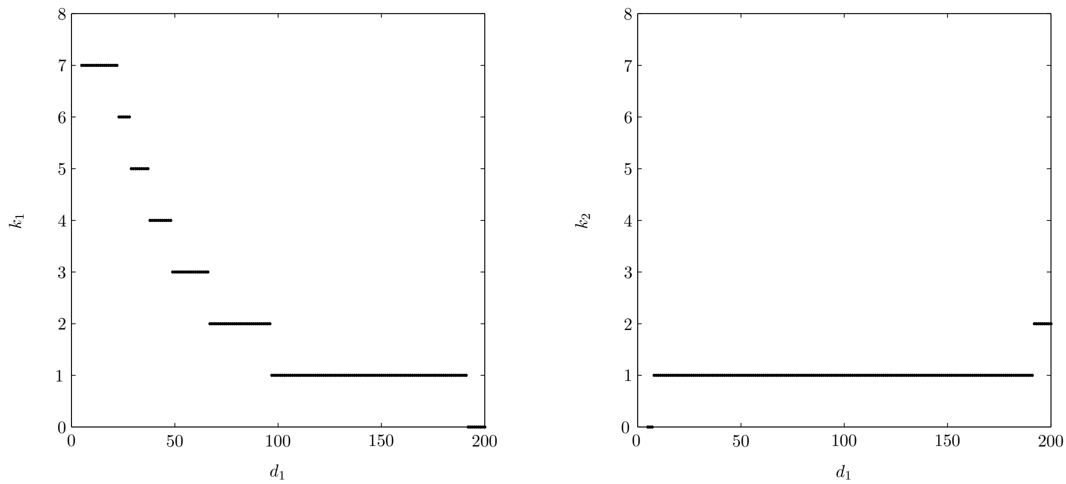


Figure 10: Cooperative equilibrium, hours of social support

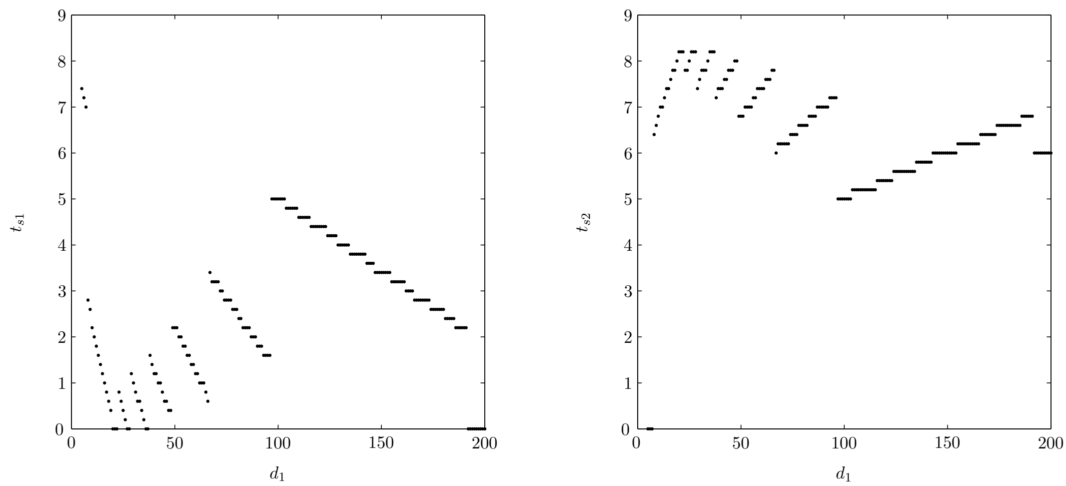


Figure 11: Cooperative equilibrium, total number of contacts and hours of social support

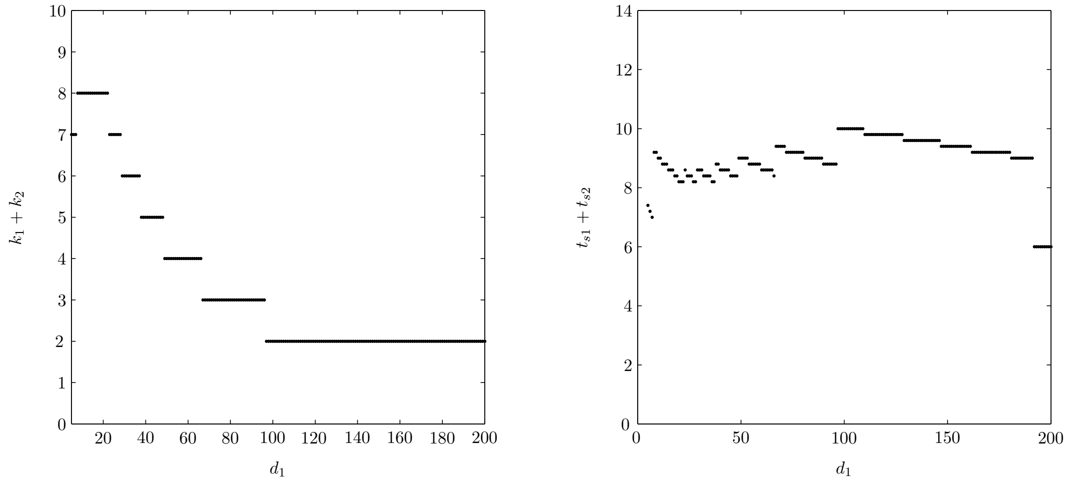


Figure 12: Cooperative equilibrium, number of contacts

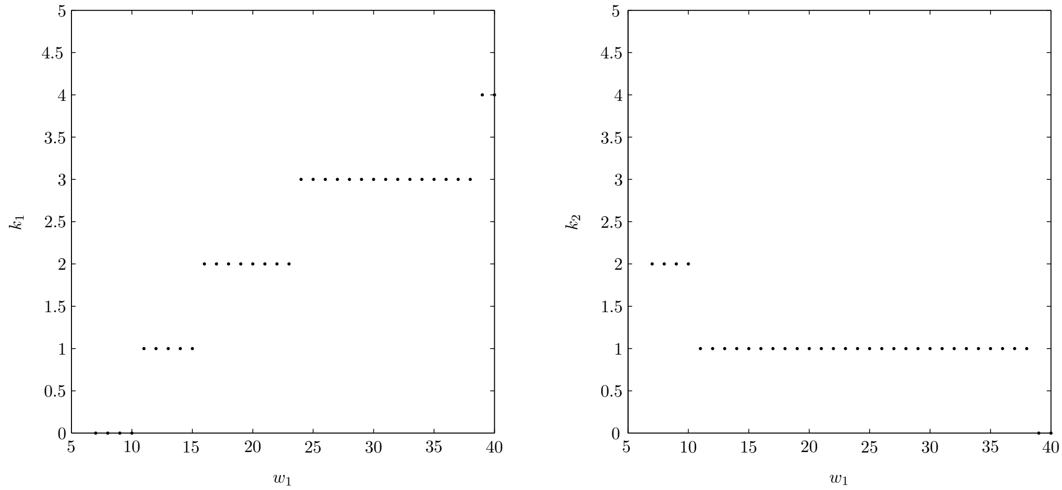


Figure 13: Cooperative equilibrium, hours of social support

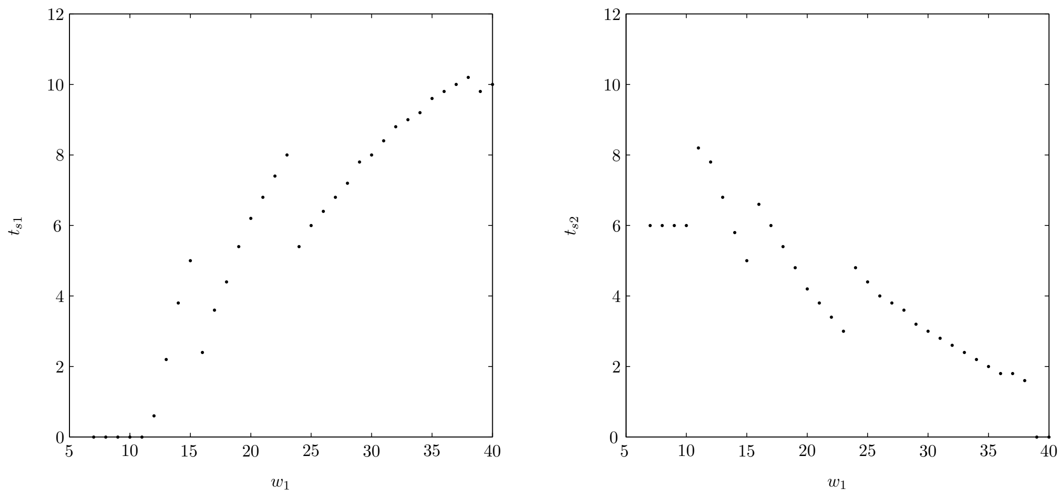
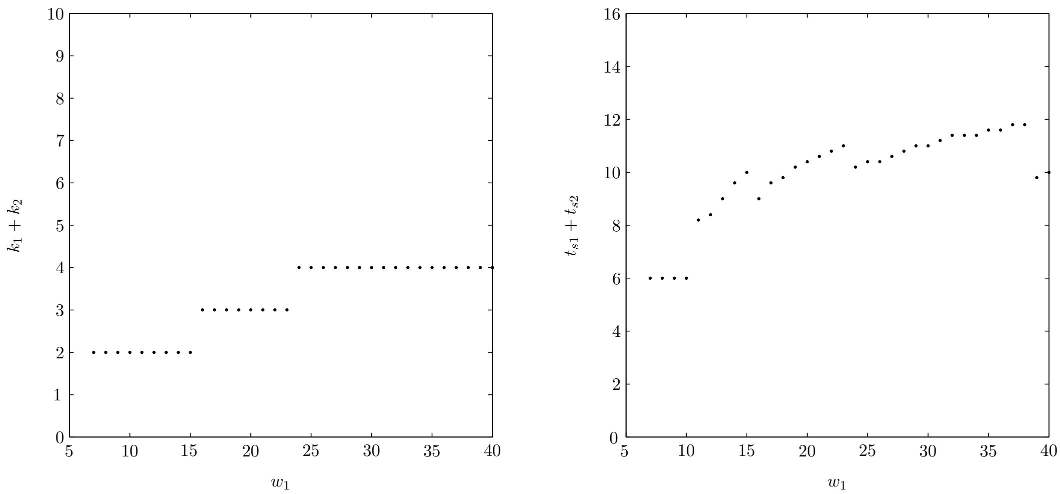


Figure 14: Cooperative equilibrium, total number of contacts and hours of social support



3 Data and Empirical Application

The Survey of Health, Ageing and Retirement in Europe (SHARE) is a multidisciplinary database of micro data on health, socio-economic status and social and family networks of individuals. In the current version of the paper we use the 2004 wave; the next version will also use the second wave of SHARE (which is expected to become available early 2008). Eleven countries have contributed data to the 2004 SHARE dataset. Three regions can be distinguished: Scandinavia (Denmark and Sweden), Central Europe (Austria, France, Germany, Switzerland, Belgium, the Netherlands) and the Mediterranean (Spain, Italy and Greece). Eligible respondents are all household members aged 50 and over, plus their spouses, independent of age. The questionnaire is composed by face-to-face computer-aided personal interviews (CAPI), plus a self-completion drop-off part with questions that command more privacy.

In contrast with papers such as Bonsang (2006) and Bolin, Lindgren, Lundborg (2007), where informal care given by the respondents is studied, in this paper we consider the respondents in their role of receiver of informal care. The reason is that we want to have information for all siblings within a family. The respondents (in our case 'the parents') give information about all their children. If we would consider the respondents as the providers of informal care, there would be no information on the amount of care the siblings of the respondents give to their parents. Further, by considering the respondents as the receivers of informal care, we also have information on the receivers' health condition, for instance, self-reported health, physical functioning and the utilization of health-care facilities. The respondents provide basic information on all their children that are still alive (sex, year of birth and distance to the parents). Due to the length of the interview, further information (such as education, household situation and employment of the child) is gathered for at most four children.

Table 2 presents descriptive statistics on the number of respondents, households, and accompanying children by country. In total there are 31,114 respondents, from 21318 households, with on average 2.2 children. On average, 19.6% of the respondents face difficulties with daily activities. With 'daily activities' it is meant that the respondent has difficulties with for example dressing (including shoes and socks), walking across a room, bathing or showering, eating (cutting up food), getting in or out of bed, using the toilet, using a map in a strange place, preparing a hot meal, shopping for groceries, telephone calls, taking medication, doing work around the house or garden and difficulties with managing money. Conditional on the fact that there are difficulties, the average number of difficulties is 2.9.

As our subject is informal care given by the children of the respondents, Table 3 presents by country the percentage of children involved in social support to their parents. In the second column the percentage of children involved in social support is given, conditional on the fact that the parents have one ore more difficulties. As expected, the percentage of children involved in social support is then higher.

Social support contains three components: personal care, practical household help and paperwork. Column 3, 4 and 5 give the percentage of persons involved in these tasks, given the fact that they are providing social support. Household help is the most common form of social support. Conditional on social support being provided, personal care is relatively high in Italy and Spain.

In the examples of section 2 we saw that in general a higher distance between the child and the parents causes a lower level of social support. For children living independently from their parents Table 4 shows a strong negative relationship between distance and social support provided.

Table 5 shows the relationship between social support and employment. The difference in giving social support by people who are full time employed and part-time employed has the expected sign but is small. Adult children who are retired are very often involved in social support. Note that retired persons have relatively older parents.

Conflicts in the family may influence the provision of social support.

Table 6 gives the relation between conflicts and social support in families with two siblings. Fewer conflicts result in a higher percentage of adult children involved in social support. When there are often conflicts, the number of hours social support per week is relatively low. Note that the conflict question in SHARE refer to conflicts in general, not specifically related to providing informal care.

In section 2 we saw that in the Nash equilibrium two children give almost the same amount of care as one child (with the same preferences and characteristics). In case two siblings behave cooperatively, two siblings together give more care than one child. Table 7 gives the hours of social support (per week) received, given the number of children. For one and two children the number of hours of social support received by the parents is about the same. As from 3 children a higher number of children results in more hours of social support.

4 Policy Evaluation

Several countries represented in SHARE have implemented policies aimed at encouraging low-cost provision of long-term care. For example, in the Netherlands, individuals who care for someone with a chronic illness who would otherwise be institutionalized can receive an amount of 250 euros, as a “financial appreciation of caring”. Little is known about the effectiveness and efficiency of these policies. One important issue is the possibility of unintended side effects, such as discouraging labor force participation.

This section describes a framework that can be used to assess various policies. Possible policy instruments are: 1) a financial compensation for the hours of social support; 2) a financial compensation for traveling expenses; 3) help such that siblings behave more cooperatively; 4) policies that change the distance between parents and their children (for example, the social rent sector could weigh informal care by their assignment of houses, or senior houses could be built in residential area's).

While the model presented above applies to a single family, the empirical version to be estimated will allow for heterogeneity across families and countries. Preference parameters will depend on observed characteristics, such as gender, education, health status, and family status, of the adult children and the parents. In addition, adult children face different budget and time constraints, due to variation in wages and in distances to the parental home.

To analyze the effects of policies consider the adjusted budget constraint for a single adult child:

$$c + kp_d d = t_h w(1 - \tau_h) + \tau_d d + \tau_s t_s,$$

where τ_h tax on income, τ_d compensation for travel expenses, τ_s compensation for social support. The net government revenue from this household is given by:

$$R = t_h w \tau_h - \tau_d d - \tau_s t_s - p_f(F - \delta t_s), \tag{27}$$

with p_f denoting the price of formal care. The first term in the righthand side of (27) is the labor income tax received. The second and third terms are the compensations for travel expenses and for providing informal care, respectively. The fourth term is the amount the government spends on formal care.

A simple example of a social planning problem is to maximize R subject to a given level of care provided. Thus the government's problem is to choose τ_h, τ_d, τ_s, and δ such that R is maximized subject to $t_s + t_f = \bar{F}$, taking into account the family's response to these financial incentives.

A similar (though slightly more complicated) approach can be developed for the case of two adult children.

5 Preliminary Conclusions

We have presented a model to analyze families' complex decisions regarding care provision for aging parents. The model focuses on the strategic interactions between siblings, and can be used to assess the effects of a variety of policy measures. In a future version of the paper we will estimate the structural parameters of the model using the first two SHARE waves, allowing for heterogeneity in preferences, constraints, and institutions both between and within countries represented.

A tentative exploration of the data reveals that the stylized empirical facts in the SHARE data are consistent with a number of qualitative predictions from the model: children provide more care the larger the difficulties their parents experience in daily life; children provide less care when they live farther away and when they are more involved in paid work; and the occurrence of conflicts in families is associated with less care provided. Clarifying and understanding the nature of these correlations – by tightening the link between the theoretical model and the data through estimation – is the challenge ahead.

References

Bolin K., B. Lindgren and P. Lundborg, 2007, Your next of kin or your own career? Caring and working among the 50+ of Europe. Tinbergen institute discussion paper TI 2007-032/3.

Bonsang E., 2006, How do middle-aged children allocate time and money transfers to their older parents in Europe? CREPP working papers 2006/02.

Hiedemann B. and S. Stern, 1999, Strategic play among family members when making long-term care decisions. Journal of economic behavior and organization, vol. 40, p.29-57.

Table 1: Pay off matrix

	$k_2 = 0,\, t_{s2} = 0$	$k_2 = 1,\, t_{s2} = 0$	$k_2 = 1,\, t_{s2} = 1$	etc.
$k_1 = 0,\, t_{s1} = 0$	(2.05, 2.05)	(2.23, 1.76)	(2.40, 1.98)	...
$k_1 = 1,\, t_{s1} = 0$	(1.76, 2.23)	(1.86, 1.86)	(2.03, 1.99)	...
$k_1 = 1,\, t_{s1} = 1$	(1.89, 2.40)	(1.99, 2.03)	(2.09, 2.09)	...
$k_1 = 1,\, t_{s1} = 2$	(1.94, 2.50)	(2.04, 2.13)	(2.12, 2.16)	...
etc.	...	...	...	...

In this example it is assumed that $p_d = 0.4, \tau = 0.025, v = 1, d_i = 350, \alpha_{li} = 0.25, \alpha_{yi} = 0.25, \alpha_{sfi} = 0.25, \alpha_{ki} = 0.25, \gamma_{li} = 110, \gamma_{ci} = 400, \gamma_{ki} = -1, \gamma^*_{sf} = 10, \delta = 0, T = 168, \mu_i = 0 \text{and} F = 11$ for $i = 1, 2$.

Table 2: Descriptive statistics

country	# respondents	# households	% difficulties	# difficulties (mean)	# children (mean)
Austria	1,893	1,409	19.9	2.7	1.9
Germany	3,008	2,002	16.1	2.8	1.8
Sweden	3,052	2,139	17.3	2.8	2.3
Netherlands	2,979	1,954	16.8	2.5	2.4
Spain	2,396	1,753	27.8	3.2	2.5
Italy	2,559	1,778	17.2	3.4	2.0
France	3,193	2,110	20.0	2.9	2.2
Denmark	1,707	1,176	20.0	2.9	2.1
Greece	2,898	1,982	19.4	2.8	1.9
Switzerland	1,004	712	11.5	2.1	2.0
Belgium	3,827	2,532	21.4	2.6	2.1
Israel	2,598	1,771	24.4	3.4	3.4
Total	31,114	21,318	19.6	2.9	2.2

From left to right the columns present: the number of respondents in the sample, the number of households, the percentage of respondents with difficulties, the mean number of difficulties, and the mean number of children per household. With difficulties we mean difficulties with dressing (including shoes and socks), walking across a room, bathing or showering, eating (cutting up food), getting in or out of bed, using the toilet, using a map in a strange place, preparing a hot meal, shopping for groceries, telephone calls, taking medication, doing work around the house or garden and difficulties with managing money.

Table 3: Descriptive statistics social support

country	% children social support	% children social support conditional on difficulties	personal care	household	paperwork	#hours week (conditional on giving help)
Austria	10.0	16.8	13.7	86.3	32.4	5.8
Germany	11.2	20.9	10.6	89.9	37.4	6.2
Sweden	7.7	16.1	6.6	87.0	25.7	2.8
Netherlands	5.0	9.9	9.6	69.0	40.6	2.6
Spain	4.8	8.1	29.6	69.0	50.7	14.5
Italy	3.9	7.8	28.7	69.2	52.4	21.0
France	6.2	13.7	13.6	73.9	53.7	8.5
Denmark	11.2	18.8	5.7	87.6	20.6	2.5
Greece	10.5	20.0	16.7	69.4	66.3	10.5
Switzerland	5.0	13.7	4.2	75.0	37.5	3.6
Belgium	7.4	13.8	10.0	88.5	30.8	6.0
Israel	6.0	11.6	14.4	83.4	45.4	10.9
Total	7.2	13.6	13.0	80.7	40.7	7.2

From left to right the columns present: the percentage of children who are involved in social support, the percentage of children who are involved in social support given that their parents have difficulties with one or more daily activities, the percentage of children who give personal care, the percentage of children who give practical household help, the percentage of children who help with paperwork, and the number of hours social support per week conditional on giving any social support.

Table 4: Distance and social support

Distance	% social support	% social support conditional on difficulties	# hours social support conditional on giving social support
In the same household	1.93	5.19	21.5
In the same building	17.89	29.72	12.0
Less than 1 kilometre away	13.70	21.95	8.8
Between 1 and 5 kilometres away	10.28	17.65	5.7
Between 5 and 25 kilometres away	8.63	14.76	5.1
Between 25 and 100 kilometres away	6.33	12.34	3.4
Between 100 and 500 kilometres away	4.04	7.27	3.6
More than 500 kilometres away	1.40	2.78	7.3
More than 500 kilometres away in another country	0.92	1.38	9.8
Refusal to answer the question	1.39	0.00	
Don't know	0.00	0.00	

For each distance category the columns present: the percentage of children involved in social support, the percentage of children involved in social support given the fact that at least one of their parents have one or more difficulties with daily activities, and the number of hours social support per week conditional on giving any social support.

Table 5: Employment and social support

	% social support	% social support conditional on difficulties	# hours social support conditional on giving social support
Full-time employed	7.4	13.8	5.1
Part-time employed	9.3	18.0	6.6
Self-employed	9.0	16.2	5.6
Unemployed	8.1	13.0	10.9
In vocational education	2.8	7.7	6.2
Parental leave	5.7	12.7	8.3
Retirement	22.8	27.6	13.8
Permanently sick or disabled	8.4	12.1	8.6
Looking after home or family	11.7	18.7	14.9

For each employment status the columns present: the percentage of children involved in social support, the percentage of children involved in social support given the fact that at least one of their parents have one or more difficulties with daily activities, and the number of hours social support per week conditional on giving any social support.

Table 6: Conflicts and social support

Conflicts	% social support (two siblings)	% social support conditional on difficulties (two siblings)	# hours social support conditional on giving social support (two siblings)
Often	4.36	6.82	3.68
Sometimes	5.82	12.80	6.00
Rarely	9.27	20.50	5.36
Never	8.67	17.53	6.42

For each category of the number of conflicts the columns present: the percentage of children involved in social support, the percentage of children involved in social support given the fact that at least one of their parents have one or more difficulties with daily activities, and the number of hours social support per week conditional on giving any social support. Only families with two siblings are included.

Table 7: Number of children and social support

# children	# hours social support to the parents (mean)
1	0.919
2	0.877
3	1.212
4	1.432
5	1.672
≥ 6	3.933

This table presents the number of hours of social support the respondents (the parents) receive, conditional on the number of children they have.