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ABSTRACT

This paper extends existing theories on parental time investment in children to a three generational setting and discusses identifiable restrictions of alternative explanations for grandparental help with childcare.

It shows on data of 10 European countries (taken from the 2004 SHARE-survey) that earlier empirical work may have mistakenly identified gender variation as an indication of non-altruistic behavior. In fact, grandparental choices can be explained as a response to varying constraints, for instance with regards to the disproportional care needs of lone parents or employed children experiencing rationing in the market for formal care services.

Keywords: grandparents, grandchildren, childcare support, needs, public policy

JEL-codes: D13, J14, J13, D64

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1. Introduction

This paper addresses the behavior of grandparents relating to their infant grandchildren and more specifically their motives to help with childcare for preschool children. Hence, we focus on a specific period in life where adult children have left the parental home and have started their own stage of active parenting. In the economic literature this life-stage has received hardly any attention. Yet, parental action towards non-adult children has been studied extensively. Therefore, the first step in our analysis of grandparental behavior towards infant grandchildren is to transpose the analysis of the parent-child relationship to the grandparent-grandchild interaction, using some of the particular characteristics of the life period chosen to limit the number of possible theoretical ramifications. We go into altruistic and non-altruistic explanations for grandparental time allocation and discuss specific restrictions to identify the various explanations.

We subsequently test these restrictions on data of grandparents living in 10 European countries. In section 3 we present the data (SHARE 2004) and elaborate an empirical strategy based on random effects estimates. We discuss the results in section 4 and conclude in section 5 that the constraints of the grandparental decision making set are often binding, i.e. have a strong influence of the eventual outcome. On the other hand, a selective preference for daughters predicted by non-altruist theory, is not supported by the data.

2. Theoretical considerations

In the following paragraphs, we expand the economic model of parental behavior towards young children into a three generation model seen from the perspective of grandparents. We will only make brief reference to parent models and refer the reader to the various textbooks on family economics for further explanations (Cigno 1991; Ermisch 2003; Kooreman and Wunderink 1996).

Many economists have assumed that the relationship between parents and children is characterized by parental altruism, which means that the utility of the children is of (positive) interest to the parents in one way or another. In its most general formulation, utility actually refers to the complete life of the children. Obviously, lifetime utility is not known. For the children the latter stems from the uncertainties of life, but for the parents the unknown character of the outcome of their children is even wider. It also has to do with the uncertainty of educational technology ("What kind of parental action serves my child's interests best?") and the agency of the child ("Can I motivate my child to make a reasonable effort to make the best of her or his capabilities?").

For the life-stage we study in this paper, however, uncertainty is not a major issue. Regarding the children, the period during which parents can expect to have a large impact on the (educational) outcomes has passed. As the children have entered a new phase of life, with children of their own and, most often, economic independence, the outcome of the upbringing efforts of the parents is reasonably clear and largely beyond alteration. Alternately, for grandchildren it is too early to intervene specifically. The grandchildren have not yet entered the school system and, hence, not much is known about their specific abilities. Thus, neither the parents nor the grandparents can elicit optimal behavior by the children through a balance of personalized educational investments and compensations (cfr. the discussion on optimal educational investment in the literature).

Consequently, grandparents go through a period during which the impact of their actions on the utility of their children and their grandchildren is relatively uniform. That is, compared with their own period of active parenting or the period when their grandchildren will be in primary and secondary school, grandparents have few indications of a differential impact ('productivity') of their contributions to the utility of their (grand)children. Therefore, we will assume hereafter that in case grandparents treat their infant grandchildren differently, reasons other than a motivation to correct for known or expected differences between the grandchildren have to lie at the origin of this non-homogeneous behavior. We develop this reasoning in a more formal way below.

In a fairly general formulation the utility U_i of an altruistic grandparent can be written as in equation (1), the "compound utility function" W , which incorporates the private consumption vector \mathbf{x}_i and the utility of all directly related family members, being her or his partner (j), children ($c1$ through cM) and grandchildren ($gc11$ through $gcXN$, where the first number x refers to the grandchild and the second n to the child, hence $gc12$ is the first descendant of the second child of grandparent i).

$$U_i = W(\mathbf{x}_i, U_j, C_i, G_i) \quad (1)$$

$$C_i = C(U_{c1}, \dots, U_{cN}) \quad (2)$$

$$G_i = G(U_{gc11}, U_{gc21}, \dots, U_{gcXN}) \quad (3)$$

To clarify that grandparents with so-called 'caring preferences' do not necessarily incorporate the (lifetime) utilities of their partner and descendants in a uniform way in their compound utility function, we grouped the utility levels of the children into the overall utility index C_i and the utility levels of all grandchildren into the utility index G_i .

Many competing assumptions can be thought of, when analyzing the relative weight of children and grandchildren in the compound utility function of the grandparent. For some grandparents, the main concern remains with their children and grandchildren are only incorporated indirectly, through the utility functions of the children. Hence, in that case $G_i = 0$ and grandchildren enter the compound utility function as:

$$\frac{\partial W_i}{\partial U_{gcn}} = \frac{\partial W_i}{\partial C_i} \frac{\partial C_i}{\partial U_{cn}} \frac{\partial U_{cn}}{\partial U_{gcn}} \quad (4)$$

In the opposite extreme case, grandparents may feel that, with the arrival of grandchildren, their own children have achieved full autonomy, that they do not need to worry about their wellbeing anymore and that their only concern is now with the grandchildren. This would result in the disappearance of C_i in the compound utility function.¹

Descriptive empirical work does not sustain any of the previous extreme cases. On the contrary, several authors (Mueller and Elder 2003; Uhlenberg and Bradley 1998) indicate that grandparents need to sustain a good relationship with their children if they want to relate to their grandchildren. Hence, a concern for grandchildren requires some concern for the children themselves.

Still, whatever the goal function of an individual grandparent, utility maximization also will have to deal with time and budget constraints and the relative contribution of grandparents to the utility level of their children and grandchildren:

$$l_i + t_i + h_i = T \quad (5)$$

$$x_i + g_i = t_i w g_i + y_i \quad (6)$$

$$U_x = U_x(h_{ix}, g_{ix}, Z_x) \quad \forall x \in \{1, \dots, XN\} \quad (7)$$

where l refers to leisure, t to time spent on paid labor for a corresponding hourly wage of wg , h describes the vector of care efforts towards infant grandchildren and the time spent on help to children or household chores in the own household and T is the total time available;

x is the vector of personal consumption items (in monetary value), g indicates a vector of gifts to children and grandchildren (related or not to care efforts) and y reflects the non-labor income of the individual grandparent;

U_x refers to the utility level of child or grandchild x from the viewpoint of the grandparent, thus reflecting the perceived utility contribution of the help in time h and gifts g to the utility level of the child or grandchild

¹ A referee rightly pointed out that grandchild utility may also enter the compound utility function through the utility of the partner. For simplicity, we do not dwell on this and other types of non-separability as it has no general intergenerational consequence, though we will return to its meaning in the empirical section.

(which complements the output Z_x of household production by child n to the benefit of grandchild x).

The usual optimization of time allocation results in the optimality condition that the marginal utilities of the various time categories be equal, as in the following example which assumes that grandparents are altruistic towards both their children and their grandchildren:

$$\forall x, n \quad \frac{\partial W_i}{\partial U_i} \frac{\partial U_i}{\partial l_i} = \frac{\partial W_i}{\partial G_i} \frac{\partial G_i}{\partial U_{gcn}} \frac{\partial U_{gcn}}{\partial h_i} + \frac{\partial W_i}{\partial C_i} \frac{\partial C_i}{\partial U_{cn}} \frac{\partial U_{cn}}{\partial U_{gcn}} \frac{\partial U_{gcn}}{\partial h_i} \quad (8)$$

For the grandparents at hand, these optimality conditions imply also that, even in the restrictive case that every grandchild enters the compound utility function in exactly the same way, factors that influence the marginal utility contribution (productivity) of their effort may lead to a non-uniform distribution of grandparental effort. Empirical findings of descriptive studies of grandparental behavior have, for instance, found that grandparents tend to spend more time on grandchildren who live nearby (Michalski and Shackelford 2005; Uhlenberg and Bradley 1998). This corresponds perfectly with the marginal utility reasoning under homogeneous preferences. A longer distance to reach a grandchild increases the marginal cost of a utility contribution by a grandparent (supposing this involves her or his physical presence at the home of the grandchild) and hence decreases the optimal amount of effort spent on the grandchild living far away as compared with the grandchild living nearby.²

Summarizing, the discussion of the behavioral consequences of an altruistic model of grandparents with infant grandchildren shows that much depends on the compound utility function of the grandparent at hand. However, keeping this constant, we also saw that costs to realize childcare help may explain variation in the provision of childcare to grandchildren.

In the literature, however, it has been stressed that less altruistic motives of grandparents also deserve attention. First, grandparents may direct their intergenerational behavior to some extent by their own care motives. Many grandparents with infant grandchildren are at the end of their professional career or starting the retirement stage of life. They are probably well aware of the fact that in the future they may require care from their relatives, especially if they are providing some kind of care for their own frail parents.

The consequences of the care motive are a matter of debate in the literature. Cigno (1991) stresses the importance of family rules of

² We assume that time spent on grandchildren has a strictly positive impact on the utility level of the grandchild (the utility of the grandchild is strictly increasing in the effort of the grandparent, at least from the viewpoint of the latter, which is the relevant viewpoint in this paper).

conduct, a form of family specific norms and values of which family members of the younger generations need to be convinced. Because it is difficult to force adult children to comply to these rules, but everyone is likely to end up in a needy situation by the end of his or her life, all adult family members feel an urge to show their children the good example by complying, i.e. providing help to the currently frail generations of the family. In the view of Cigno adult family members are mainly those currently in employment, but given the fact that many people live an active life for years after retirement, the help of grandparents in the raising of their infant grandchildren can be another example of the same principle of “intergenerational teaching”.

As such the empirical consequences of the care motive seem equivalent to the altruistic motive. In fact grandparents have an incentive to treat everyone similarly, because “intergenerational teaching” extends to all members of the family.

Nevertheless, other authors (Friedman, Hechter and Kreager 2008) offer a more narrow understanding of the care motive. They believe that grandparents know early on which family members are most likely to come to their aid when frail. For practical reasons, distance is crucial, for example, and because of cultural norms it is also more likely that a female descendant will prove helpful than a male descendant and that a child will help rather than a more remote family member. Therefore, the authors suggest that it is in grandparents’ interest to target one particular child with their efforts. Both with childcare assistance and with financial help, they should clearly signal to one child that she or he is the chosen one. This may work in two ways. First the favored child will feel obliged, because she or he knows to have received more favors than others. Secondly, the other children will exert pressure on the favored child in case of default, because they will want the balance of favors and efforts to be restored. Along these lines, one may understand the concentration of care as an ‘in kind’ version of the well documented bequest motive. Grandparents direct their care towards those children they perceive as most likely to help them in later life. With regards to the (planned) division of bequests, evidence of this type of reasoning was found by Brown (2006) for the US.

Empirically, the care concentration reasoning has clearly distinct -and hence identifiable- consequences. Even if there are several children with infant grandchildren and the other characteristics of the family are roughly equal (e.g. distance to home of the grandparent), one set of grandchildren descendant from one child will be clearly preferred and there will be no substitution between childcare assistance and monetary gifts across sets of grandchildren. Furthermore, few context variables can influence the focus of the grandparents. An income shock, for example, does not alter their single preference, although it may change the amount of their gifts

and/or the number of hours spent on childcare, much in the same way as we described above for the altruist grandparent.

A second class of non-altruist motives derives from evolutionary biology and investigates to what extent grandparental behavior follows from an implicit desire to safeguard the survival of the own genes. Partisans of this theory (Danielsbacka et al. 2011; Dubas 2001; Michalski and Shackelford 2005; Pollet, Nelissen and Nettle 2009) bring forward that even in contemporary society grandparents have no certainty of the paternal line of descent. While there is hardly any doubt about maternity, paternity can always be questioned to some extent. Therefore, it is in the interest of the grandparents to invest mainly in their matrilineal descendant, i.e. their daughters and grandchildren descendent of the daughters.

In other words, the theory predicts a well defined preference shift in favor of matrilineal descendants. According to this theory, one may again expect that not all grandchildren will be treated uniformly. Contrary to the former theory, however, the target group now extends to all grandchildren of maternal descent. Again, context variables are not expected to alter the focus on interest of the grandparents, though they may change the total amount or the mix of assistance offered.

It should be noted, moreover, that intergenerational genetic transmission and uncertainty about paternity are not the only potential explanations for a preference for matrilineal descendants. Dubas (2001) rightly notes that social norms about gendered conduct can equally explain the preference. In Western societies women are expected to care and to maintain social ties, which makes the contact between mothers and daughters tighter and in turn raises the likelihood of mutual help. Thus, a larger involvement of grandmothers with grandchildren of their daughters is an indicator of this gendered rules of conduct.

In empirical work a distinction between the two underlying motives is not easily made. It may well be that socio-biological elements are partially responsible for the existence of the gender norms. Yet, the main point for our work is that reasons exist to expect a matrilineal bias in the distribution of grandparental efforts towards their grandchildren.

Summarizing, we described how the efforts of grandparents towards their infant grandchildren can be driven by altruistic and less altruistic motives. In both cases, the usual balance between preferences and constraints needs to be achieved. Consequently, external factors influencing the relative impact of grandparents on the life outcomes of their grandchildren (e.g. time to reach the house of their grandchildren) will determine both their inclination to make an effort at all (compared with actions that will deliver personal utility directly) and the way they distribute their efforts over the various grandchildren.

Two non-altruistic theories of grandparental behavior add identifiable restrictions to the more general behavioral model offered by the altruistic approach. The personal care motive may drive grandparents towards a behavioral focus on one particular child (and set of grandchildren)(strict care concentration), while the gene transmission motive predicts grandparents to favor children and grandchildren of maternal descent (female care concentration).

3. Empirical strategy

3.1. Data and sample considerations

We use data from the first wave (2004-2005) of SHARE, the Survey on Health, Ageing and Retirement in Europe, which is a multidisciplinary, cross-national sample survey among all individuals aged 50 and over in a selection of European countries. Given the focus of our investigation, we selected respondents having at least one grandchild younger than five years old and constructed grandchild sets with information on the child n

$$c_n \in \{c_1, \dots, c_N\}$$

and aggregate information on her or his children (the X grandchildren):

$$\{gc_{1n}, \dots, gc_{Xn}\} \quad \forall n \in \{1, \dots, N\}$$

We thus reiterate that our basic unit of analysis is a grandchild set and not an individual grandchild. We choose to proceed this way, because of the theoretical considerations in section 2. Moreover, an analysis per grandchild would require additional assumptions about return to scale in the utility contribution of grandparents through childcare efforts. A final pragmatic argument relates to data limitations. In the SHARE dataset, no data is available on the childcare time for every grandchild separately.

Table 1 shows the number of observations for every country in the sample. On average a grandparent in our sample has 1.7 grandchild sets, i.e. children with grandchildren. With small differences between the countries (not shown), this average derives from a distribution with 48% having only one grandchild set, 35% having two, 14% having three and 3% with four. Unfortunately, the construction of the questionnaire limits our analysis to four grandchild sets, while in some countries a considerable number of grandparents has more than four elective children (e.g. Spain 10%). However, with more than half of the grandparents having two or more grandchild sets to distribute their efforts between, we consider this sample to be fit for our analytical purposes.

A final note regards the selection of respondents. In couples, one respondent is asked the questions relating to the household and the family (including childcare assistance). This person is the first person to be

interviewed, which explains why respondents are roughly equally distributed among the sexes (56% is male in the couple subsample). In Austria (74%), Belgium (63%), France (66%) and Switzerland (82%), however, the distribution of family respondents among couples is skewed in favor of men. Consequently, we will control for the sex of the respondent in the empirical estimates.

3.2. *The dependent variable*

Table 1 also reflects basic descriptive information regarding the dependent variable. We constructed our dependent variable on the basis of the questions regarding childcare in SHARE. These questions reveal the frequency (daily, weekly, monthly, etc.) of childcare assistance by the grandparent (and, potentially, his/her spouse) to any child of the respondent (i.e. the grandchild set) and probe for the usual number of hours. As a unified measure, we constructed a weekly indication,³ with an average value of 4.4 hours.

This average hides both cross-country and within country variation. The first column of the table highlights that a considerable proportion of grandparents is not involved in childcare at all, even in our selective subsample of grandparents with at least one young grandchild.⁴ Moreover, the variation between countries is large. In Spain 55% of grandparents does not engage in childcare on a regular basis, while the latter is true for only 21% in the Netherlands.

In the second data column figures the mean value of childcare time provided by grandparents in a week, for grandparents with positive values on care. Again the variation between countries is large, with southern countries having considerably higher grandparental care figures than the Nordic countries.

³ In the Annex to this paper more detail is given about the reliability of this reconstruction.

⁴ The skewness of the distribution of the dependent variable raises concern when making multivariate estimates. However, tests with stepwise approaches (Heckman-like, see for an example on similar SHARE-data: Hank and Buber, 2009) or tobit specifications gave no substantively different results and are therefore not reported here.

Table 1. The dependent variable (grandparental childcare) by country

	Percentage with 0 hours a week (in total, over all grandchild sets)	Average hours (per week and per grandchild set) of those not declaring 0 in total	Number of analytical units (grandchild sets)	Number of clusters (grandparents)
Sweden	35	3	987	539
Denmark	28	4	521	288
Netherlands	21	5	817	493
Germany	33	6	548	344
France	39	7	870	507
Austria	39	8	357	213
Belgium	31	8	1100	645
Spain	55	10	620	345
Italy	47	12	660	387
Greece	40	15	470	288
Anova	>99.9%	>99.9%		
N	4042	4471 of 6950	6950	4042

Note: By construction of the dataset (see text), grandparents have between 1 and 4 grandchild sets. On average grandparents are in the dataset with 1.7 grandchild sets (all within an interval of 1.6 in Germany and 1.8 in Denmark)

Source: SHARE, wave 1 (2004-2005)

Selection: Grandparents with at least one grandchild younger than 5

Hank and Buber (2009) suggest that the figures in the first and second column of Table 1 may follow from the combination of the prevalence of mothers' employment and formal childcare services in European countries. In Table 2 we show the employment rates of mothers with a child younger than 5 and the use of formal childcare or school by the child(ren) of these same mothers.

In Sweden and Denmark, mothers' employment is common and is usually combined with the use of formal childcare services. Even though hardly any rationing exists for formal childcare, the latter do not tend to offer a truly comprehensive service (e.g. the service does not cover working times of parents completely or ill children cannot attend it) and therefore working parents need grandparental help to cover their full need for care services. Consequently, many grandparents in Sweden and Denmark help to complete the picture. Yet, few are the main childcare providers, which explains the fairly generalized but relatively low weekly figure.

In Italy, Spain and Greece on the other hand, reconciliation of work and family life is not publicly arranged for young children. The supply of subsidized childcare slots for children below three is low and hence only few families can rely on formal childcare. As a consequence, many mothers are restricted in their employment options and assume childcare

responsibilities at least until their youngest enter preschool⁵ and even then the lack of part-time work complicates their care arrangements. Grandparental help offers an alternative to the parental arrangement, but requires a quite intense engagement of the grandparents, because they are not complementing a public childcare arrangement, but rather assume the bulk of non-parental care. Accordingly, the data show relatively many grandparents not engaging in care, but those who do, make a large time effort.

The other countries assume intermediate positions that can be linked with their particular combination of mothers' employment and formal childcare. An interesting example is the Netherlands, with the comparatively highest prevalence of grandparental help, though at a low number of hours a week. This can be explained by the exceptionally high proportion of part-time working mothers and the relatively low supply of childcare slots in the country.

Table 2. The employment and care context

	% Formal care and school for children < 5yrs			Female employment rate		
	Total	1-20 hours	>20 hours	Total	Full-Time	Part-Time
DK	80.90	5.02	75.87	69.17	50.33	18.84
SE	59.17	16.92	42.25	72.54	43.94	28.61
FR	61.87	15.68	46.19	61.53	39.10	22.43
BE	59.10	12.88	46.22	63.15	37.14	26.01
NL	56.54	34.51	22.03	52.49	6.41	46.07
ES	57.10	17.21	39.89	52.57	37.78	14.80
IT	48.24	7.19	41.05	46.62	30.90	15.72
DE	47.55	20.25	27.29	36.61	7.59	29.02
GR	31.20	0.58	30.62	56.07	46.97	9.09
AT	28.76	15.76	12.99	33.28	11.45	21.83

Source: EU-SILC 2005

Selection: Households with a child < 5

Note: hours of formal care and school refers to the hours of services used in a 'usual week' for the child with the lowest number of hours in the household (most often the youngest child), an indication of the formal service complement of parental care time. Female employment refers to market work only.

⁵ Appreciate on www.eurydice.org the variation of pre-primary education in the countries of our sample.

3.3. Independent variables: costs and utility contributions

In section 1 we discussed the particularities of the decision framework of grandparents in the context of utility maximization and time allocation. Consequently, an empirical enquiry into determinants of childcare effort requires controls along both of these dimensions.

The distance between the homes of the grandparents and the grandchildren provides an obvious contribution to the cost (constraints) side. Indicators of the current employment status of the respondent grandparent, her or his sex and educational level jointly provide proxy information on the opportunity cost of time allocated to childcare, as they give an implicit estimate of the wage level of the grandparent. Furthermore, the age of the grandparent can be hypothesized to be of importance, as an indicator of the likelihood of impairments that complicate care activities.

Moreover, in previous research on US grandparents, Uhlenberg and Hammill (1998) found a combined effect of marital status of the grandparent and gender. Lone grandfathers were observed to be less involved in childcare. This is hypothesized to have to do with their relative social isolation (immaterial costs) and/or lack of interest in care matters (preference; lower marginal utility) (Dubas 2001).

The number of grandchildren, grandchild sets and grandchildren within a particular set can also be studied through the lens of 'relative productivity' in utility. *Ceteris paribus*, a higher number of grandchildren and grandchild sets makes it less likely that a particular grandchild receives care, because grandparents face competing demand. Conversely, a grandchild who belongs to a grandchild set with more grandchildren than other grandchild sets, is predicted to be more likely to be 'served' because care time is often beneficial to all grandchildren present and, hence, grandparents can benefit from advantages to scale if they allocate their efforts to large rather than small grandchild sets.

The relative care need of (grand)children constitutes another class of potential determinants, because grandparents may derive more satisfaction from helping where their contribution is utterly required than in a situation where parents can perfectly cope themselves. As we already discussed in section 1, this response to need may contribute directly to the personal utility of the grandparent or indirectly through a utility contribution of the parent (of the grandchildren). Indicators on the age of the youngest grandchild and the employment and marital status of the child (parent of the grandchildren) will be treated as representatives of need.

Obviously, need is not just a matter of private perception. We showed in section 2.2 that, between European countries, large variation exists in

state provided care services and, hence, that the (perceived) utility of private provision may vary depending on the country and the coverage of state provisions regarding the age group at hand (childcare services and/or pre-school). Therefore, we will add an indicator of the latter to the set of control variables (overall coverage as represented in Table 2).

3.4. Estimation strategy

For all theories described in section 1, the elements determining costs and utility contributions that we discussed above are relevant. Consequently, while being useful control variables, their inclusion in a multivariate analysis, does not allow us to discriminate between various theoretical explanations for childcare effort.

At the end of section 2, we identified two restrictions. The ‘female care concentration’ restriction stems from gene transmission theory and predicts daughters to get receive more help with childcare. With a likelihood ratio test, we will test whether childcare differs significantly between the matrilineal and patrilineal grandchild sets.

The ‘strict care concentration’ restriction follows from the personal care motive and predicts grandparents to focus on one child only. Unfortunately, concentration on one particular set cannot be tested reliably on a cross-sectional dataset. It may well be that grandparents currently focus their efforts on one particular grandchild set, but have favored other grandchild sets in the past (or will do in the future) and, hence, balance their contributions over the life-course. We leave testing of this hypothesis for the future, when the completion of the panel structure of SHARE will allow for a more reliable test. Consequently, we will basically confront two specifications: one without the sex of the child linking the grandchildren to the grandparent, and a second one including this characteristic.

Econometrically we will rely on random effects estimates to control for the clustering of observations in both countries and families, with as basic specification:

$$h_{cn} = \mathbf{k}_{cn}\boldsymbol{\beta}_{cn} + u_i + u_{country} + \varepsilon_{cn} \quad (9)$$

where h is the dependent variable, hours of care, the vector \mathbf{k} refers to observed characteristics and u to the random effects of, respectively, the individual grandparent i and the country. Moreover we assume

$$\mathbf{u}_i \sim N(\mathbf{0}, \boldsymbol{\Sigma}_1) , \mathbf{u}_{country} \sim N(\mathbf{0}, \boldsymbol{\Sigma}_2) \text{ and } \varepsilon_{cn} \sim N(0, \sigma_\varepsilon^2 \mathbf{I}) \text{ and } u_i, u_{country} \text{ and } \varepsilon_{cn} \text{ to}$$

be independent.

Yet, because descriptive analyses (not shown) indicate that attachment to the labor market differs considerably between countries for various age

groups and that the coverage by formal care services and (pre)school shown in Table 2 follows country-specific age patterns, we extended the above specification with random coefficients at the country level for two elements, the age category of the respondent (grandparent) and the age category of the youngest grandchild in the set:

$$h_{cn} = k_{cn}\beta_{cn} + u_i + u_{country,0} + age1_i * u_{country,1} + age2_i * u_{country,2} + birthyear_{gci} * u_{country,3} + \varepsilon_{cn} \quad (10)$$

where *age1* signals that the respondent is younger than the average age at early retirement in her or his country, *age2* that the respondent is above the official retirement age and *birthyear* refers to the birth year of the youngest grandchild.

To obtain convergence in the maximum likelihood procedure, the covariance structure of the random coefficients was limited to mutually independent variation:

$$\Sigma_2 = \begin{bmatrix} u_{country,0} \\ u_{country,1} \\ u_{country,2} \\ u_{country,3} \end{bmatrix} = \begin{bmatrix} \sigma_{u0}^2 & 0 & 0 & 0 \\ 0 & \sigma_{u1}^2 & 0 & 0 \\ 0 & 0 & \sigma_{u2}^2 & 0 \\ 0 & 0 & 0 & \sigma_{u3}^2 \end{bmatrix} \quad (11)$$

4. Estimation results

The following sections discuss the results of our estimations on the SHARE-data. Basic descriptive information on the independent variables can be found in the Annexes to this paper (Table 5).

4.1. General cost and preference elements (model 1)

In the first phase of our analysis, we look into empirical indicators of elements that we consider general to all the behavioral models we discussed theoretically in section 2. In Table 3, the first column (denoted *Model 1*) shows that many determinants of grandparental help that were found to be of importance in earlier research, are also significant in our European estimates and often explain substantively large deviations from the average weekly help with childcare (4.4 hours a week). Grandparents tend to be involved less intensely in childcare for every year they age beyond the official age of retirement in their country,⁶ if they are men living without a partner and if they are employed full-time or more.

⁶ Splines were constructed over three country specific periods (before the average age of early retirement, between early retirement and official retirement and at or after the moment of official retirement; data from OECD, relating to 2004).

Interestingly, a part-time job does not alter the childcare efforts of grandparents. Apparently, grandparents are able to combine childcare with a part-time job.⁷

Furthermore, the total number of grandchildren tends to limit the availability of grandparental childcare, although it should be noted immediately that their care contribution tends to increase with the size of the grandchild set. In other words, children with relatively many grandchildren tend to get a larger share of the total, but grandparents with many grandchildren divide their time among more grandchildren (grandchild sets), which limits the average time available for every grandchild set (compatible with the idea of competing demands).

Additionally, the age of the youngest child is a clear determinant of the childcare time of grandparents. Grandparental help is especially prominent if the youngest child in the grandchild set is between one and four years old (born in 2001, 2002 or 2003), leading to an increase of almost 4 hours a week. Before the first anniversary (born in 2004), many parents take care of their newborn themselves and after the fifth anniversary, the need for childcare diminishes quickly because the school system becomes a dominant element in children's lives.

Also in line with previous results are our estimates of the impact of the distance between the residence of the grandchildren and the house of the grandparents. A larger distance tends to reduce the childcare involvement of grandparents.

Moreover, the estimates show that the employment status of the child (parent of the grandchildren) and the partnership status (being a lone parent) incites grandparents to provide additional help, which illustrates the needs argument.

⁷ Because the incidence of part-time work differs considerably between countries and age periods, we also tested a specification where the country intercepts (random effects) were allowed to vary between the employment categories and cohorts. This specification did not prove to fit the data better than the specification shown in the table (likelihood ratio test).

Table 3. Random effects estimates of the number of weekly hours spent on childcare for the particular grandchild set

	Model 1			Model 2			Model 3		
	Coeff.	Std. Error		Coeff.	Std. Error		Coeff.	Std. Error	
Characteristics of the child and her/his children (grandchild set)									
Distance from home of grandparents									
Less than 1 km	(refer								
1-24 km	-2.16	0.30	**	-2.16	0.30	**	-2.16	0.30	**
25-99 km	-3.60	0.39	**	-3.62	0.39	**	-3.64	0.39	**
100-500 km	-4.97	0.43	**	-4.98	0.42	**	-4.95	0.42	**
Over 500 km	-6.03	0.49	**	-5.93	0.49	**	-5.91	0.49	**
Number of grandchildren (in set)									
	0.95	0.39	*	0.88	0.39	*	0.92	0.39	*
Number squared	-0.14	0.07		-0.13	0.07		-0.13	0.07	
Birth year of youngest grandchild (in set)									
Before 1993	()								
1993-2000	2.56	0.50	**	2.84	0.51	**	2.87	0.51	**
2001	4.02	0.55	**	4.40	0.55	**	4.44	0.55	**
2002	3.63	0.54	**	4.14	0.55	**	4.19	0.55	**
2003	3.43	0.54	**	3.90	0.55	**	3.95	0.55	**
2004	1.90	0.57	**	2.47	0.58	**	2.54	0.58	**
Lone parent (1=Yes)									
	1.71	0.33	**	1.71	0.32	**	1.63	0.32	**
Coverage Rate Formal Care (Country level)									
28-32%	(reference)								
47-49%	-1.63	1.37		-1.70	1.31		-1.69	1.30	
56-62%	-2.05	1.14		-2.15	1.10		-2.18	1.08	*
81%	-3.22	1.73		-3.30	1.67	*	-3.35	1.65	*
Employment of child									
No market work	()								
Employee	0.61	0.29	*	1.68	0.31	**			
Self-employed	1.94	0.47	**	3.29	0.48	**			
Sex of child (1=Son, patrilineal descent)									
				-2.38	0.23	**			
Daughter without job (reference)									
Daughter, employee							2.10	0.33	**
Daughter, self-employed							3.78	0.70	**
Son without job									
							0.16	0.79	
Son, employee									
							-0.51	0.32	
Son, self-employed									
							1.11	0.55	*

Table continued on the next page

(Table 3 continued)
 Characteristics of the grandparent (respondent)

	Model 1			Model 2			Model 3		
	Coeff.	Std. Error		Coeff.	Std. Error		Coeff.	Std. Error	
Total number of grandchildren	-0.31	0.07	**	-0.30	0.07	**	-0.30	0.07	**
Age spline:									
Years before average age at early retirement	0.02	0.06		0.02	0.06		0.02	0.06	
Years after average age at early retirement	0.05	0.14		0.06	0.14		0.05	0.14	
Years after official age of retirement	-0.15	0.04	**	-0.13	0.04	**	-0.13	0.04	**
Current employment									
No market work	(reference)								
Working part-time	0.25	0.50		0.21	0.50		0.20	0.49	
Working standard full-time	-0.92	0.40	*	-0.97	0.39	*	-0.99	0.39	*
Working over 45 hours	-1.87	0.55	**	-1.95	0.55	**	-1.94	0.55	**
Lone woman	(reference)								
Woman with partner	0.70	0.38		0.66	0.37		0.67	0.37	
Lone man	-2.91	0.62	**	-2.95	0.62	**	-2.93	0.62	**
Man with partner	0.15	0.37		0.09	0.36		0.08	0.36	
Educational level (ISCED)									
1	0.78	0.63		0.70	0.62		0.69	0.62	
2	1.68	0.68	*	1.60	0.67	*	1.57	0.67	*
3	1.59	0.66	*	1.47	0.66	*	1.47	0.65	*
4	2.71	1.13	*	2.51	1.13	*	2.44	1.12	*
5	1.27	0.69		1.08	0.68		1.04	0.68	
6	0.05	1.89		-0.53	1.87		-0.53	1.87	
Constant	4.64	1.37	**	4.74	1.34	**	4.40	1.33	**
Log likelihood		-25203.9			-25150.6			-25145.0	
LR test versus previous model	Chi ²	448.11	**	106.61	**		11.28	**	
	DF	41		1			2		

N = 6950

Method: random effects estimates controlling for clustering at the level of grandparents (level 2: 4042 clusters) within countries (level 3: 10 clusters) (see text for details on covariance structure)

** and * refer to statistical significance levels of respectively >99% and >95%

4.2. The importance of matrilineal descent (model 2)

The second phase of our empirical analysis addresses a hypothesized preference of grandparents for grandchildren of matrilineal descent. This can be easily checked using the random effects estimation approach of the previous section. We add the sex of the child, parent of the grandchildren, to the specification (Model 2 in Table 3) and observe, consistent with the hypothesis and earlier estimates on similar data of Hank and Buber (2009) and Danielsbacka et al. (2011), that grandparents tend to spend less childcare time on children of their sons than children of their daughters (minus more than 2 hours, 55% of the average grandparental childcare).

Moreover, we can see in Table 3 that the effect appears to be additively independent of other characteristics. The inclusion of the sex of the child does not alter the point estimates nor the significance of any of the other determinants.^{8 9}

4.3. The need for informal care as an alternative explanation for gender differences (models 3 and 4)

As we explained in section 2, the motive underlying this gendered pattern of care contributions may be related to gene transmission or gender norms, which cannot be differentiated in model 2. However, the data do allow us to elaborate on the gendered pattern of care needs. Because we know that many women adjust their employment status when becoming a parent, while the latter is much less the case for men, we hypothesize that the situation of non-employment or part-time employment may have a different need association for male children than for female children. Therefore, we introduce in model 3 an interaction effect between the sex of the child and her/his employment status.

Interestingly, the estimates of model 3 strongly qualify the sex effect observed earlier (Danielsbacka et al. 2011; Hank and Buber 2009; Michalski and Shackelford 2005; Pollet, Nelissen and Nettle 2009). In fact, the estimates suggest that need rather than sex drives the relatively higher contribution of grandparents to the care for their grandchildren. Only daughters active in the labor market are beneficiaries of increased care, which cannot be explained by gene transmission motives, because the latter predicts a uniform rather than a partial sex effect. Conversely, the estimates do allow a gender norms explanation, because employed

⁸ The only exception seems to relate to lone parents, who are predominantly women.

⁹ We also tested this hypothesis with a t-test on the estimated error term of Model 1, i.e. before the inclusion of the sex of the child. The unexplained part of the variance proved to be significantly different between men and women, with a mean difference of 1,95 and a t-value of 9,58 (>99,99%).

daughters get more help than employed sons,¹⁰ which follows from the idea that care is a female responsibility and help is required when the prime caretaker (the daughter, not the son) has other pressing time demands (paid employment).

Given the variety in public care arrangements that we discussed in section 2, one can additionally hypothesize that need is not only linked with (maternal) employment, but also varies with the formal care alternatives offered by the state. This is also reflected in the results of specification 3. In countries with a fairly high coverage of formal care services or pre-school (56% and over; taken from Table 2: Netherlands, Spain, Belgium, Sweden, France and Denmark), grandparents spend on average less time on care for their grandchildren.

Model 4 (see Table 4 below) elaborates on the latter. We interacted the formal care supply variable with the employment situation and sex of the child, rather than using it in an additively separate way as in models 1 to 3. It turns out that neither the sex, nor the employment effect is found in all types of countries. We set a non-employed daughter living in a country with only a limited service offer as the reference case and observe that only two living situations are estimated to engender a clearly distinct help level of grandparents. They belong both to countries in the lowest level of service offer (i.e. Greece and Austria) and reflect daughters working as an employee and sons being self-employed. Again, these estimates can be reconciled with a perceived need explanation, but not with gene transmission motives.

¹⁰ Wald coefficient tests confirm that the parameter estimates of employees and self-employed individuals differ between the sexes (Chi²-values of 11.5 and 107.8 for respectively the employees and the self-employed, both with 1 degree of freedom, both statistically significant at a level of over 99%).

Table 4. Random effects estimates of the weekly hours spent on childcare: focus on child's employment, sex and country service level

	Model 1			Model 2			Model 3			Model 4					
	Coeff.	Std. Error		Coeff.	Std. Error		Coeff.	Std. Error		Coeff.	Std. Error				
Characteristics of the child and her/his children (grandchild set)															
Coverage Rate Formal Care (Country level)									Sex x Coverage Rate x Employment						
28-32%	(reference)									Daughter	28-32%	No job (reference)			
47-49%	-1,63	1,37		-1,70	1,31		-1,69	1,30				Employee	3,56	0,90	**
56-62%	-2,05	1,14		-2,15	1,10		-2,18	1,08	*			Self-employed	3,49	1,89	
81%	-3,22	1,73		-3,30	1,67	*	-3,35	1,65	*		47-49%	No job	-1,51	1,49	
												Employee	1,46	1,47	
Employment of child															
No market work	(reference)											56-62%	No job	-1,46	1,27
Employee	0,61	0,29	*	1,68	0,31	**						Employee	0,20	1,23	
Self-employed	1,94	0,47	**	3,29	0,48	**						Self-employed	2,00	1,51	
												81%	No job	-2,88	2,00
Sex of child (1=Son, patrilineal descent)															
				-2,38	0,23	**						Employee	-1,41	1,80	
												Self-employed	-1,00	3,19	
Daughter without job (reference)															
Daughter, employee							2,10	0,33	**			Employee	-0,64	0,82	
Daughter, self-employed							3,78	0,70	**			Self-employed	4,02	1,67	*
Son without job (reference)															
Son, employee							0,16	0,79			47-49%	No job	-1,74	2,24	
Son, self-employed							-0,51	0,32				Employee	-1,87	1,45	
							1,11	0,55	*			Self-employed	-1,14	1,64	
											56-62%	No job	-1,23	1,54	
												Employee	-2,22	1,23	
												Self-employed	-0,28	1,37	
											81%	No job	-4,76	2,90	
												Employee	-2,33	1,79	
												Self-employed	-3,51	2,42	
Constant	4,64	1,37	**	4,74	1,34	**	4,40	1,33	**				3,88	1,43	**

Model 4: Log likelihood -25135,3 ; LR test versus previous model Chi² 19,26 (with 14 degrees of freedom: not significant at conventional levels).

See previous table for the full set of explanatory variables. In model 4 none of estimates differs from model 3 with more than 0.05 (significance =)

5. Discussion and conclusions

In this paper we addressed the behavior of grandparents relating to their infant grandchildren and more specifically their motives to provide help with childcare. In the economic literature, this particular life period has hardly received attention. Conversely, parental action towards non-adult children has been studied extensively and therefore, we first approached the question through the application of the analysis of the parent-child relationship to the grandparent-grandchild interaction. We developed an altruistic model of grandparents with infant grandchildren and showed - unsurprisingly- that much depends on the (compound) utility function of the grandparent at hand. However, keeping the latter constant, we also saw that costs to realize childcare assistance may explain variation in the provision of childcare to grandchildren. Consequently, external factors influencing the relative impact of grandparents on the life outcomes of their grandchildren (e.g. time to reach the house of their grandchildren) are likely to determine both their inclination to make an effort at all (compared with actions that will deliver personal utility directly) and the way they distribute their efforts over the various grandchildren.

Furthermore, we described how the efforts of grandparents towards their infant grandchildren can be driven by less altruistic motives. We discussed two non-altruistic theories of grandparental behavior that add specific, identifiable elements to the more general behavioral model offered by the altruistic approach. The personal care motive may drive grandparents towards a behavioral focus on one particular child (and set of grandchildren), because grandparents want to guarantee that they receive proper care when becoming frail and therefore maximize "moral debt" (a risk reduction strategy). Alternately, the gene transmission motive predicts that grandparents favor children and grandchildren of maternal descent, because there always remains some doubt about paternity and, hence, about the effective transmission of their own genes through fathers. Yet, a preference towards matrilineal descendants can equally be explained by the common gendered pattern of care, which facilitates care efforts of grandmothers to daughters and their offspring. Irrespective of the explanation, however, a larger care effort can be expected towards the children of daughters than of sons.

For the subsequent empirical tests, we relied on a large sample of grandparents living in 10 European countries, taken from the SHARE-dataset of 2004. First, we showed that much as in earlier work on American grandparents, European grandparents tend to be sensitive to a whole range of general cost and preference elements (e.g. distance, gender of the grandparent, employment situation of the grandparent, age of the grandchild, number of grandchildren). Interestingly, we noted that part-time work does not seem to cause a hindrance for grandparents. In our pan-European dataset, part-time workers provide just as many hours of childcare as non-employed grandparents (*ceteris paribus*).

Regarding the specific hypotheses on a gendered care pattern, we reproduced the difference between childcare offered to daughters and sons, found earlier for the Netherlands and the UK (Pollet et al., 2009) and for the collection of countries in the SHARE-dataset (Danielsbacka et al. 2011; Hank and Buber 2009). Controlling for other characteristics, daughters (and their children) get almost two and a half hours a week more of grandparental help with childcare (55% of the average weekly childcare help of grandparents).

However, in the last part of our analysis we elaborated on explanations for this apparent daughter preference and found that the 'perceived need of support' strongly qualifies the sex difference. Lone parents and employed daughters are the specific categories of children that receive more grandparental care than on average. Moreover, if we interact the employment situation with the country specific level of supply of formal care services and pre-primary education, we find no son/daughter distinction at all anymore. Employment in a country with a comparatively low level of service supply is then found to be the driving factor. Consequently, a structurally selective preference in favor of the (children of) daughters cannot be sustained by the European data. In other words, the gene transmission motive (the only non-altruistic theory our data allow to test) is not supported empirically.

All in all, we find empirical evidence that is most consistent with 'fairness' and 'individual efficiency'. Grandparental childcare efforts are determined by objective determinants. These objective determinants can be interpreted as indications of a Becker like time allocation reasoning of grandparents ('efficiency'). Yet, they are likely to serve as a justification of the distribution of their efforts, as well. In stated preference surveys, grandparents indicate that maintaining good relations with their children is an important motive for their actions. Being able to explain differences ('fairness'), is definitely helpful to avoid conflicts between children over grandparental help.

Finally, one may wonder if grandparental help with childcare is a strategic complement to the well-documented bequest motive in intergenerational relations. Brown (2006) showed recently that a strict bequest motive is hard to sustain empirically, because (grand)parents have difficulties to condition their estate division effectively on care efforts of their (grand)children and bequest are often small when compared with the total care time typically spent by children for their frail parents. She argues instead of a 'resource constrained altruistic' explanation, which means that (grand)parents relatively favor children whom they expect to engage in elderly care. Their decisions regarding childcare can complement this motive for unequal estate division (e.g. when favoring children living nearby, who are also the most likely care providers in the future), but not all our results are easily reconciled with this motive (e.g. non-employed daughters are more likely care providers than employed daughters, while the latter get more childcare help than the former). We leave a proper

exploration of the links between estate division and childcare help for future work, when the SHARE-survey will have developed into a panel survey and allows for more dynamic sibling comparisons.

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Suggestions by participants at a Lunch Seminar of the Department of Economics (University of Antwerp), by Karel Van den Bosch and Aaron Van Den Heede are gratefully acknowledged.

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Annexes

Table 5. Basic descriptives

		%	Mean	Min	Max
Characteristics of the child and her/his children (grandchild set)					
Distance from home of grandparent	Less than 1 km	20.7			
	1-24 km	47.2			
	25-99 km	14.4			
	100-500 km	10.8			
	Over 500 km	7.0			
Number of grandchildren (in set)			1.8	1	9
Birth year of youngest grandchild (in set)	Before 1993	11.8			
	1993-2000	29.2			
	2001	13.3			
	2002	15.3			
	2003	17.1			
	2004	13.4			
Lone parent (1=Yes)		14.8			
Coverage Rate Formal Care (Country level)	28-32%	11.9			
	47-49%	17.4			
	56-62%	63.2			
	81%	7.5			
Employment of child	No market work	18.1			
	Employee	73.8			
	Self-employed	8.1			
Sex of child (1=Son, patrilineal descent)		47.5			
	Daughter without job	16.1			
	Daughter, employee	33.7			
	Daughter, self-employed	2.7			
	Son without job	2.1			
	Son, employee	40.1			
	Son, self-employed	5.4			
Characteristics of the grandparent (respondent)					
Total number of grandchildren			4.1	1	18
Age			63.1	42	90
Age spline (country specific)(descriptives on non-zero cases)					
Years before average age at early retirement		38.1	-4.8	-13	-1
Years after average age at early retirement		15.1	2.4	1	7
Years after official age of retirement		40.7	6.9	1	20
Current employment	No market work	70.1			
	Working part-time	7.3			
	Working standard full-time	16.5			
	Working over 45 hours	6.1			
Lone woman		17.9			
Woman with partner		36.3			
Lone man		5.3			
Man with partner		40.5			
Educational level (ISCED)	0	5.5			
	1	28.7			
	2	18.4			
	3	27.5			
	4	1.8			
	5	17.6			
	6	0.5			

Reconstruction of a weekly amount of childcare time

In the questionnaire respondents are first asked whether they help their children out with childcare, then asked for the frequency of their help and finally for an estimate of the number of hours. Because of this sequence, respondents tend to report hours according to the standard suggested by the frequency. Hence, those who help on a daily basis report hours per day, while those helping out approximately every month tend to refer to hours per month.

To obtain (roughly) comparable time data, we recoded all time indications to a weekly value, using as conversion factors:

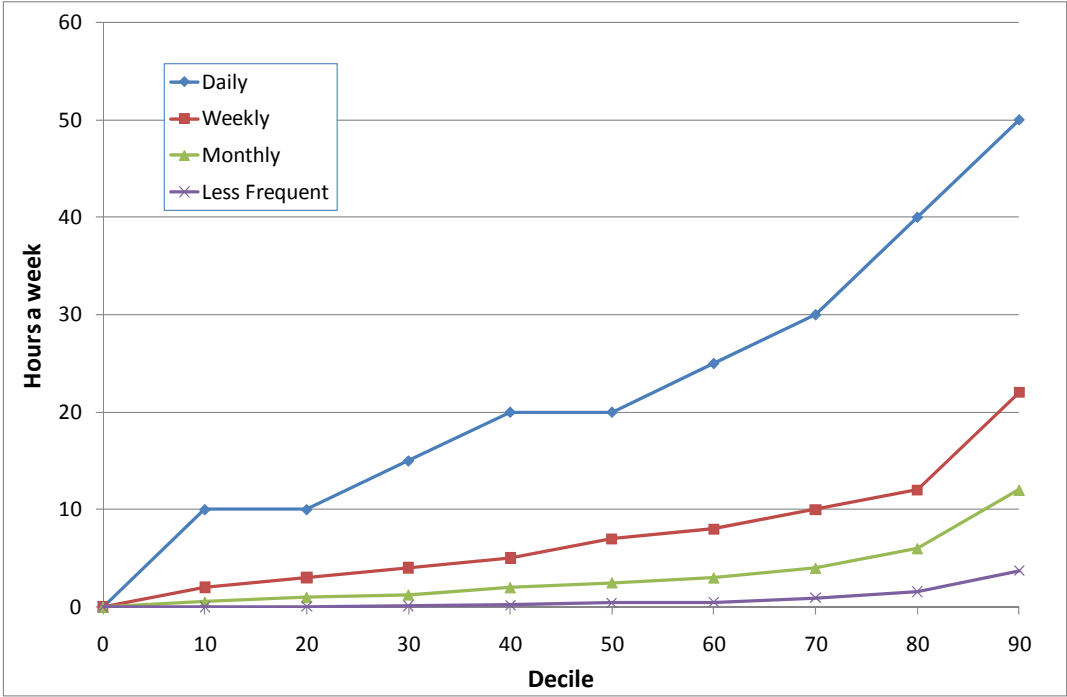
- A daily average was multiplied by 5
- A monthly average was divided by 4
- A response 'less frequent' was treated as a yearly average and divided by 52

Moreover, extreme outliers (top 1%) were top-recoded as 60 hours a week.

Thereafter we verified the credibility of this conversion over the whole distribution per country. For limits of space we report hereafter only a general overview with the decile values per frequency indication, for the sample as a whole. Yet the graphs for every country separately represents completely similar distributions.

Graph 1 shows that respondents indicating that they help with childcare on a daily basis, report consistently more hours than respondents indicating a weekly frequency, and so on for all frequency indications. The expected hierarchy of frequency indications is nicely observed over the full decile distribution.

Graph 1. Childcare time spent per week (decile values, per grandchild set)



References

- Brown, Meta (2006) Informal Care and the Division of End-of-Life Transfers. *Journal of Human Resources* 41(1): 192-219.
- Cigno, Alessandro (1991) *Economics of the Family*. Clarendon, Oxford.
- Danielsbacka, Mirikka, Antti O. Tanskanen, Markus Jokela, and Anna Rotkirch (2011) Grandparental child care in Europe: evidence for preferential investment in more certain kin. *Evolutionary Psychology* 9(1): 3-24.
- Dubas, Judith Semon (2001) How gender moderates the grandparent-grandchild relationship: a comparison of kin-keeper and kin-selector theories. *Journal of Family Issues* 22(4): 478-492.
- Ermisch, John (2003) *An Economic Analysis of the Family*. Princeton University Press, Princeton.
- Friedman, D., M. Hechter, and D. Kreager (2008) A theory of the value of grandchildren. *Rationality and Society* 20(1): 31-63.
- Hank, Karsten, and Isabella Buber (2009) Grandparents caring for their grandchildren: findings from the 2004 Survey on Health, Ageing and Retirement in Europe. *Journal of Family Issues* 30(1): 53-73.
- Kooreman, Peter, and Sophia Wunderink (1996) *The Economics of Household Behaviour*. MacMillan, Houndsmills.
- Michalski, Richard L., and Todd K. Shackelford (2005) Grandparental investment as a function of relational uncertainty and emotional closeness with parents. *Human Nature* 16(3): 293-305.
- Mueller, M. M., and G. H. Elder (2003) Family contingencies across generations: grandparent-grandchild relationships in a holistic perspective. *Journal of Marriage and Family* 65(3): 404-417.
- Pollet, T. V., M. Nelissen, and D. Nettle (2009) Lineage based differences in grandparental investment: evidence from a large British cohort study. *Journal of Biosocial Science* 41(3): 355-379.
- Uhlenberg, Peter, and Hammill G. Bradley (1998) Frequency of grandparent contact with grandchild sets: six factors that make a difference. *The Gerontologist* 38(3): 276-285.