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## Should We Care that They Care? Grandchild Care and Its Impact on Grandparent Health

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# Working Papers

## Should We Care that They Care? Grandchild Care and Its Impact on Grandparent Health

Janina Reinkowski

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# Should We Care that They Care? Grandchild Care and Its Impact on Grandparent Health\*

## Abstract

This paper investigates the impact of occasional grandchild care on grandparent health using the pan-European dataset SHARE on elderly people. We find a small but statistically significant positive correlation between grandchild care and physical health, cognitive functioning and mental health. These relationships are robust to controlling for socio-demographic characteristics, social engagement, and intergenerational support. Using propensity score matching, we can show that the findings are also robust to the underlying functional form. To see whether they can be interpreted as causal, we exploit the panel character of the data and use an instrumental variable approach. Applying these methods, the effects seem to be smaller than the OLS correlations suggested.

JEL Code: I1, J13, J14.

Keywords: Grandparent health, grandchild care.

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# 1 Introduction

Increasing life expectancy and declining fertility rates are dominant demographic characteristics of most Western economies. Europe, in particular, is an ageing continent. According to mainstream projections, by 2025 more than one-fifth of the European population will be age 65 or older, with the number of persons more than 80 years old growing especially rapidly. This trend will put a great deal of pressure on most societal systems, including social insurance and healthcare. For example, the total spending for age-related health care is expected to sharply increase. In most European countries, public health expenditures have already doubled their share of GDP since the 1970s. Currently, these expenditures are as much as 11% of the national GDP in some European countries (Przywara 2010).

At the same time, female labour supply has increased considerably, supported by an increase in public child-care provision. Appropriate public solutions for childcare have become a significant aspect of family and labour market policy. However, publicly-financed childcare is not the only option parents might have. For many, informal childcare by friends, neighbours, and, most importantly, grandparents is an attractive alternative. Potential advantages of informal childcare include its flexibility, a better fit to personal needs, and accessibility at short notice as well as during nonbusiness hours. What makes informal childcare a particular relevant object of study is that it not only helps women combine labour force participation and family life, but it may also affect those providing it. Qualitative studies of this issue in Britain show that most of the informal care is provided by grandparents (Wheelock and Jones 2002).

Thus, in light of an increasing number of grandparents available for grandchild care due to their increasing life expectancy combined with working parents relying on grandparents for childcare, this paper investigates how grandchild care affects the older generation.

Scholars identify two potential ways grandchild care could affect grandparent health. On the one hand, grandchild care can be rewarding and thus allow the grandparent to derive more satisfaction from the role of being a grandparent (Pruchno 1999), leading to a positive effect on the grandparent's health. Being a grandparent has a positive impact on the life satisfaction of the elderly (Powdthavee 2011) and grandchild care strengthens intergeneration relations (Pruchno 1999). Occasional grandchild care (200 to 500 hours per year) increases the likelihood of exercising and of reporting fewer functional limitations. Moreover, those who continue to provide this level of care show fewer depressive symptoms (Hughes et al. 2007). On the other hand, the responsibility and the associated physical and mental stress of providing such care may harm the health of the elderly (Hughes et al. 2007). Indeed, some empirical literature finds that custodial grandchild care (National Family Health Survey, NFHS) and grandchildren joining the grandparent household (Health and Retirement Survey, HRS) have a detrimental effect on grandparent health (Blustein et al. 2004; Szinovacz and Davey 2006; Fuller-

Thomson et al. 1997; Szinovacz et al. 1999). However, grandparents in this situation might also be experiencing harmful effects from the circumstances resulting in the need for them to care for their grandchildren and thus one must be careful in interpreting the negative health outcome as purely a consequence of grandchild care. Grandchild care shows a negative effect on health only in cases of long hours or full-time care and low income (Hughes et al. 2007), which suggests that it may be the intensity of grandchild care that is an important determinant of its effect on grandparent health.

This study looks at the effect of occasional grandchild care on physical health, cognitive functioning and mental health of grandmothers in Europe. Using a representative European dataset on the elderly (SHARE), we find that the positive correlation between grandchild care and grandparent health persists when controlling for several possible channels that might induce the correlation. We employ semi-parametric propensity-score-based matching, as an alternative to OLS, to check the robustness of the results to underlying functional form of the estimation approach. To see whether this relation can be interpreted as causal, we exploit the panel character of the data using lagged dependent variable and fixed effects estimation, and adopt an instrumental variable approach; these causal effects are less clear-cut.

The remainder of this paper is organized as follows. Section 2 discusses the underlying theoretically expected link between childcare and health status and provides some examples of the motivations and circumstances under which grandchild care takes place. Section 3 reviews the empirical literature on the topic. Section 4 presents the data and Section 5 discusses the empirical results. Section 6 concludes.

## **2 Why Do Grandparents Offer Care, and Why Do Their Children Request It?**

Grandparents and parents agree on grandchild care for various reasons, and the motivation for and the circumstances of grandchild care may have much to do with how providing it affects grandparent health.

First, grandparents may want to spend time with their grandchildren. Powdthavee (2011) shows a positive impact of being a grandparent on the life satisfaction of the elderly, and this effect might coincide with grandchild care. As grandparents usually do not have primary responsibility for the child, but may receive a great deal of unconditional affection, grandchild care can be very rewarding. Providing care also gives grandparents the opportunity of handing down knowledge from their own life experience.

Second, grandparents may wish to provide grandchild care in order to help their children. Raising children and assuring the economic welfare of a family at the same time can be demanding and parents with young children may feel relieved if they can rely on their parents for help with childcare.

Third, grandparents might also take into account intertemporal reciprocity. One day, they themselves will need help. Grandparents may provide grandchild care to their children today in the expectation of receiving care in return when they need it. This would be consistent with findings by Cox and Rank (1992), who find inter-vivos (between living) transfers to be more based on exchange than on altruism.

When looking at the “demand side” explanation for grandchild care, that is, children asking their parents to provide grandchild care, three examples help illustrate how the nature of care can depend on family structure and labour market behaviour.

First, take the case of a family in which one parent works and one parent looks after the children. In this case, grandparental care is not needed in a strict sense, and thus may be of an optional and irregular character. The core family is relatively flexible concerning its demand for grandchild care. The task thus can be adapted to personal preferences of the grandparent.

The second example involves two types of families: single parents and intact families with a double income, that is, both parents are working. In both types of family, parents are responsible for childcare and for the financial situation of the family. In this situation, the care-providing grandparent will need to adapt his or her personal life to the schedule of the core family. Even if the family has access to public childcare, due to restrictive open hours, high cost, and long working hours, demand for care is less flexible. The family relies on the grandparent to take on a certain amount of responsibility, maybe provide spontaneous care if needed, and spend more hours providing care.

A third example is highly intensive grandchild care, for example, custodial care or cases where the grandchildren live in the same household as the grandparents. In these situations, the grandparents have primary responsibility for their grandchildren. This can occur when the grandchildren’s core family falls apart due to drug abuse, incarceration, or the death of a parent. As the literature review will show, these types of grandchild care are likely to result in poor grandparent health. However, it must be remembered that it could be the circumstances leading to the need for intensive grandchild care that are causing the poor health outcome, not necessarily the provision of care itself.

### **3 Previous Literature**

There are two strands in the literature on grandparent childcare. The larger body of sociological, gerontological, and health-related literature focuses on highly intensive and custodial grandchild care, which often leads to a negative effect on grandparent health. Only a handful of studies looks at “occasional” childcare, and this work finds that providing this type of childcare is beneficial for the health of grandparents.

However, it could be the initial health endowment and socio-demographic characteristics that lead to these diverging effects if grandparents self-select into the

different types of care. Fuller-Thomson and Minkler (2001) look at the characteristics of grandparents and the sort of care they provide (occasional, extensive, or custodial grandchild care). They find that the population of occasional care providers is less likely to be poor and more likely to have completed high school. Extensive and custodial caretakers are similar in their characteristics; however, extensive care is more likely to be provided by younger and married grandmothers who are living in close proximity to an adult child. The probability of providing custodial grandchild care is strongly influenced by co-residing children and the loss of a child (Fuller-Thomson et al. 1997). In the US, compared to non-care-providing grandparents, care-providing ones are at an initial health disadvantage, but the activity itself does not make their health worse (Hughes et al. 2007; Musil et al. 2011). Grandmothers who start or continue to provide occasional care report better self-rated health than non-care-providing grandmothers. Those grandmothers who start providing 200 to 500 hours of care per year are more likely to exercise, to report fewer functional limitations, and those continuing this level of care show fewer depressive symptoms. Grandparents who continue to provide 200 hours or increase their hours of care also increase their probability of exercising. Only long hours or full-time care and low income providers of grandchild care seem to suffer a negative effect on health (Hughes et al. 2007). Two recent papers use instrumental variable approaches to overcome the endogeneity of grandchild care. The instruments they use are grandparenthood (Arpino and Bordone 2012), the number of grandchildren and marital status of adult children (Ku et al., 2012). Both studies find a positive effect, on cognitive functioning (Arpino and Bordone 2012) as well as a reduction of mobility limitations (Ku et al., 2012). These instruments base on the assumption, that children do not take the provision of grandchild care by their parents into account, when deciding on their fertility. Gete and Porchia (2010) and Garcia-Moran and Kuehn (2012), however, show that children do take the availability and the current provision of grandchild care to the offspring of their siblings into account.

The larger part of the literature focuses on primary and custodial grandchild care, and much of this work relies on very small, and often unrepresentative, datasets. Burton (1992) uses a sample of grandparents that took care of their grandchildren because the grandchildren's parents were absent due to drug abuse. Based on in-depth interviews, Jendrek (1994) reports that grandparents engaged in primary care giving mainly to avoid their grandchildren being placed in foster care, and that they started to provide care long before a custody relationship had been established. The problems these grandparents face are manifold and range from financial difficulties to stress-related illnesses and social isolation (Roe and Minkler 1996). Miller (1991) reports an increased incidence of depression, insomnia, hypertension, back and stomach problems, and so forth due to the physical or emotional demands of taking on the role of grandparent caretaker. Deterioration in self-rated health is most likely for working grandchild care providers, great-grandmothers, and those caring for several

grandchildren (Roe et al. 1996). Care-providing grandparents also report that the high demands of care provision lead to cancelling a medical appointment within the past year.

The research using large datasets also tends to concentrate on highly intensive care. The National Survey of Families and Households (NSHF), focuses on custodial or primary care, and the Health and Retirement Survey (HRS), asks about grandchildren living in the same household as the responding grandparent. Still, many of the health deficits among these grandparents are not caused by grandchild care provision, but are due to their socioeconomic characteristics and to prior health status (Hughes et al. 2007). Compared to non-care-providing grandparents, custodial-care-providing grandparents show significantly higher functional health limitations (Minkler and Fuller-Thomson 1999), they are more likely to be poor, to have a low level of education, and to be socially isolated and depressed. Minkler et al. (1997) look at the impact of custodial grandchild care and add lagged depressive symptoms as well as self-rated health status and social integration to the general socio-demographic characteristics. They find the effect of grandchildren moving into the grandparent's household to have an ambiguous impact on health. Bulstein et al. (2004) find no detrimental effect of grandchildren living in the same household if a partner or an adult child co-resides. For grandmothers who live alone, however, grandchild care is found to increase the probability of reporting depressive symptoms. Szinovacz et al. (1999) look at the general well-being of caring grandparents and control for changes in marital status, care giving to other family members, and spouse's health as potential risk factors influencing grandparent health. They find a significant negative impact of starting care on the grandmother's health, as well as reduced church attendance and a lower frequency of socializing. At the same time, however, the support grandparents receive from friends and relatives increases.

Grandfathers are mostly involved in grandchild care if they co-reside with a care-providing grandmother, and the literature does not find significant benefits to these men from a co-residing grandchild, but finds detrimental effects of grandchildren moving out of the household (Szinovacz et al. 1999).<sup>3</sup>

Thus, it appears that custodial grandchild care is likely to coincide with a disadvantageous social background; however, the more common type of care is occasional grandchild care, and grandparents are likely to benefit from it.

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<sup>3</sup> Other consequences of grandchild care, such as child outcomes and the mid generation's labor supply, are also covered in the literature. Child outcomes of children raised by their grandparents are better than those of children raised by a single parent and not significantly different from those raised in intact families when it comes to behavioral and health aspects. However, they do differ in their academic performance (Solomon and Marx 1995). Grandchild care highly correlates with geographical proximity to the grandmother and has a strong positive impact on the female labor supply of the mid generation (Compton and Pollak 2011; Dimova and Wolff 2008, 2011).



## 4 Data and Estimation Method

### 4.1 Survey of Health, Ageing and Retirement in Europe (SHARE)

We use the Survey of Health, Ageing and Retirement in Europe (SHARE). Participating countries are: Austria, Belgium, Czechia, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden and Switzerland. The dataset covers the non-institutionalized (i.e., not living in nursing homes, etc.) population aged 50 and older and their spouses (who are interviewed even if they are younger than 50). The multidisciplinary dataset consists of three panel waves from 2004/2005, 2006/2007 and 2011/2012. The 2008 questionnaire focuses on retrospective life history and does not cover grandchild care information.

The panel questionnaire covers socioeconomic status and social and family networks, and is comparable across countries. Detailed health information is available. To improve statistical power, we generate an index of physical health from a set of five indicators: the number of chronic condition (diabetes, high blood pressure, chronic lung disease etc.), the number of symptoms (back pain, heart trouble, swollen legs etc.), number of limitations concerning mobility, arm function and fine motor limitations (walking 100 meters, sitting for about two hours, climbing several flights of stairs without resting etc.), number of limitations with activities of daily living (adl, like dressing, walking, bathing etc.), number of limitations with instrumental activities of daily living (iادل, like using a map, preparing a hot meal or shopping groceries).

For chronic conditions and the number of symptoms, the waves provide varying numbers of categories; we use only those available in all waves and subsume all those not available in all waves into the category of other condition. Cognitive functioning measures memory, i.e. the immediate and the delayed recall of up to ten words.

The indices consist of the equally weighted average of the z-scores of their components. Components are recoded if necessary, so that the highest value is the most preferable. The z-scores are obtained by subtracting the mean in the estimation sample (after dropping all observations showing missing observations in any of the components) and dividing by the standard deviation. The standardized components, thus, have a mean of zero and a standard deviation of one. To generate the indices, we then sum the standardized components and divide this sum by the number of components.

Mental health is generated using the standardized Euro-D depression index, which sums the number of depressive symptoms a person reported to have experienced. Depressive symptoms include, for example, trouble sleeping, self-blame, guilt, suicidal feelings, and loss of interest or appetite (for descriptive analyses, see Table 1).

**Table 1 Descriptives: Health outcomes, grandchild care and socio-demographics**

Variable	Description	Obs	Mean	StdDev	Min	Max
#Chronic conditions	diabetes, high blood pressure, chronic lung disease etc.	29427	8.4533	1.3138	1	10
#Symptoms	back pain, heart trouble, swollen legs etc.	29427	10.0033	1.9580	0	12
Mobility	number of limitation concerning mobility, arm function and fine motor limitations (walking 100meters, sitting for about two hours, climbing several flights of stairs without resting etc.)	29427	8.2852	2.2298	0	10
#ADL	number of limitations with activities of daily living (dressing, walking, bathing etc.)	29427	5.8319	0.6611	0	6
#IADL	number of limitations with instrumental activities of daily living (using a map, preparing a hot meal or shopping groceries)	29427	6.7204	0.7946	0	7
Immediate recall	counts of recalled words out of ten words that were asked to remember	29427	5.2594	1.7480	0	10
Delayed recall	counts of recalled words out of ten words that were asked to remember	29427	3.8730	2.0724	0	10
Euro-D	number of depressive symptoms for example trouble sleeping, self-blame, guilt, suicidal feelings, and loss of interest or appetite.	29427	9.2655	2.3315	0	12
Grandchild care	average weekly hours of grandchild care	29427	8.8314	12.4413	0	38.7
Care frequency	Never cared in the last 12 months	29427	0.3552	0.4786	0	1
	less than montly	29427	0.1532	0.3602	0	1
	almost every month	29427	0.1309	0.3373	0	1
	almost every week	29427	0.2283	0.4197	0	1
	almost daily	29427	0.1324	0.3390	0	1
Age	age in years	29427	64.0242	8.0624	45	90
Education	low education (isced1/2)	29427	0.5059	0.5000	0	1
	medium education (isced3/4)	29427	0.3264	0.4689	0	1
	higher education (isced5/6)	29427	0.1677	0.3736	0	1
Married	1 if married	29427	0.7311	0.4434	0	1
Widowed	1 if widowed	29427	0.1601	0.3667	0	1
Retired	1 if retired	29427	0.4819	0.4997	0	1
Employed	1 if employed	29427	0.2265	0.4186	0	1
Unemployed	1 if unemployed	29427	0.0326	0.1777	0	1
Sick	1 if chronically ill	29427	0.0388	0.1931	0	1
Homemaker	1 if homemaker	29427	0.2201	0.4143	0	1
Homeowner	1 if owns real estate	29427	0.5167	0.4997	0	1
#Children	number of children	29427	2.6864	1.3134	1	17
#Grandchildren	number of grandchildren	29427	3.9315	3.0569	0	23
Retired b/o health	1 if retired early because of bad health	29427	0.0592	0.2360	0	1

A mayor advantage of SHARE compared to HRS and NFHS is that it provides the age of the youngest grandchild for each respondent, (HRS data report only the age of co-

residing grandchildren, and NFHS concentrates on primary or custodial care). In the SHARE questionnaire, all elderly who claim to have grandchildren are asked whether they provided grandchild care.

Those who answer “yes” are then asked for the frequency of care (less than monthly, almost every month, almost every week, almost daily), and, based on that frequency, they are also asked for the number of hours of care in wave 1 and 2 (the third wave provides the care frequency, but not the hours of care). From this information we calculate the weekly caring hours in the first two waves.

To optimize interpretability of the care frequency, we replace the standard values of the categorical variable by the mean weekly hours of grandchild care these categories had in the first two waves (0 for no care, 38.7 hours per week for almost daily, 11.3 hours per week for almost every week, 5.8 hours per week for almost monthly and 2.4 hours per week for less than monthly care). This adjustment means we do not have to assume that the categories have linear effects; it also aids interpretation of the coefficients.

**Table 1 Descriptives: Health outcomes, grandchild care and socio-demographics (contd<sup>2</sup>)**

Variable	Definition	Obs	Mean	StdDev	Min	Max
Closest child	same house/household	25618	0.2771	0.4476	0	1
	within a 5-km radius	25618	0.3845	0.4865	0	1
	5km to 25km	25618	0.1807	0.3848	0	1
	25km to 100 km	25618	0.0863	0.2809	0	1
	over 100km	25618	0.0714	0.2575	0	1
Contact frequency	no contact	25618	0.1954	0.3965	0	1
	contact less than monthly	25618	0.2869	0.4523	0	1
	contact almost every month	25618	0.3432	0.4748	0	1
	contact almost every week	25618	0.1436	0.3507	0	1
	contact almost daily	25618	0.0308	0.1729	0	1
Received help	1 if received any help from a child	25618	0.1958	0.3968	0	1
Given help	1 if given any help to a child	25618	0.3200	0.4665	0	1
Charity	1 if done voluntary/charity work weekly	25618	0.0805	0.2721	0	1
Attend training	1 if attended educational or training course weekly	25618	0.0403	0.1967	0	1
Sport	1 if gone to a sport, social, or other club weekly	25618	0.1585	0.3652	0	1
Church	1 if taken part in activities of a religious organization weekly	25618	0.0934	0.2910	0	1
Politics	1 if taken part in a political or community-related organization weekly	25618	0.0107	0.1031	0	1

We restrict the sample to 45- to 90-year-old females who report having at least one grandchild aged 16 or younger and have complete survey records. The final sample consists of about 29,461 grandmothers. Table 1 sets out variable definitions and descriptives of the measures for health and the explanatory variables.

## 4.2 Variable Selection

As a first step, we employ pooled OLS estimation to measure the partial correlation between grandchild care and grandparent health. However, a simple bivariate correlation might be misleading as healthy grandparents are more likely to be asked, and more likely to feel able, to look after their grandchildren. This would induce causality from the health status to grandchild care, that is, reversed causality. The literature on custodial care does not face this problem as grandparents providing custodial care are not able to make the decision about care provision depending on their health status; instead, due to the circumstances, they feel as though they have no choice but to take in their grandchildren. Occasional care, on the other hand, is likely to be provided voluntarily. The healthier grandmothers thus self-select into grandchild care, which leads to an upward bias of our results.

We control for age and education (dummies for medium and high education, with low education as the reference group), marital status (dummies indicating whether a person is currently married or is widowed; the reference group consists of singles and the divorced as both show similar patterns), current employment status, (dummies for homemaking, employment, unemployment, and chronically ill, with retired as the reference group), and wealth (a dummy variable for owning residence, being member of a cooperative, or owning a secondary home, holiday home, or other real estate or land). We also include the number of children and grandchildren as explanatory variables.

SHARE contains a great deal of information on the life of elderly people, most of which is only partially covered in the literature on custodial care. This allows us to separate the variation caused by confounding factors from the correlation of interest. Potentially distorting factors include support from their children and social engagement. By controlling for these factors, we can discover whether, for a given frequency of contact to one's children, a given amount of social engagement etc., grandchild care still has an effect on grandparent health.

A grandmother providing grandchild care might be healthier because of her care provision; however, it might also be the contact with the children and the support she receives along with grandchild care that leads to better health. For example, contact with the children can lead to health-relevant information exchange; children can give their parents advice on whether to visit a doctor. On the other hand, frequent contact and the receipt of support could also indicate that the grandmother suffers some physical constraints. The frequency of contact is coded here the same way the care frequency is,

with dummies for “no contact”, “less than monthly”, “almost every month”, “almost every week” and for “almost daily.” And we include a dummy indicating the receipt of any help.

Geographic distance to one’s children is likely to determine the frequency of contact to a large extent and to impact the likelihood of a grandparent to provide grandchild care. However, the child’s choice of where to live could be endogenous: grandparents in poor health may have to give up their own household and move in with their children, and children who anticipate that their parents may need help in the future may factor that into their residence location choice (Rainer and Siedler 2009).

Similarly, providing grandchild care is much more likely for grandmothers who have their children nearby, but the expectation of receiving grandchild care might induce children to live close to their parents.<sup>4</sup> Controlling for geographic distance allows us to compare the health of grandmothers living at the same distance from their closest child but who differ in the amount of grandchild care provided.

Also, grandmothers who provide care to their grandchildren might be active in more than one aspect of life. By including various aspects of social engagement, we ensure that we are comparing grandparents who have an equal level of engagement and are thus discovering variation in health caused solely by grandchild care. Social engagement can range from charity work to caring for a sick person to taking part in a religious or political organization. We control for at least weekly engagement in charity or voluntary work, care for a sick or disabled adult, provision of help to a friend, educational training, and participation in a sport, social, or other club or in a religious organization.

### 4.3 Estimation Design

We first use pooled OLS estimation to measure the partial correlation between grandchild care and grandparent health.

We control for all these aspects by including a vector of control variables ( $X_{it}$ ) in the regression equation for the dependent health variable  $y_{it}$ :

$$(1) y_{it} = \alpha + \beta \times GC_{it} + \gamma \times X_{it} + u_{it}$$

Where  $i=1, \dots, N$  denotes the cross-sectional dimension and  $t=1, 2, 3$  is the time index for the different waves of the data. The regressor  $GC_{it}$  measures the influence of grandchild care;  $u_{it}$  is the residual term of the regression equation,  $\alpha$ ,  $\beta$ , and  $\gamma$  are coefficients to be estimated.

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<sup>4</sup> As an example of how to cope with the endogeneity of location choice, Compton and Pollak (2011) look at a sample of mothers with young children whose husbands are serving in the U.S. military: the location of these families is determined by military needs, and is thus exogenous to the grandparents’ location. They find that the labour supply of women living in close proximity to their mothers or mothers-in-law is greater than that of those living distant from parents.

As an alternative, we use a semi-parametric propensity score method. This method does not rely on a particular functional form of the regression equation; the approach is to compare the sample average of the outcome variable of caring grandmothers to grandmothers who have similar characteristics but do not provide grandchild care. The mean difference between the two groups can be interpreted as the average treatment effect, if two assumptions are fulfilled. The first assumption is the conditional independence or unconfoundedness assumption. It implies that systematic differences in the outcome between individuals with the same values of covariates, that is, the same propensity score value in the treatment and the comparison group, are fully attributable to the treatment variable. The assumption is not testable, but it is expected to be fulfilled if all relevant variables are observable. We do not claim to have access to all variables influencing the outcome; however, we have at our disposal a set of care- and health-relevant variables not used in the literature to date, and thus we do make a relevant contribution to this scholarship. The second assumption is the overlap or common support assumption, which postulates that individuals with the same characteristics have a positive probability of both providing and not providing grandchild care.

The estimation strategy consists of two steps. In the first step, the predicted probability of treatment (propensity score) is estimated using a probit model. This propensity score is then used to match observations.

The effect of grandchild care  $\widehat{\theta}_{ATT}$  using the outcome difference between treated (T) and comparison grandmothers (C) can be estimated empirically as:

$$(2) \widehat{\theta}_{ATT} = \frac{1}{N} \sum_{i \in T} [y_{care,i} - \sum_{j \in C} w(i,j) y_{no\ care,j}]$$

where N is the total number of treated grandmothers i,  $y_{care}$  and  $y_{no\ care}$  denote outcome values for treated and comparison observations j, respectively. The match of each treated grandmother is constructed as a weighted average over the outcomes of non-treated, where the weights  $w(i,j) \in [0,1]$  depend on the ‘distance’ between i and j.

The most popular matching method is nearest neighbour matching. However, the mean comparison for Kernel Epanechnikov matching with a bandwidth of 0.06 has the best fit with regard to the mean comparison after matching, see Appendix. Also, Kernel matching has better finite sample properties than k-nearest neighbour matching functions (Frölich 2004).

OLS and propensity score matching both build on the assumption, that all characteristics influencing grandparental health and grandchild care provision can be observed in practice. However, there may exist differences that cannot be observed.

Fixed effects and lagged dependent variable estimation both make use of the time dimension of our data sets and allow us to control for time fixed characteristics influencing grandchild care and grandparent health. Fixed effect estimation makes use of the changes from the individual mean over time.

We control for this individual mean by including an observation fixed intercept  $\alpha_i$

$$(3) y_{it} = \alpha_i + \beta \times GC_{it} + \gamma \times X_{it} + u_{it}$$

While the lagged dependent estimation uses the outcome in an earlier period,  $health_{it-1}$ , as a proxy for unobserved individual fixed characteristics.

$$(4) y_{it} = \alpha + \beta \times GC_{it} + \gamma \times X_{it} + y_{it-1} + u_{it}$$

Our estimates might, however, still be biased, if there are time-varying unobservables correlated with the variables of interest. We thus use exogenous variation in the amount of grandchild care to cope with this issue.

We use an instrumental variable that leads to a change in the provision of grandchild care but which is expected to be otherwise unrelated to the health of a grandmother: the gender of the firstborn child. This instrument relies on the random distribution of a child's gender. Its influence on grandchild care has been shown in previous literature (see Rupert and Zanella, 2011).

The instrumental variable approach makes two assumptions. First, the instrumental variable has significant impact on the endogenous grandchild care, also called the relevance assumption. And second, the exclusion restriction, says that the instrument is as good as randomly assigned and grandchild care is the only channel through which the instrumental variable affects the outcome.

$$(5) GC_{it} = \delta + \theta \times Z_{it} + \vartheta \times X_{it} + u_{it}$$

This approach assumes the effect of grandchild care to consist of two parts, one part being endogenous and the other variation not suffering from endogeneity – the instrument  $Z_{it}$ . The IV thus isolates in a first stage the part of the variation in the treatment variable that can be attributed to an observed third variable which is not otherwise correlated with the outcome.

$$(6) y_{it} = \alpha + \beta \times \overline{GC_{it}} + \gamma \times X_{it} + u_{it}$$

In the second stage the outcome variable is regressed on all right hand side variables and the predicted values  $\overline{GC_{it}}$  from the first stage.

## 5 Empirical Results

In this section, we show empirical results, starting with a description of the characteristics of caring grandmothers. In a first step we then show pooled OLS

estimates, control for further possible channels that might induce the correlation we are interested in, and look at the patterns across Europe. We then move on to a propensity-score matching approach to check the robustness of the findings to the assumed underlying functional form. As to this point, estimated coefficients can only be interpreted as causal if we assume that all relevant factors influencing grandchild care and grandparent health have been included.

Thus in a next step we make use of the time dimension of our data by applying fixed effects and lagged dependent variable estimation, and use two instrumental variables: the number of daughters and the gender of the firstborn child.

## **5.1 Which Grandmothers are Taking Care of Their Grand-children?**

Table 1 shows that 35.6% of all grandmothers in this sample do not provide care to any of their grandchildren and 64.4% do (for a more detailed descriptive analysis of the care-relevant variables in SHARE, see Hank and Buber, 2009). Descriptive analysis (available on request) tell us that the amount of grandchild care is at about 9.7 hours per week for grandmothers aged between 45 and 69, at about 6.5 hour per week for grandmothers in their seventies, and at 3.0 hours for grandmothers in their eighties. Across education levels, grandmothers with a low level of education care for the longest hours (9.3 hours per week compared to 7.4 hours per week provided by grandmothers with a high level of education).

## **5.2 OLS Estimates of the Impact of Grandchild Care on Grand-parent Health**

The pooled OLS results for the regression approach are shown in Table 3. Grandchild care has a persistent positive and statistically significant effect on grandmothers' health. The full regression output based on this step-wise modelling approach is given in Table A.1 in the Appendix and shows the coefficients for all control variables. Grandmothers providing ten more hours of grandchild care show a 2.3 percent of a standard deviation better physical health, when controlling for the grandmother's age and education. Adding further socio-demographic controls leads to only a minor reduction in the care coefficient. Even though we cannot infer causality from this, including the variable allows us to state that grandparents living at the same distance from their grandchildren have a significantly higher physical health if they provide grandchild care. Grandparents living at long distances from their children are healthier, but we strongly suspect distance to be an endogenous variable: they are able to live at a long distance from their children because they are healthier. Compared to grandparents



who have no contact with their children, the ones who are in contact, but less than monthly, show significantly better physical health. No contact at all with one's children may be indicative of a family conflict.

**Table 2 OLS regressions of health outcomes on grandchild care**

Physical health				
Grandchild care	0.00233*** (0.000329)	0.00179*** (0.000312)	0.00162*** (0.000328)	0.00188*** (0.000332)
Cognitive functioning				
Grandchild care	0.00238*** (0.000385)	0.00193*** (0.000384)	0.00204*** (0.000409)	0.00222*** (0.000419)
Mental health				
Grandchild care	0.00166*** (0.000528)	0.00102* (0.000520)	0.000483 (0.000553)	0.000798 (0.000567)
Age	yes	yes	yes	yes
Education	yes	yes	yes	yes
Further socio-demographics		yes	yes	yes
Social interaction				yes
Observations	29,427	29,427	25,619	25,618

Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Controlling for further socio-demographics: year dummies, education: high and medium with low education as the reference group, marital status: married, widowed, with divorced and singles as reference group, employment status: employed, retired, chronically ill, homemaker, with retired as reference group, possession of any real estate, number of children, number of grandchildren and retirement because of bad health.

The grandparents with almost daily contact with their children however, are less healthy compared to those with no contact. High frequency of contact with one's children thus does not seem to be an indicator for the frequency of grandchild care or for the exchange of health-relevant information but, instead, for a need for companionship and help. Just like close contact with a child, receiving help indicates a significant negative effect on the health status, while giving help to family members, friends, and neighbours, as well as all sorts of social engagement, show significant positive coefficients.

Table 2 provides the coefficients from a regression of physical, cognitive and mental health on grandchild care. For the baseline sample, the first two Columns show the coefficients of grandchild care when controlling for age and education as well as a set of country and year dummies (Column 1) and further socio-demographic characteristics like marital status, employment status, number of children and grandchildren (Column 2). Columns 3 and 4 show the change in the coefficient for the sample of observations that report all variables of social interaction. Column 3 thus corresponds to Column 2 run on the smaller sample. From here on we use the specification controlling for all socio-demographic factors as our baseline specification. In this specification, the effect of grandchild care on all outcomes is positive and statistically significant. Grandmothers providing ten more hours of grandchild care per week show 1.79 percent

of a standard deviation higher physical health (significant at the 1 percent level), 1.93 percent higher cognitive functioning and 1.02 percent of a standard deviation higher mental health. Controlling for indicators of social interaction hardly changes the size of the coefficients for physical health and cognitive functioning. However, with the baseline identification run on the smaller sample of observations reporting social interaction, we see that the correlation between grandchild care and mental health decreases to about half the size and turns insignificant. Controlling for social interaction slightly increases the size of the insignificant coefficient.

### **5.3 Region specific estimation**

Across European regions, there are large variations in cultural and demographic characteristics. Northern European countries are known to show high shares of public care provision for children as well as for the elderly, while in Southern Europe family ties are stronger (Bolin et al, 2008) and co-residence is more common described as the way that Southern Europeans make intergeneration transfers (Albertini et al. 2007).

Albertini et al. (2007) also point out that outside a shared household, the intergeneration exchange of help is rare in Southern Europe, while in Scandinavian countries there is a high share of grandparents looking after their grandchildren but for a relatively low number of hours. Western European countries show a higher variation in their patterns, lying somewhere in between these two extremes (Dimova and Wolff, 2011).

As the samples for individual countries vary strongly in size, and some are rather small, four groups of regions are generated: Northern Europe (Denmark, Sweden), Southern Europe (Greece, Italy, Spain, Portugal), Western Europe (Austria, Belgium, France, Germany, Ireland, Switzerland, Netherlands) and Post-Communist Countries (Hungary, Slovenia, Estonia, Poland, Czech Republic) (as Israel cannot be subsumed into either of those groups, we do not include it in this specification).

Table 3 shows the results from a regression that controls for grandchild care, region dummies and the interaction of the two. In general, compared to Western European grandmothers, Post-Communist or Southern European grandmothers are on average less healthy, while Northern European ones significantly healthier. Grandchild care providing Western European grandmothers, show .81 percent of a standard deviation better physical health when increasing their weekly time of care by 10 hours, Northern European and grandmothers in Post-Communist Countries do not differ significantly from the Western European pattern, and Southern European grandmothers show an additional positive coefficient of 1.40 percent which sums to give 2.21 percent of a standard deviation (.81+1.40). For cognitive functioning we do not find significant differences in the region specific care effects, while, due to the small point estimate and

the large standard errors, for mental health we do not find a significant correlation at all. Southern European grandmothers' physical health thus seems to profit more from their grandchild care than grandmothers in the rest of Europe.

**Table 3 OLS with region specific care coefficients**

Dependent	Physical health	Cognitive functioning	Mental health
Grandchild care	0.000814* (0.000493)	0.00193*** (0.000718)	0.000301 (0.000845)
Grandchild care*Northern Europe	0.00150 (0.00165)	-0.000882 (0.00204)	4.02e-06 (0.00269)
Grandchild care* Post-Communist	0.000844 (0.000776)	-0.00144 (0.00100)	0.000519 (0.00127)
Grandchild care*Southern Europe	0.00140* (0.000775)	0.000781 (0.000967)	0.00123 (0.00131)
Northern Europe	0.0590*** (0.0155)	0.217*** (0.0208)	0.201*** (0.0239)
Post-Communist Countries	-0.192*** (0.0139)	-0.269*** (0.0163)	-0.195*** (0.0212)
Southern Europe	-0.194*** (0.0170)	-0.472*** (0.0181)	-0.300*** (0.0257)
Socio-demographics	yes	yes	yes
Observations	28,618	28,618	28,618
R-squared	0.198	0.253	0.084

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Controlling for further socio-demographics: year dummies, education: high and medium with low education as the reference group, marital status: married, widowed, with divorced and singles as reference group, employment status: employed, retired, chronically ill, homemaker, with retired as reference group, possession of any real estate, number of children, number of grandchildren and retirement because of bad health.

After controlling for social interaction and looking at regional variation, grandchild care is significantly positively correlated with physical health and cognitive functioning. For mental health also, we find positive correlations, even though they turn insignificant when controlling for social interactions.

## 5.4 Propensity Score Matching Estimation

As OLS makes an assumption about functional form, we alternatively apply a semi-parametric matching method to estimate the effect of grandchild care on grandparent health.

Matching does not rely on a particular functional form of the regression equation; its approach is to compare the sample average of the outcome variable of caring grandmothers to grandmothers with similar likelihood of caring but who do not care. The latter thus serve as a comparison group for the caring grandmothers. Conditional on the two assumptions – conditional independence or unconfoundedness assumption –

discussed in the method section, the mean difference between the two groups can be interpreted as the average treatment effect or, in other words, as the effect grandchild care has on grandmother health.

**Table 4 Average treatment effect on the treated for different health variables**

Matching method	Physical health		Cognitive functioning		Mental health	
Kernel Epan. bw(.06)	0.0648*** (.0100)	.0567*** (.0117)	0.0941*** (0.0121)	.0768*** (.0141)	0.0725*** (0.0143)	.0502*** (0.0166)
Kernel Epan. bw(.02)	.0622*** (.0101)	.0543*** (.0118)	.0885*** (0.0122)	.0707*** (.0143)	.0705*** (.0144)	.0473*** (.0168)
Nearest neighbour	.0540*** (.0125)	.0505*** (.0145)	.0958*** (.0156)	.0594*** (.0179)	.0658*** (.0184)	.0395*** (.0211)
5 Nearest neighbour	.0616*** (.0106)	.0579*** (.0125)	.0962*** (.0130)	.0718*** (.0151)	.0711*** (.0154)	.0422*** (.0179)
N neighbour caliper(.0005)	.0549*** (.0125)	.0513*** (.0143)	.0949*** (.0156)	.0588*** (.0177)	.0669*** (.0184)	.0417*** (.0208)
Radius caliper (.05)	.0652*** (.0099)	.0572*** (.0117)	.0951*** (.0121)	.0779*** (.0141)	.0727*** (.0143)	.0507*** (.0766)
OLS	0.0840*** (0.00823)	0.0753*** (0.0086)	0.111*** (0.0102)	0.100*** (0.0109)	0.0764*** (0.0130)	0.058*** (0.0139)
Socio-demographics	yes	yes	yes	yes	yes	yes
Social interaction		yes		yes		yes
Observations	29416 (11)	25611 (6)	29417 (11)	25612 (6)	29417 (11)	25612 (6)

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Controlling for Socio-demographics: country and year dummies, education with low education as the reference group, marital status with divorced and singles as reference group, employment status with retired as reference group, possession of any real estate, number of children, number of grandchildren, retired early because of bad health and for Social interaction: most frequently contacted child with no contact as reference group, distance to closest child with living in the same house or household as reference group, a dummy for any help received, a dummy for any help given, a dummy for done voluntary/charity work, attended educational or training course, gone to a sport, social, or other club, taken part in activities of a religions organization, at least once a week. Nearest neighbour matching with Abadie and Imbens (2006) standard errors.

Figure A.1 and Figure A.2 in the Appendix show the distribution of propensity score values in the treatment and comparison group. When matching on the socio-demographic controls (Figure A.1), we see a close to normal distribution for the untreated, while the distribution of the treated is left-skewed. If we add social interaction variables (Figure A.2). we find flatter distributions for both groups. This means more dispersed propensities for the treatment group and a broader distribution of the untreated at both ends of the distribution. Very few (11 and 6) observations are dropped when imposing the common support. Table A.2 in the Appendix shows that the comparison group matches the treatment group quite well, except for a few significant but numerically minor differences in age, homeownership and the number of grandchildren. Adding social interaction variables to the matching criteria, treatment

and comparison groups differ because treated grandmothers have their children living close by more often and more of them are receiving help (Table A.3). Numerically the differences, however, remain small.

Table 4 shows the results for several matching procedures on the control variables that are also used in the OLS estimations above. Based on the propensity score estimation, observations are matched with Kernel Epanechnikov matching with a bandwidth of 0.06 and 0.02. We also perform one- and five-nearest neighbour matching as well as one-nearest neighbour within a caliper of (.005), that is, we allow for matching within a 0.05% difference in the propensity score and all observations without any match are dropped. This relatively small caliper is chosen because the results of nearest-neighbour matching with larger calipers are identical to the default nearest-neighbor matching. We also use a radius matching with a caliper of 0.005 and 0.05 and match a treated observation to all observations within a .5% and 5% difference in the propensity score.

The average treatment effect of grandchild care on physical health, when matched by socio-demographic characteristics, amounts to 6.48 percent of the standard deviation for Kernel matching; the effect is significant at the 1% level and varies between 5.40 and 6.52 across matching procedures. These average treatment effects are all smaller than the OLS coefficient obtained from regressing the outcome variables on a dummy for grandchild care. The effect decreases further to 5.67 percent when additionally including social interaction in the propensity score estimation. The other outcomes show similar patterns. The average treatment effect of grandchild care increases the cognitive functioning by 9.41 percent and mental health by 7.25 percent of a standard deviation when Kernel matching on socio-demographic characteristics. The effects persist even though they decrease when we include social interaction controls.

## **5.5 Panel Estimation**

The correlations shown up to now should not be interpreted as causal, grandchild care providing grandmothers might still differ from non-caring ones in ways we cannot observe. Thus, in order to get closer to a causal interpretation of our results, we make use of the panel dimension of our data and looking at an instrumental variable, the gender of the firstborn child.

Fixed effect and lagged dependent estimation make both use of the time dimension of the data. Fixed effect estimations use the variation within one individual over time in order to get rid of unobserved time invariant heterogeneity, and lagged dependent estimations assume that all unobserved individual fixed characteristics can be approximated by controlling for the outcome variable in the earlier period.

Table 5 shows the fixed effect estimates, which suggest that grandchild care has no significant effect on any of the health outcomes. The point estimates of the coefficients on physical health and cognitive functioning are about half the size of the pooled OLS

estimates. Ten more hours of weekly grandchild care increase physical health by .98 and cognitive functioning by .95 percent of a standard deviation. For mental health, we see the fixed effect coefficient change the sign to -1.80 percent of a standard deviation.

**Table 5 Fixed effect estimation**

Physical health	
Grandchild care	0.000982 (0.000623)
Cognitive functioning	
Grandchild care	0.000949 (0.00109)
Mental health	
Grandchild care	-0.00180 (0.00125)
Socio-demographics	yes
Observations	5,535
Number of individuals	1,845

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Controlling for year fixed effects, education: high and medium with low education as the reference group, marital status: married, widowed, with divorced and singles as reference group, employment status: employed, retired, chronically ill, homemaker, with retired as reference group, possession of any real estate, number of grandchildren, retirement because of bad health.

As only three periods of data are available, and fixed effects estimation is based on the variation within an observed individual, we also look at lagged dependent variable estimation, which allows us to compare grandmothers that showed a similar health status in the previous period; the grandchild care coefficient can then be interpreted as the short term effect of grandchild care provided in this period.

To make fixed effects and lagged dependent estimations comparable, both regression results are shown for the balanced sample. Table 6 Column 1 shows the pooled OLS estimates for the balanced sample, and Column 2 shows the results when adding the lagged dependent variable. Controlling for the past period's physical health reduces the apparent impact of grandchild care, but it remains significant at the ten percent level, i.e. ten more hours of grandchild care leading to an increase in physical health of 1.25 percent of a standard deviation. The effect on cognitive functioning decreases slightly to 2.19 percent of a standard deviation (significant at the ten percent level); for mental health, as in the fixed effect estimation, we find an insignificant negative, but much smaller, effect of .42 percent of a standard deviation. For all three health outcomes, the causal effect of grandchild care seems to be smaller that estimated from the OLS.

**Table 6 Lagged regressions on grandchild care**

Physical health		
Grandchild care	0.00332*** (0.000985)	0.00125** (0.000617)
Cognitive functioning		
Grandchild care	0.00265** (0.00117)	0.00219** (0.000991)
Mental health		
Grandchild care	0.00127 (0.00159)	-0.000422 (0.00127)
Socio-demographics	yes	yes
Lagged dependent variables		yes
Observations	3,690	3,690

Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Controlling for further socio-demographics: country and year dummies, education: high and medium with low education as the reference group, marital status: married, widowed, with divorced and singles as reference group, employment status: employed, retired, chronically ill, homemaker, with retired as reference group, possession of any real estate, number of children, number of grandchildren and retirement because of bad health.

Both approaches allow us to control for time invariant personal characteristics influencing both grandchild care and health outcomes. If, however, there are time-varying unobservables correlated with the variables of interest, the results would still be biased. In the next section, we thus use exogenous variation in the amount of grandchild care.

## 5.6 Instrumental Variable Estimation

Finally, we use an instrumental variable that leads to a change in the provision of grandchild care but which is arguably otherwise unrelated to the health of a grandmother: the gender of the firstborn child. This instrument relies on the random distribution of a child's gender. Its influence on grandchild care has been shown in previous literature (see Rupert and Zanella, 2011).

When we look at the 2SLS estimation in Table 7, we make use of the fact that women on average become parents at an earlier age than men, due to the average age difference of about two years between the male and the female partner. If the firstborn is a daughter, her mother is likely to become a grandmother earlier in life than if the firstborn is a son. When controlling for the number of children and the number of further daughters a grandmother has, we can thus distinguish the effect of becoming a grandmother and providing grandchild care earlier in life, from the one of having more daughters.

The first stage estimate in Table 7 shows that when controlling for the number of further daughters, a grandmother who has a daughter as her firstborn, provides on average 1.02

hours of grandchild care more per week, with an F-value of 42.36 this is a relatively strong instrument (as not all observations in our sample provide the gender and the birth year for all of their children, we are left with the 29.069 observations that do).

**Table 7 IV estimation, firstborn a daughter**

	OLS	2SLS
<b>Physical health</b>		
Grandchild care	0.00164*** (0.000314)	-0.00322 (0.00794)
<b>Cognitive functioning</b>		
Grandchild care	0.00182*** (0.000386)	-0.00622 (0.00980)
<b>Mental health</b>		
Grandchild care	0.000853 (0.000523)	-0.00633 (0.0124)
Socio-demographics	yes	yes
Number of further daughters	yes	yes
Observations	29,036	29,036
<b>First stage</b>		
Firstborn a daughter	1.021*** (0.156)	
F-value	42.63	

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Controlling for further socio-demographics: country and year dummies, education: high and medium with low education as the reference group, marital status: married, widowed, with divorced and singles as reference group, employment status: employed, retired, chronically ill, homemaker, with retired as reference group, possession of any real estate, number of children, number of grandchildren and retirement because of bad health.

The 2SLS estimates of the grandchild care effect are insignificant. The point estimates are all larger in magnitude than for OLS, and the signs for all three health outcomes are negative. Ten more hours of grandchild care would then lead to a 3.22 percent of standard deviation deterioration in physical health, a 6.22 percent reduction in cognitive functioning and a 6.33 percent reduction in mental health. For physical health, the IV estimate is smaller than the OLS coefficients. In contrast to Arpino and Bordone (2012), cognitive functioning of grandmothers does not seem to profit from grandchild care; the point estimate has a negative sign, just like mental health.

Are there other ways than grandchild care for the gender of the firstborn to influence the health of a grandmother? Ejrnaes and Pörtner (2004) find that educational attainment is higher for children with higher birth order. As higher education increases the probability of employment, a better educated and thus working daughter is more likely to rely on her mother's grandchild care than a son. This is part of the grandchild care channel we are investigating.

The gender of the firstborn has also been used as an instrument for marital instability by Bedard and Deschenes (2005). If, however, a marriage is more likely to result in divorce if the firstborn was a girl, and marriage is positively correlated with health, having a daughter, and being more likely to divorce should have a negative effect on health. This,



however, leads only to an underestimation of our 2SLS results. Thus we want to emphasize again, that these insignificant negative estimates are the lower bound of the true care effect only.

## 6 Conclusion

Health-care costs for the elderly are increasing in today's ageing societies, and the rise in female labour force participation means that parents rely more and more on grandparents to provide informal care. We investigate the correlation between occasional grandchild care and the health of grandparents. To date, there is very little research on occasional childcare as representative datasets such as HRS and NFHS focus on custodial care. SHARE provides us with a representative sample of grandparents from several European countries and detailed information about care intensity.

In contrast to the literature on custodial care, the analysis of occasional care faces the problem of self-selection. Also, grandparents who provide grandchild care might differ from the non-care-providing grandparents in their characteristics. Both situations could lead to an upward bias in our results. We control for several channels that might be driving the correlation. Potential channels include contact with the children, help provided to family members, friends, and neighbours and social engagement. The correlation between grandchild care and grandparent health, however, remains positive when controlling for all these channels. Across cultural regions in Europe the effect of grandchild care is very similar, only Southern European grandmothers tend to profit significantly more from their care provision than Western European grandmothers. Also, using semi-parametric propensity score matching, we see that the relation is robust to the assumed underlying functional form. We use panel analyses and instrumental variable estimation to get a sense as to whether these relations can be interpreted as causal. These methods impose higher requirements on the data and we hardly find any significant causal effects. All the estimates, however, point into the direction of the causal effect of grandchild care being smaller than the OLS correlations suggested.

The effect of occasional grandparent childcare on grandparent health is of current relevance in Europe. Policies encouraging grandchild care are being discussed and implemented, for example in the Netherlands, since the Childcare Act from 2005 grandparents can be considered as self-employed child-minders. In Germany the implementation of a grandparental leave as a supplement for parental leave has been discussed.

Future research could take a closer look at the interaction between public childcare and grandparent care. As female labour force participation increases in Western countries, these two major sources of childcare might either begin competing with each other or perhaps become combined in a “care-mix.”

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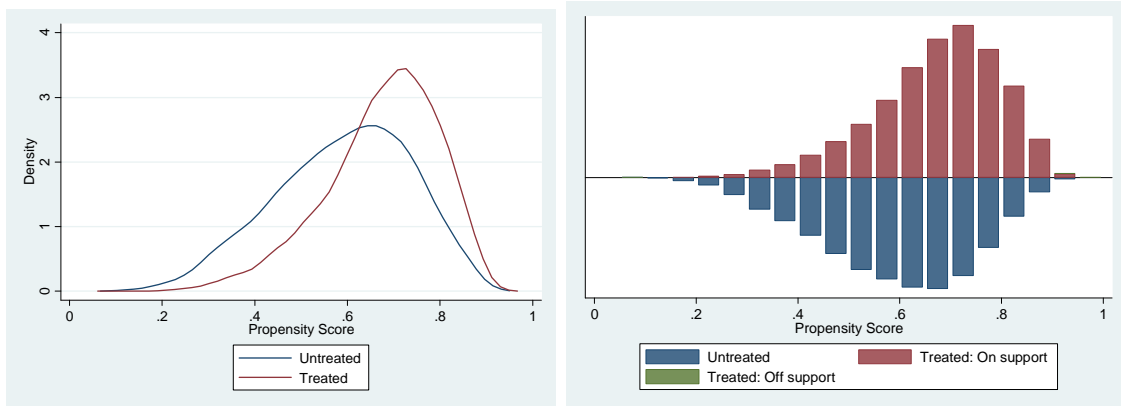
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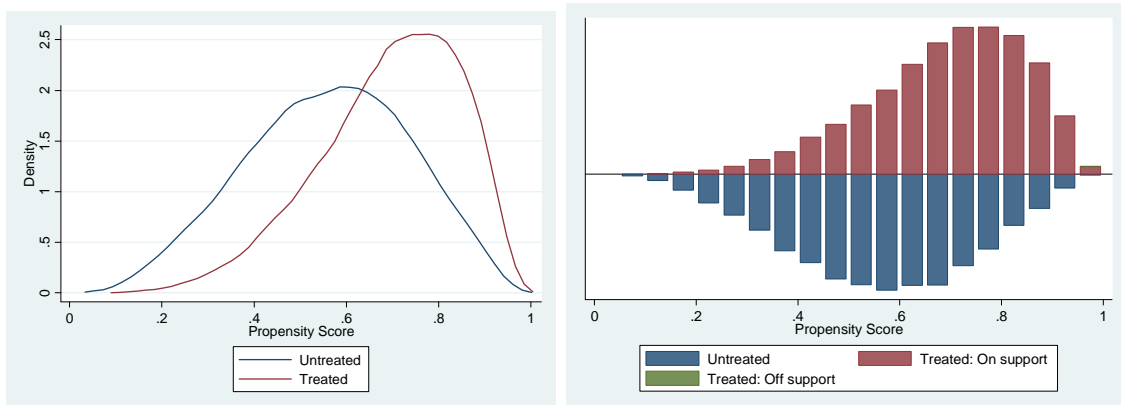
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## Appendix Supplementary Figures and Tables

**Figure A.1** Propensity score distribution for treated and comparison group (baseline model)



**Figure A.2** Propensity score distribution for treated and comparison group (socio-demographic and social interaction controls)



**Table A.1 Step-wise model construction**

Dependent	Physical health			
Grandchild care	0.00233*** (0.000329)	0.00179*** (0.000312)	0.00162*** (0.000328)	0.00188*** (0.000332)
Age	-0.0193*** (0.000603)	-0.0189*** (0.000826)	-0.0190*** (0.000841)	-0.0174*** (0.000820)
Medium education	0.156*** (0.0101)	0.114*** (0.00949)	0.119*** (0.00967)	0.0994*** (0.00945)
High education	0.254*** (0.0120)	0.183*** (0.0114)	0.188*** (0.0118)	0.158*** (0.0118)
Married		0.0785*** (0.0134)	0.0671*** (0.0135)	0.0305** (0.0131)
Widowed		0.0122 (0.0176)	0.00507 (0.0176)	0.0126 (0.0170)
Employed		0.0178 (0.0114)	0.0192 (0.0118)	0.0320*** (0.0116)
Unemployed		-0.0970*** (0.0212)	-0.102*** (0.0225)	-0.0856*** (0.0217)
Chronically ill		-0.870*** (0.0308)	-0.873*** (0.0316)	-0.806*** (0.0306)
Homemaker		-0.0378*** (0.0120)	-0.0390*** (0.0126)	-0.0296** (0.0123)
Homeowner		0.0322*** (0.00781)	0.0282*** (0.00812)	0.0297*** (0.00793)
#Children		-0.0214*** (0.00445)	-0.0181*** (0.00452)	-0.00489 (0.00480)
#Grandchildren		-0.0101*** (0.00209)	-0.0103*** (0.00213)	-0.00945*** (0.00208)
Retired b/o health		-0.444*** (0.0197)	-0.469*** (0.0206)	-0.446*** (0.0200)
<i>Contact frequency</i>				
less than monthly				0.0252** (0.0116)
almost every month				0.0153 (0.0123)
almost every week				-0.0364** (0.0161)
almost daily				-0.155*** (0.0299)
<i>Closest child</i>				
within a 5km-radius				0.0220** (0.0110)
5km to 25km				0.0619*** (0.0127)
25km to 100km				0.0754*** (0.0158)
over 100km				0.0769*** (0.0171)

**Table A.1 Step-wise model construction (cont'd):**

Received help				-0.307*** (0.0119)
Given help				0.0375*** (0.00766)
Charity				0.0367*** (0.0128)
Attend training				0.0234 (0.0154)
Sport				0.105*** (0.00866)
Church				0.0339*** (0.0131)
Politics				0.00196 (0.0262)
Observations	29,427	29,427	25,619	25,618
R-squared	0.125	0.215	0.222	0.260

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Controlling for country and year dummies, education with low education as the reference group, marital status with divorced and singles as reference group, employment status with retired as reference group, possession of any real estate, number of children, number of grandchildren and retirement because of bad health, most frequently contacted child with no contact as reference group, distance to closest child with living in the same house or household as reference group, a dummy for any help received, a dummy for any help given, a dummy for done voluntary/charity work, attended educational or training course, gone to a sport, social, or other club, taken part in activities of a religious organization, at least once a week.

**Table A.2 Mean comparison before and after matching (baseline model)**

Variable	Treated	Comparison (unmatched)	Comparison (matched)
Physical health	0.073	-.1336***	.0083***
Cognitive functioning	0.2347	-.0742***	.1406***
Mental health	-0.0717	-.2394***	-.1442***
Age	62.83	66.2110***	62.5630***
Medium education	0.3474	.2877***	.3466
High education	0.1802	.1450***	.1806
Married	0.756	.6856***	.7559
Widowed	0.1363	.2034***	.1297*
Employed	0.2515	.1810***	.2539
Unemployed	0.0346	.0291***	.0361
Permanently sick	0.0367	.0427***	.0378
Homemaker	0.2148	.2291***	.2116
Homeowner	0.5357	.4818***	.5249**
#Children	2.602	2.8403***	2.5916
#Grandchildren	3.7383	4.2835***	3.6079***
Retired b/o health	0.05465	.0665***	.0567
Observations	18992 (+11) <sup>1)</sup>	10424	10424

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Kernel Epanechnikov matching with a bandwidth of 0.06. Controlling for country fixed effects, marital status with divorced and singles as reference group, employment status with retired as reference group, distance to closest child with living in the same house or household as reference group, contacted child with no contact as reference group. 1NN: Nearest neighbour matching one-on-one, Radius: Radius matching with a caliper of 0.05, Kernel: Kernel matching. 1)off support.

**Table A.3 Mean comparison before and after matching (socio-demographic and social interaction controls)**

Variable	Treated	Comparison group (unmatched)	Comparison group (matched)
Physical health	0.0737	-0.1276***	0.0167***
Cognitive functioning	0.2307	-0.0709***	0.1540***
Mental health	-0.0763	-0.2314***	-0.1265***
Age	62.4580	65.7660***	62.1830***
Medium education	0.3498	0.2892***	0.3452
High education	0.1790	0.1470***	0.1837
Married	0.7526	0.6779***	0.7561
Widowed	0.1390	0.2071***	0.1316**
Employed	0.2620	0.1909***	0.2650
Unemployed	0.0364	0.0312**	0.0363
Chronically ill	0.0368	0.0445***	0.0362
Homemaker	0.2190	0.2284*	0.2182
Homeowner	0.5381	0.4775	0.5374
#Children	2.6293	2.8543***	2.6304
#Grandchildren	3.7219	4.2698***	3.5795***
Retired b/o health	0.0570	0.0704***	0.0607
Contact frequency			
less than monthly	0.3106	0.2439***	0.3079
almost every month	0.3380	0.3527**	0.3422
almost every week	0.1097	0.2057***	0.1136
almost daily	0.0227	0.0458***	0.0252
Closest child			
within a 5km-radius	0.4008	0.3546***	0.3891**
5km to 25km	0.1842	0.1743**	0.1775
25km to 100km	0.0784	0.1010	0.0806
over 100km	0.0548	0.1017***	0.0559
Received help	0.1919	0.2029**	0.1834**
Given help	0.3831	0.2041***	0.3773
Charity	0.0909	0.0612***	0.0901
Attend training	0.0464	0.0292***	0.0455
Sport	0.1815	0.1159***	0.1767
Church	0.0963	0.0879**	0.0971
Politics	0.0126	0.0073***	0.0125
Observations	16550 (+6)	9062	9062

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Kernel Epanechnikov matching with a bandwidth of 0.06. Controlling for country dummies with divorced and singles as reference group, retired as reference group, living in the same house or household as reference group, contact frequency with no contact as reference group. 1)off support.



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