Regular provision of grandchild care and participation in social activities

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Abstract Against the background of rapid population ageing, studying social participation in later life is of particular relevance within the framework of active ageing. Although caring for grandchildren has taken a central role for older persons due to unprecedented overlap between grandparents’ and their grandchildren’s lives, whether the relationship between grandparental childcare and social activities is characterised by cumulation or competition remains under-explored. Grandparental childcare may increase the purpose in life for grandparents, stimulating their social participation, or it may impose time and energy constraints on it. This study aims to assess the effect of providing grandchild care on participation in social activities for people aged 50–85 in Europe. Using an instrumental variable approach on data from the Survey of Health, Ageing and Retirement in Europe, we find no significant negative effects of grandchild care on engagement in at least one social activity. However, regular provision of grandchild care has a significant negative effect on the number of activities in which grandmothers participate. When considering the activities separately by type we also find, for grandmothers only, a negative effect on volunteering, engagement in educational or training courses and participation in political or community-related organisation.

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1 Introduction

Social participation in later life is a relevant aspect of the ‘active ageing’ (Zaidi et al. 2013) and ‘successful ageing’ frameworks (Rowe and Kahn 1998) that dominate the current discourse on ageing. As such, it is understood and measured either in relationship to health and well-being (Engelhardt et al. 2010; Hultsch et al. 1999; Menec 2003) or in terms of civic participation emphasising the contribution older people make to society through, for example, volunteering in their communities (Ahern and Hendryx 2008).

Active ageing is defined by the World Health Organization as “the process of optimising opportunities for health, participation and security in order to enhance quality of life as people age” (WHO 2002: 12). In fact, being “active” until later in life is not only meant as optimisation of life expectancy and minimization of physical and mental deterioration, as defined by biomedical theories (see e.g., Seeman et al. 1994). The active ageing concept also aims to promote continuing participation in social, economic, cultural, spiritual, and civic affairs, as emphasized by socio-psychological models (see Bowling and Dieppe 2005 for a discussion of the different models of the constituents of active and successful ageing). Similarly, the concept of “successful ageing”, besides referring to “avoidance of disease and disability, maintenance of high physical and cognitive function”, explicitly mentions “sustained engagement in social and productive activities” (Rowe and Kahn 1997: 439). This is given impetus by several studies indicating that involvement in social activities is a modifiable risk factor for cognitive decline and plays a decisive role in determining life satisfaction, health, functioning, autonomy and survival (e.g., Engelhardt et al. 2010; Hultsch et al. 1999; Scarmeas and Stern 2003). It is therefore of crucial importance to better understand social participation within the framework of active and successful ageing.

A considerable number of studies also exist on the interrelationship between participation in different types of activities (e.g., Choi et al. 2007; Hank and Stuck 2008), suggesting a cumulative relationship between engaging in volunteer work, providing informal help, and caring for older adults in Europe, but the literature has overlooked possible conflicts between provision of grandchild care and participation in social activities. Indeed, about 50% of grandparents report looking after grandchildren both in Europe (Hank and Buber 2009) and in the USA (Ho 2015). The consequences of grandparents’ engagement in childcare on their engagement in social activities are poorly understood. Yet, this topic is increasingly relevant because older people are asked more and more frequently to help with childcare and this may subtract time and energies from other activities with possible negative consequences for their health and life satisfaction and also on the formation of social capital.
In this paper, leaving aside the consequences of social participation, we study the effect of regular provision of childcare by grandparents on their participation in social activities. We add to the limited evidence on the topic present in the literature (e.g., Arpino and Bordone 2015; Bulanda and Jendrek 2016; Kohli et al. 2009) a deeper analysis of the relationship between grandchild care and several variables measuring engagement in social activities, which include the scope (i.e., the number of different social activities in which individuals are involved) and the type of social activities (namely voluntary or charity work; educational or training course; sport, social or other kind of club; religious organisation; political or community-related organisation). Methodologically, we use an instrumental variable approach on data from the Survey of Health, Ageing and Retirement in Europe (SHARE), which allows us to account for individual unobservable characteristics.

2 Background

The notion that participation in social activities can facilitate the production of economic and noneconomic goods, benefiting both individuals and the community, derives from longstanding theories concerning the link between democracy and social participation popularised under the concept of social capital (see Paxton 2002 for a discussion). According to Putnam (1993), interactions, represented mainly by social activities, create trust, horizontal social networks, and civic engagement. In this perspective, participation in (civic and political) social activities is considered as an important factor to increase individuals’ social capital, strengthen the own sense of purpose in life and sense of community, and reduce risk of isolation (Alexander et al. 2010).

During the whole life, individuals engage in activities within and outside the family. The family and intimate friends form the so-called “primary social groups” (Cooley 1912). Individuals, however, may also be members of an array of “secondary social groups” such as clubs or organisations, but also the workplace. Older adults seem to reallocate their time from participation in secondary groups to primary group activities. In fact, partner, children, and grandchildren usually account for the majority of social ties in later life (Lubben and Gironda 2003).

Some early theories of the sociology of ageing proposed that social disengagement at an advanced age was inevitable and even desired (Cumming et al. 1960). However, as pointed out by the socioemotional selectivity theory elaborated in the 1990s (e.g., Carstensen 1992), as individuals age they may choose to reduce certain social activities but maintain others, especially those involving the most intimate ties. Evidence from numerous studies on either intergenerational family relationships (e.g., Bordone 2009) or on social participation in later life in a variety of activities (e.g. Engelhardt et al. 2010; Hank and Stuck 2008) emphasizes the ongoing integration of older people.

Increasing longevity has created, on the one hand, more opportunities for intergenerational relationships and on the other hand, together with an improvement in the health status of older individuals, the potential for carrying out social activities until later in life (see e.g., Erlinghagen and Hank 2006) with positive
implications for social capital formation. However, only a few studies considered the relationship between grandchild care and social activities. Kohli et al. (2009) analysed the interrelationship between several activities, including grandchild care, and found that the relationship between the various dimensions of what they refer to as social connectedness (i.e., social relationships of various kinds, within kin and non-kin networks) was cumulative rather than competitive, meaning that older people who were involved in one type of relation also tended to be more engaged in other types. An exception was the relationship between informal social relations (i.e., exchange of help with friends, neighbours, colleagues or other acquaintances) and family relations (i.e., exchange of functional support with children, including grandparental childcare). Yet, Kohli et al. (2009) were interested in social connectedness per se and therefore did not distinguish whether the individual was the provider or the recipient of help. Bulanda and Jendrek (2016) focussed, instead, on the effect of grandchild care and found that (non-residential) grandchild care is related to a higher likelihood of volunteering, while raising grandchildren has the opposite relationship with volunteering. However, these authors considered only volunteering as social activity and they did not distinguish between men and women. On the contrary, a recent latent class analysis accounting for different types of social activities (Arpino and Bordone 2015) provided evidence of competition between care-related and other social activities for women. The authors however did not focus explicitly on the effect of grandchild care on engagement in social activities.

The provision of grandchild care is more and more often the object of economic, sociological, and psychological studies with a focus on caregiving grandparents, that is, grandparents who are the primary carers of their grandchildren (see Baker and Silverstein 2008; Minkler and Fuller-Thomson 2005). However, supplementary grandchild care is far more common. In this paper we study the relationship between grandchild care—and in particular provision of care on a regular basis—and grandparents’ participation in various types of social activities. We also consider participation in at least one activity and the number of activities. Differently from Bulanda and Jendrek (2016), we stratify the analyses by gender because the relationship between grandchild care and social participation may be very different for women and men.

2.1 Social participation and grandchild care

Previous literature has shown that children serve as bridges to new social networks and activities for their parents through involvements at school and in clubs (Dykstra 2006; Furstenberg 2005). Similarly, grandchildren may increase the social networks and interactions of the grandparents who look after them via their school or extracurricular activities (McNamara and Gonzales 2011). Following Coall and Hertwig’s (2011) argument that supplementary grandchild care may have a positive effect on well-being, broadly defined to include also time spent with others, it could be hypothesized that looking after grandchildren stimulates grandparents’ sense of purpose in life (Silverstein and Giarrusso 2013), induces a more active lifestyle and, in turn, fosters grandparents’ engagement in social activities (Silverstein et al. 2006;
Waldrop and Weber (2001). Moreover, just as social network research has found a high level of interdependency between social network structure and engagement in social activities (e.g., Rotolo 2000), we may believe that people who are more active within their family network (e.g., those providing grandchild care) are also more likely to be involved in social activities. These arguments would favour a cumulation hypothesis, namely, that grandparents involved in childcare cumulate this activity with social participation. Research supporting a cumulation hypothesis has interpreted the positive correlation between engagement in various activities as the result of a general (unobservable) motivation for being active (Hank and Stuck 2008) or, with reference to care and volunteering, as the “super helper” effect, i.e., a high commitment to helping others (e.g., Bulanda and Jendrek 2016).

However, once we control for possible unobserved characteristics of the grandparent (as explained in the Sect. 3.5), we may find a negative effect of grandchild care on social participation. As the role strain theory poses, intensive caregiving can be physically taxing and takes away resources from older adults (Jendrek 1993; Minkler 1999). Indirect evidence for this comes from research on parents. Albertini and Kohli (2009), for example, showed that parents were less likely than childless to participate in some social activities, arguing that such differences may arise from fewer time constraints for the childless and from the fact that these latter are more likely to search for support networks outside the household. Moreover, Caro and Bass (1995), Choi et al. (2007), and McNamara and Gonzales (2011) found that family caregiving obligations reduced the probability of volunteering. Brown and Zhang (2013) also found a negative effect of having children on volunteering to secular causes (non-youth related organisations). Similarly, engaging in grandchild care may reduce willingness, energy, and time availability to carry out those activities that do not involve grandchildren (Koslowski 2009; Minkler 1999), but also reduce the pressure to search for social support outside the family. As a result, grandparents may be selective in their choice of social activities when they regularly look after their grandchildren. These arguments would favour a competition hypothesis, namely that, net of the person-specific general motivation (or other unobserved characteristics, such as preferences or abilities), grandchild care has a negative effect on participation in social activities.

Empirical evidence on the relationship between grandchild care and social participation is therefore mixed and could lead to state two alternative hypotheses: regular grandchild care increases the probability to engage in at least one social activity and the number of different activities in which grandparents participate (cumulation hypothesis); regular grandchild care reduces the probability to engage in at least one social activity and the number of different activities in which grandparents participate (competition hypothesis). Controlling for possible unobserved characteristics (i.e., net of the person-specific general motivation) and endogeneity, we favour the competition hypothesis (Hypothesis 1).

Social activities are not all the same. Putnam (1993, 2000) and other researchers (see Mascherini et al. 2010 for a review) distinguished them into bridging (or inclusive) and bonding (or exclusive) social capital, where the first identifies outward looking activities and encompasses people across diverse social cleavages,
while the second is characterized by inward looking activities and tends to reinforce exclusive identities and homogeneous groups. However, the focus of our work is on the effect of grandparental childcare on social participation. Therefore, it is of our interest to distinguish the type of social activities in terms of amount of time, abilities, and effort they require. We thus consider each activity separately and, following Bukov et al. (2002) and Morrow-Howell and Gehlert (2012), we differentiate activities requiring more resources from those demanding less time, abilities, and effort, namely leisure activities. We expect that those activities that are more demanding in terms of commitment or mental effort are more likely to compete with regular grandchild care. Among the activities we consider, we expect that volunteering, participation in political or community organisations, and taking part in education or training courses will be more likely to be affected by competition with regular provision of grandchild care than the less demanding ones, i.e., taking part in a sport club or in a religious organisation (Hypothesis 2).

From the literature we cannot derive a specific hypothesis about differences by gender in the interrelationship among several activities as most of previous studies have used gender only as a control variable. Yet, different levels of engagement were found in grandchild care (Hank and Buber 2009; Lee and Tang 2015), with women taking on most of the responsibilities entailed. Also participation in social activities is gendered and women are, for example, less likely than men to participate in sport and political activities (Bukov et al. 2002; Mascherini et al. 2010). Therefore, we will also assess if gender differences arise in the relationship between grandchild care and participation in social activities. Research on caregiving among spouses showed that wife caregivers tend to restrict social activities, while husband caregivers do not (Choi et al. 2007). This indirect evidence hints to a stronger competition effect between regular grandchild care and social participation for women than for men (Hypothesis 3).

3 Data and method

3.1 Data and sample selection

We use data from the Survey of Health, Ageing and Retirement in Europe (SHARE), a multidisciplinary longitudinal survey, representative of the non-institutionalised population aged 50 and over in Europe (Börsch-Supan et al. 2005; Börsch-Supan and Jürges 2005).

Our analyses are based on the first interview for each respondent from the first, second, and fourth wave (2004–2005, 2006–2007, 2010–2012), including 19 countries: Austria, Belgium, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, and Switzerland.1 The third wave (2008–2009) of SHARE, called SHARELIFE, contains only retrospective information on the respondents.

1 More specifically, we used data from the first wave (2004) and the refresher samples from the following waves for those countries that took part in the data collection in 2004 (i.e., Austria, Belgium, Denmark,
We restricted our sample to women and men with at least one child, aged 50-85, and who did not report being disabled. Disability decreases the probability of looking after grandchildren because ill grandparents are less able (physically) to take care of grandchildren, and parents might prefer to leave their children with fit grandparents. Disability also decreases the likelihood to participate in social activities. For similar reasons, in a robustness check analysis we also excluded respondents who reported ever having been diagnosed with stroke, Parkinson’s disease, or cancer.

After application of the aforementioned selection criteria, our sample included 27,102 women and 20,354 men who answered the questions about children and grandchildren. Missing values in each of the variables used in the statistical analyses were other criteria for the exclusion of cases. The final sample was composed of 26,161 women and 19,807 men.

3.2 Dependent variables

Our dependent variables measured participation in social activities. SHARE asked: “Have you done any of these activities in the last 4 weeks?” Respondents could tick several activities from a list. We first considered as outcome a dummy variable that takes value 1 if the respondent has participated in at least one of the following social activities: voluntary or charity work; educational or training course; a sport, social or other kind of club; taken part in a religious organisation (church, synagogue, mosque etc.); a political or community-related organisation.

Several studies (e.g., Cigler and Joslyn 2002; Wollebæk and Strømsnes 2008) highlighted the importance of the scope of involvement in social activities, that is, participation in multiple organisations, for the development of civic competencies, civic engagement, and trust. Thus, a second outcome variable we considered was the number of activities in which the respondent was engaged.

Moreover, as anticipated in the formulation of our hypotheses, we expect a stronger competition effect of grandchild care on the most demanding social activities. Therefore, in a third set of analyses, we considered the participation in each activity as separate outcome variables. Since respondents were also asked...
about the frequency of participation in the activities they mentioned (“almost daily; almost every week; less often”), we carried out additional analyses considering participation in at least one activity on a daily basis and the number of activities older people practice daily. Results were in line with those reported here (independent from frequency) but will be omitted for the sake of saving space. Moreover, we could not consider daily engagement on each activity separately because the corresponding rates are very low (from about 0.5 % of the pooled sample of women and men engaged in education and political activities to 2.9 % engaged in sport or social clubs).

3.3 Regular grandchild care

Information on grandchild care in SHARE is obtained through a first question asking “During the last 12 months, have you regularly or occasionally looked after your grandchild without the presence of the parents?” If “yes”, a second question asked the frequency of such grandchild care for each respondent’s child (“almost daily; almost every week; almost every month; less often”). We defined regular grandchild care, the independent variable of interest to us, as a dummy variable taking value 1 if the respondent provided childcare on a daily basis to the child(ren) of at least one child and 0 otherwise. This latter, also include respondents who do not have grandchildren (i.e., 30 % of the male sample and 27 % of the female sample). In Sect. 4.3, we also considered a less stringent measure of grandchild care, including provision of childcare on at least weekly basis.

3.4 Control variables

Control variables were chosen according to past evidence on important determinants of participation in social activities (see e.g., the review by Bukov et al. 2002) and provision of grandchild care, that is, potential confounding variables. We therefore included age (six dummy variables: “50–55” (reference), “56–60”, “61–65”, “66–70”, “71–75”, “76–80”, and “80–85”) and partnership status (“no partner” =1 if not living with a partner; =0 otherwise), which are usually found to be negatively associated with social participation. Marital status is also associated with grandparental childcare (Ho 2015; Hank and Buber 2009). Arpino and Bordone (2014) found that people with low education are more likely to provide grandchild care and Kohli et al. (2009) found a positive relationship between the level of education and engaging in formal and informal social activities. To control for education, we used three binary variables: “low” (corresponding to ISCED 0–1, no or primary education; reference), “medium” (ISCED 2, lower secondary education), and “high” (ISCED 3–4, higher secondary education; and ISCED 5–6, tertiary education).

5 In wave 1 and 2, respondents were additionally asked about the number of childcare hours on a typical day/week/month in the last 12 months, depending on the answer to the previous question. However, this information was not asked in wave 4 and is also not available for Israel.
Retirees have more free time to care for grandchildren (Hank and Buber 2009) and tend to increase their participation in some activities, such as volunteering (van den Bogaard et al. 2014). We measured activity status by using three dummy variables: “employed”, “retired” (reference), and “other” (i.e., unemployed, homemaker, etc.). The vast majority of women in the group “other” were housewives.

Living in rural areas has been found to be positively associated with grandchild care (e.g., Elder and Conger 2000) and it may also influence participation in social activities (see Nummela et al. 2008 for a review of studies showing mixed evidence). Thus, we included a dummy variable “rural” (=1 if living in rural area; =0 otherwise).  

Finally, we considered several measures of health. Functional impairment and depressive symptoms may be independent reasons for not looking after grandchildren and negative associations were found between bad health and social participation (e.g., Cornwell et al. 2008). Thus, we controlled for the number of limitations in activities of daily living (“ADL limitations”), “self-reported health” (ranging from 1 to 5; the higher the value, the worse the health), and “depression”. The latter was measured using the EURO-D scale (0–12; the higher the value, the more the symptoms of depression).

Across SHARE countries, substantial variation has been documented in the frequency of grandchild care (Bordone et al. 2016; Hank and Buber 2009) as well as with regard to older individuals’ engagement in social activities (Erlinghagen and Hank 2006; Kohli et al. 2009). Therefore, we included country fixed effects. We also control for time fixed effects to account for demographic and socio-economic changes over the period under study. More specifically, we included dummy variables for the years of interview (2004 -reference-; 2005; 2006; 2007; 2010; 2011; and 2012).

3.5 Method

Grandparents who provide childcare (especially those who do so regularly) could be different from other older people with respect to observable and unobservable characteristics. Similarly to Hank and Stuck (2008), we argue that a general motivation for being active as well as individual preferences and abilities could influence both the provision of grandchild care on a regular basis and participation in social activities.  

These unobserved factors may be controlled for by using regression models with individual fixed effects (FE). However, FE models require considerable within-individual variation in the variables of interest from one wave.

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6 We used the question on the type of area where the building is located and we coded as “rural” respondents in the category “rural area or village”, while all other categories (“big city”, “suburbs or outskirts of a big city”, “large town”, and “small town”) were included in the reference group.

7 In SHARE the few questions on preferences and values (for example about parents’ and grandparents’ duties as well as about who should bear the responsibility for older persons in need) are included in the so-called drop-off questionnaire, to which only a sub-sample answers. Moreover, these questions were not repeated in the fourth wave. Using this information would have implied an overall reduction in our sample size of 65 %.
to another, which is lacking in SHARE data for the variables of our interest. Moreover, FE models cannot deal with a possible problem of reversed causality: not only may grandchild care affect participation in social activities but also previous engagement in these activities may influence the provision of grandchild care. For these reasons we implemented an instrumental variable (IV) approach that can deal with both these endogeneity issues.

The IV method requires a variable to be used as an instrument that must be relevant, that is, associated with the endogenous variable (grandchild care in our case) and valid, that is, this variable should influence the outcome (social participation) only through its effect on the endogenous variable. Therefore, the instrument should not have a direct effect on the outcome. Similarly to other papers studying the impact of grandchild care (e.g., Arpino and Bordone 2014; Ku et al. 2012), our instrument is the availability of grandchildren (=1 if the interviewee has at least one grandchild; =0 otherwise). As expected, our instrument easily passed the test of relevance in all the analyses. In fact, the value of the F-test statistic measuring the association between the IV and regular grandchild care in the different analyses (including robustness checks) was never smaller than 865 for women and 474 for men, i.e., it was much bigger than the threshold of 10 usually considered acceptable (Staiger and Stock 1997).

The most frequently used instrumental variable estimator is two-stage least squares (2SLS). The first stage consists of regressing the endogenous variable on both the instrumental variable and the control variables. In our case, the first stage consisted of predicting the provision of regular grandchild care. In the second stage, we subsequently regressed social participation on the provision of regular grandchild care as estimated in the first stage and on control variables. Using the predicted value of regular grandchild care instead of the actual provision cleans the “bad” variation of the endogenous variable (i.e., the part of variation that is correlated with unobserved factors and social participation and that causes endogeneity). By using the Stata command *ivreg2*, the two stages are estimated jointly to obtain corrected standard errors (Baum et al. 2007). We used a linear model also for binary outcomes as advocated for example by Angrist and Pischke (2009: 198–204), and used, for example, by Katz et al. (2001) for its advantages over alternatives, such as bivariate probit models: results are more straightforward to interpret, tests on the IV can be easily implemented, and we do not have to rely on normality assumptions on the error terms for identification. We will show the results of the 2SLS regression together with OLS estimates for comparison.

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8 For binary outcomes we also estimated bivariate probit models that take into account that both the endogenous variable and the outcome are binary variables. Results are similar to those obtained using 2SLS: the coefficients of grandchild care have the same sign as those reported in the text when significant. Also marginal effects are similar to estimates obtained with linear models (results available upon request).
4 Results

4.1 Descriptive results

Table 1 presents some descriptive statistics on the dependent variables we used in the multivariate analyses. For each dependent variable we report the proportion (or the average) by gender and, within gender groups, by provision of grandchild care. We also report the significance level for the tests (two-tailed z-tests) comparing the proportions or means of each variable between women and men. Within gender groups the z-tests compare those who provide and those who do not provide daily grandchild care. Participation in at least one social activity is quite common among older Europeans (about 42 % of respondents declared that they participated in at least one of the five social activities considered). However, participating in more than one activity is less common. In fact, the average number of memberships is 0.62 and the percentage of older people involved in more than one activity is 15 % (not shown in the table). In line with previous research suggesting a hierarchy of the different types of activities (e.g., Bukov et al. 2002), the most common activity is participation in a sport or social club (22.45 %), while participation in political organisations is the rarest (about 5 %).

With respect to gender, we find that participation rates as well as the average number of activities are higher for men than for women. Looking at each activity separately, participation rates are higher for men with the exception of educational

| Social participation                        | Women total | Men total | z-test | Women | z-test | Men | z-test | Total |
|--------------------------------------------|-------------|-----------|--------|-------|--------|-----|--------|-------|
| At least one activity                      | 40.19       | 43.40     | ***    | 34.46 | 40.71  | *** | 39.80  | 43.61  | 41.58 |
| Number of activities (mean)                | 0.59        | 0.66      | ***    | 0.49  | 0.60   | *** | 0.60   | 0.67   | 0.62  |
| Voluntary or charity                       | 12.85       | 14.92     | ***    | 9.90  | 13.11  | *** | 12.41  | 15.07  | 13.74 |
| Education                                  | 10.39       | 9.00      | ***    | 5.87  | 10.80  | *** | 5.88   | 9.18   | 9.79  |
| Sport or social club                       | 19.97       | 25.71     | ***    | 14.29 | 20.48  | *** | 20.31  | 26.03  | 22.45 |
| Religious organisations                    | 13.34       | 10.02     | ***    | 16.19 | 13.08  | *** | 14.89  | 9.73   | 11.91 |
| Political organisations                    | 3.41        | 7.06      | ***    | 2.78  | 3.47   |     | 6.89   | 7.07   | 4.99  |
| N                                          | 26,161      | 19,807    |        | 2162  | 23,999 |     | 1088  | 18,719 | 45,968|
| %                                          | 56.91       | 43.09     |        | 8.26  | 91.74  |     | 5.49  | 94.51  | 100.00|

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$
courses and religious organisations (all differences are statistically significant at the 0.1 % level). Both for women and men, regular grandchild care (i.e., on a daily basis) is negatively associated with social participation. Participation rate in at least one activity is 35 % for grandmothers regularly providing childcare against a participation rate of 41 % for the others ($p$ value of the difference <0.001). For men these percentages are 40 and 44 %, respectively ($p$ value of the difference <0.01). Similarly, for grandparents providing daily childcare we observe a lower number of activities and a lower prevalence of participation in each social activity considered, with the exception of religious organisations. These differences are all statistically significant (all differences are significant at least at the 1 % level), with the exception of participation in political organisations for grandparents who regularly look after their grandchildren and those who do not.

Table 2 reports descriptive statistics on the covariates separately by gender and provision of grandchild care. As in Table 1, we report statistical significance of comparisons by gender and, within gender groups, between those who provide and those who do not provide daily grandchild care. On average, among both women and men, older people regularly involved in grandchild care are less educated, more likely to be retired, living with a partner, and having more children than their counterparts not regularly involved in grandchild care (all these differences are significant at least at the 5 % level). Depression and self-perceived health are also slightly worse on average for those engaged in regular grandchild care, while living in a rural area is positively associated with being a regular grandchild carer. These differences are statistically significant only among women. Finally, we notice that age is non-linearly associated with regular grandchild care: the lowest rates of regular grandchild care are found among the youngest and oldest groups.

4.2 Multivariate results

Table 3 shows the estimates of different OLS and 2SLS regression models. In the first model, the dependent variable is participation in at least one social activity. The second model predicts the number of reported activities. Both models were run separately for women and men.

OLS regressions show a positive and significant effect of regular grandchild care on engagement in at least one activity and on the number of activities for men. The effects for women are not statistically significant. These results would support the cumulation hypothesis but, as argued in Sect. 3.5, OLS may provide biased estimates. By applying the 2SLS estimator, we do not find any positive significant effect of regular grandchild care on social participation for men (complete results of IV models are shown in Appendix Tables 7 (first stage) and 8 (second stage). On the contrary, we find that regular grandchild care negatively affects the number of social activities for women (as hypothesised in Hypothesis 1). Our Hypothesis 1 is only partially confirmed, as the 2SLS estimates indicate no significant effect for participation in at least one activity for neither women nor men.

The results of the control variables (see Table 8 in Appendix) generally confirm previous studies. It is worth noting that the more educated are significantly more likely to be socially active and to engage in a higher number of activities. Moreover,
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Table 2  Descriptive statistics on control variables by gender and provision of daily grandchild care (%)

| Independent variables | Women total | Men total | z-test | Women Daily grandchild care | z-test | Men Daily grandchild care | z-test | Total |
|-----------------------|-------------|-----------|--------|-----------------------------|--------|---------------------------|--------|-------|
|                       |             |           |        | Yes | No | Yes | No | Yes | No |
| Age (mean)            | 64.42       | 66.02     | ***    | 63.23 | 64.53 | *** | 65.84 | 63.91 | *** | 64.25 |
| Age                   |             |           |        |      |      |     |     |     |     |     |
| 50-55                 | 22.65       | 23.30     | 14.66  | 23.37 | *** | 8.73 | 24.15 | *** | 22.93 |
| 56-60                 | 17.89       | 17.77     | 23.54  | 17.38 | *** | 15.53 | 17.90 | *   | 17.84 |
| 61-65                 | 16.61       | 17.07     | 25.86  | 15.78 | *** | 23.81 | 16.68 | *** | 16.81 |
| 66-70                 | 14.23       | 15.47     | ***    | 19.33 | 13.77 | *** | 25.55 | 14.89 | *** | 14.76 |
| 71-75                 | 12.38       | 12.16     | 10.31  | 12.57 | **  | 16.54 | 11.91 | *** | 12.29 |
| 76-80                 | 9.79        | 9.13      | 5.18   | 10.21 | *** | 7.44  | 9.23  | *   | 9.51  |
| 81-85                 | 6.44        | 5.08      | ***    | 1.11  | 6.92  | *** | 2.39  | 5.24  | *** | 5.86  |
| Education             |             |           |        |      |      |     |     |     |     |     |
| Low                   | 47.21       | 37.21     | ***    | 57.72 | 46.26 | *** | 50.09 | 36.47 | *** | 42.90 |
| Middle                | 35.09       | 39.02     | ***    | 32.33 | 35.34 | **  | 36.12 | 39.18 | *   | 36.78 |
| High                  | 17.69       | 23.77     | ***    | 9.94  | 18.39 | *** | 13.79 | 24.35 | *** | 20.31 |
| Not living with partner | 42.83     | 17.70     | ***    | 35.34 | 43.50 | *** | 6.99  | 18.32 | *** | 32.00 |
| N. children (mean)    | 2.38        | 2.43      | ***    | 2.57  | 2.36  | *** | 2.62  | 2.42  | *** | 2.40  |
| Job                   |             |           |        |      |      |     |     |     |     |     |
| Retired               | 47.80       | 53.99     | ***    | 50.83 | 47.53 | **  | 73.07 | 52.88 | *** | 50.47 |
| Working               | 30.27       | 41.39     | ***    | 18.27 | 31.35 | *** | 22.33 | 42.50 | *** | 35.06 |
| Other                 | 20.91       | 4.11      | ***    | 29.46 | 20.14 | *** | 3.68  | 4.14  |   | 13.67 |
| N. depressive symptoms (mean) | 2.90 | 1.92 | *** | 3.06 | 2.89 | ** | 2.02 | 1.92 |   | 2.48 |
| Self-perceived health (mean) | 3.17 | 2.99 | *** | 3.30 | 3.16 | *** | 3.18 | 2.98 | *** | 3.09 |
| ADL (mean)            | 0.20        | 0.15      | ***    | 0.14  | 0.21  | *** | 0.16  | 0.15  |   | 0.18  |
| Rural area            | 28.06       | 28.40     | 30.94  | 27.80 | **  | 30.24 | 28.29 |   | 28.21 |
| N                     | 26,161      | 19,807    | 2162   | 23,999 | 1088 | 18,719 | 45,968 |

* p < 0.05; ** p < 0.01; *** p < 0.001

despite expectations of the retired having more time available, working people in our sample are more likely to participate in social activities and to engage in a higher number of activities. Country coefficients show that, with few exceptions, older people in Northern and Western European countries usually have a higher likelihood of engagement in at least one social activity and also tend to participate in a higher number of activities compared with their counterparts in Southern and Eastern Europe. However, we acknowledge that the coefficients of covariates do not have a causal interpretation.
When looking at each activity separately (Table 4), OLS models suggest no significant association between grandparental childcare and engagement in the considered activities, with the exception of a higher participation in religious organisations for men. 2SLS regressions tell again a different story: while estimates for men are not statistically significant, grandchild care has a significant negative effect on volunteering, participation in educational courses, and participation in political or community-related organisations for women (complete results of IV models are shown in Appendix Tables 9 (first stage) and 10 (second stage). These results are in line with our Hypothesis 2.

The results with respect to the control variables in 2SLS models (see Table 10 in Appendix) confirm the importance of education in the active ageing framework: the higher the education, the more likely the engagement in all types of social activities considered. It also emerges that working people are more likely to participate in education or training courses and in political organisations compared with their retired counterparts. This is not surprising as firms often promote lifelong learning or refresher courses and employees may be taking part in trade union activity. We also notice a higher engagement in volunteering activities among Western Europeans (with the exception of Germany) and a lower participation in sport or other social clubs among Southern Europeans. Greece and Ireland show particularly high levels of engagement in religious organisations compared with the other countries considered.

In the third hypothesis we expected a stronger competition effect between grandchild care and participation in social activities for women. This hypothesis is largely confirmed: 2SLS estimates are significant (and always negative) only for women (Tables 3 and 4).

| Table 3 | Estimates of OLS and two-stage least square (IV) models predicting participation in at least one activity or number of activities by gender (standard errors in parentheses) |
|---------|--------------------------------------------------------------------------------------------------|
| Main independent variable: daily grandchild care | At least one activity | Number of activities |
| | Women | Men | Women | Men |
| OLS | −0.005 | 0.087** | −0.008 | 0.038** |
| | (0.019) | (0.027) | (0.011) | (0.015) |
| IV | −0.064 | 0.003 | −0.357*** | −0.175 |
| | (0.057) | (0.093) | (0.101) | (0.173) |
| N | 26,161 | 19,807 | 26,161 | 19,807 |

Each model includes all the control variables and country and time fixed effects. Complete results of IV models are shown in Appendix Tables 7 (first stage) and 8 (second stage).

* p < 0.05; ** p < 0.01; *** p < 0.001

4.3 Additional analyses and robustness checks

In Tables 5 and 6 we present results from additional analyses and some robustness checks on our previous 2SLS estimates. After reporting the 2SLS estimates of
Table 4 Estimates of OLS and two-stage least square (IV) models predicting participation in each activity by gender (standard errors in parentheses)

| Main independent variable: daily grandchild care | Volunteering | Education | Sport or other club | Political organisation | Religious organisation |
|-------------------------------------------------|--------------|-----------|---------------------|------------------------|-----------------------|
|                                                 | Women        | Men       | Women               | Men                    | Women                 | Men                   |
| OLS                                             | –0.004       | 0.010     | –0.010              | 0.015                  | –0.006                | 0.006                 | 0.001                | 0.015                 | 0.013                | 0.040***               |
|                                                 | (0.007)      | (0.011)   | (0.007)             | (0.009)                | (0.009)               | (0.013)               | (0.004)              | (0.008)               | (0.008)              | (0.009)               |
| IV                                              | –0.105**     | 0.049     | –0.187***           | –0.104                 | –0.063                | –0.088                | –0.049*              | –0.021                | 0.047                | –0.011                |
|                                                 | (0.040)      | (0.069)   | (0.035)             | (0.055)                | (0.047)               | (0.083)               | (0.022)              | (0.051)               | (0.040)              | (0.058)               |
| N                                               | 26,161       | 19,807    | 26,161              | 19,807                 | 26,161                | 19,807                | 26,161              | 19,807                | 26,161              | 19,807                |

Each model includes all the control variables and country and time fixed effects. Complete results of IV models are shown in Tables 9 (first stage) and 10 (second stage).

* p < 0.05; ** p < 0.01; *** p < 0.001
regular grandchild care defined as daily involvement in childcare as shown in Table 3 to enable an easy comparison with the additional analyses, we considered an alternative definition of regular grandchild care which includes weekly provision of childcare. This alternative explanatory variable takes value 1 for grandparents providing childcare on a daily or weekly basis and 0 otherwise.

Then we considered five robustness checks. First, we considered an alternative instrumental variable approach based on the smallest geographical distance between respondent and children with own children. In particular, four dummy variables

| Table 5 | Two-stage least square estimates of the effect of grandchild care on at least one activity or number of activities by gender from additional analyses and robustness checks |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | At least one                                                           | Number                               |
|         | Women     | Men       | Women     | Men       |
| **Alternative explanatory variables**                                                                                                                                     |
| Daily grandchild care                                    |                                                                                             |
| \( b \)     | \(-0.064\) | \(0.003\) | \(-0.357^{***}\) | \(-0.175\) |
| \( se \)   | \(0.057\) | \(0.093\) | \(0.101\)  | \(0.173\)  |
| \( N \)   | 26,161    | 19,807    | 26,161    | 19,807    |
| Daily or weekly grandchild care                           |                                                                                             |
| \( b \)     | \(-0.023\) | \(0.001\) | \(-0.128^{***}\) | \(-0.057\) |
| \( se \)   | \(0.020\) | \(0.030\) | \(0.036\)  | \(0.057\)  |
| \( N \)   | 26,161    | 19,807    | 26,161    | 19,807    |
| **Alternative instrument**                                                                                                                                           |
| Geographical distance                                      |                                                                                             |
| \( b \)     | \(-0.068\) | \(0.060\) | \(-0.275^{***}\) | \(0.040\)  |
| \( se \)   | \(0.039\) | \(0.060\) | \(0.069\)  | \(0.112\)  |
| \( N \)   | 25,683    | 19,462    | 25,683    | 19,462    |
| **Alternative sample selections**                                                                        |
| Excluding respondents with serious health problems          |                                                                                             |
| \( b \)     | \(-0.096\) | \(0.017\) | \(-0.418^{***}\) | \(-0.124\) |
| \( se \)   | \(0.058\) | \(0.096\) | \(0.104\)  | \(0.179\)  |
| \( N \)   | 23,687    | 18,070    | 23,687    | 18,070    |
| Excluding respondents with co-resident grandchildren         |                                                                                             |
| \( b \)     | \(-0.060\) | \(0.015\) | \(-0.375^{***}\) | \(-0.178\) |
| \( se \)   | \(0.061\) | \(0.099\) | \(0.109\)  | \(0.185\)  |
| \( N \)   | 25,756    | 19,617    | 25,756    | 19,617    |
| **Excluding possible mediators**                                                                         |
| IV model without health control variables                   |                                                                                             |
| \( b \)     | \(-0.077\) | \(-0.030\) | \(-0.384^{***}\) | \(-0.244\) |
| \( se \)   | \(0.057\) | \(0.093\) | \(0.101\)  | \(0.174\)  |
| \( N \)   | 26,161    | 19,807    | 26,161    | 19,807    |
| IV model without working status control variables         |                                                                                             |
| \( b \)     | \(-0.079\) | \(-0.019\) | \(-0.380^{***}\) | \(-0.218\) |
| \( se \)   | \(0.056\) | \(0.092\) | \(0.100\)  | \(0.172\)  |
| \( N \)   | 26,161    | 19,807    | 26,161    | 19,807    |

Each model includes all the control variables and country and time fixed effects

* \( p < 0.05 \); ** \( p < 0.01 \); *** \( p < 0.001 \)
Table 6  Two-stage least square estimates of the effect of grandchild care on each activity by gender from additional analyses and robustness checks

|                      | Volunteering | Education | Sport or other club | Political organisation | Religious organisation |
|----------------------|--------------|-----------|----------------------|------------------------|------------------------|
|                      | Women        | Men       | Women                | Men                    | Women                  | Men                    |
| **Alternative explanatory variables** |              |           |                      |                        |                        |
| **Daily grandchild care** |              |           |                      |                        |                        |
| b                    | -0.105**     | 0.049     | -0.187***            | -0.104                 | -0.063                 | -0.088                 | -0.049*               | -0.021                 | 0.047                  | -0.011                 |
| se                   | (0.040)      | (0.069)   | (0.035)              | (0.055)                | (0.047)                | (0.083)                | (0.022)               | (0.051)                | (0.040)                | (0.058)                |
| N                    | 26,161       | 19,807    | 26,161               | 19,807                 | 26,161                 | 19,807                 | 26,161               | 19,807                 | 26,161                 | 19,807                 |
| **Daily or weekly grandchild care** |              |           |                      |                        |                        |
| b                    | -0.038**     | 0.016     | -0.067***            | -0.034                 | -0.023                 | -0.029                 | -0.018*              | -0.007                 | 0.017                  | -0.004                 |
| se                   | (0.014)      | (0.022)   | (0.013)              | (0.018)                | (0.017)                | (0.027)                | (0.008)               | (0.017)                | (0.014)                | (0.019)                |
| N                    | 26,161       | 19,807    | 26,161               | 19,807                 | 26,161                 | 19,807                 | 26,161               | 19,807                 | 26,161                 | 19,807                 |
| **Alternative instrument** |              |           |                      |                        |                        |
| **Geographical distance** |              |           |                      |                        |                        |
| b                    | -0.110***    | 0.024     | -0.120***            | -0.086*                | -0.050                 | 0.046                  | -0.036*              | 0.003                  | 0.042                  | 0.053                  |
| se                   | (0.027)      | (0.044)   | (0.024)              | (0.036)                | (0.032)                | (0.054)                | (0.015)              | (0.033)                | (0.028)                | (0.038)                |
| N                    | 25,683       | 19,462    | 25,683               | 19,462                 | 25,683                 | 19,462                 | 25,683              | 19,462                 | 25,683                 | 19,462                 |
| **Alternative sample selections** |              |           |                      |                        |                        |
| **No serious health problems** |              |           |                      |                        |                        |
| b                    | -0.115**     | 0.065     | -0.211***            | -0.130*                | -0.067                 | -0.078                 | -0.067**             | 0.016                  | 0.042                  | 0.004                  |
| se                   | (0.041)      | (0.071)   | (0.037)              | (0.058)                | (0.048)                | (0.086)                | (0.023)              | (0.053)                | (0.041)                | (0.061)                |
| N                    | 23,687       | 18,070    | 23,687               | 18,070                 | 23,687                 | 18,070                 | 23,687              | 18,070                 | 23,687                 | 18,070                 |
| **No co-residents**  |              |           |                      |                        |                        |
| b                    | -0.112**     | 0.049     | -0.193***            | -0.103                 | -0.063                 | -0.094                 | -0.052*             | -0.021                 | 0.044                  | -0.010                 |
| se                   | (0.043)      | (0.073)   | (0.038)              | (0.059)                | (0.050)                | (0.089)                | (0.024)              | (0.054)                | (0.043)                | (0.062)                |
| N                    | 25,756       | 19,617    | 25,756               | 19,617                 | 25,756                 | 19,617                 | 25,756              | 19,617                 | 25,756                 | 19,617                 |
Table 6 continued

| Volunteering | Education | Sport or other club | Political organisation | Religious organisation |
|--------------|-----------|---------------------|------------------------|------------------------|
| Women        | Men       | Women               | Men                    | Women                 | Men                    |
| Excluding possible mediators | | | | | |
| IV model without health control variables | | | | | |
| b            | -0.111**  | 0.036               | -0.193***              | -0.115*               | -0.077                 | -0.120                 | -0.051*               | -0.027                 | 0.047                  | -0.017                 |
| se           | (0.040)   | (0.069)             | (0.035)                | (0.055)               | (0.047)                | (0.084)                | (0.022)               | (0.051)                | (0.040)                | (0.059)                |
| N            | 26,161    | 19,807              | 26,161                 | 19,807                | 26,161                 | 19,807                 | 26,161                | 19,807                 | 26,161                 | 19,807                 |
| IV model without working status control variables | | | | | |
| b            | -0.100*   | 0.049               | -0.210***              | -0.127*               | -0.066                 | -0.100                 | -0.052*               | -0.030                 | 0.049                  | -0.010                 |
| se           | (0.040)   | (0.068)             | (0.035)                | (0.055)               | (0.046)                | (0.083)                | (0.022)               | (0.050)                | (0.040)                | (0.058)                |
| N            | 26,161    | 19,807              | 26,161                 | 19,807                | 26,161                 | 19,807                 | 26,161                | 19,807                 | 26,161                 | 19,807                 |

Each model includes all the control variables and country and time fixed effects

* p < 0.05; ** p < 0.01; *** p < 0.001
indicate whether the respondent has at least one child with own children living: (1) within 5 km; (2) between 5 and 25 km; (3) more than 25 km away; or (4) does not have grandchildren.9 A similar instrumental variable approach was used by Compton and Pollak (2014) and Compton (2015) to estimate the effect of childcare provided by grandparents on their daughter’s fertility and labour market participation.

Second, we considered two alternative and more restrictive sample selections. In the first case, we excluded respondents who had experienced serious illness, that is, respondents that had reported ever having been diagnosed with stroke, Parkinson’s disease, or cancer. Similarly to disabled respondents who, as mentioned above, were already excluded from the sample, older people affected by serious illness may be at lower risk of regular grandchild care and participation in social activities. In the second case, we excluded from our sample grandparents who had co-resident grandchildren, independently of whether parents where present in the household (multi-generational households) or they were not (skipped-generation households). Their roles and burden in terms of responsibility and time might be completely different and also more difficult to identify than for grandparents who look after their grandchildren more or less frequently, but as supplementary caregivers (Hughes et al. 2007). It would have been interesting to run separate analyses for grandparents living with grandchildren, possibly even distinguishing between multi-generational households and cases of skipped-generation households, but there were not enough cases in our data set to do so. In fact, out of 26,161 women and 19,807 men in our initial working sample, only 405 women and 190 men lived with their grandchildren at the time of interview.

Finally, as two additional robustness checks we excluded from the 2SLS regressions the three control variables measuring respondents’ health conditions in one case and the working status dummy variables in the other. Health can itself be affected by grandchild care (e.g., Arpino and Bordone 2014; Di Gessa et al. 2015; Ku et al. 2012). Therefore health can act as mediator of the effect of grandchild care on social activities. Similarly, working status can be endogenous to the decision to provide grandchild care and to participate in social activities.

Table 5 shows that also when using the less stringent measure of grandchild care previous results are qualitatively confirmed. However, as it could be expected, the effect of grandchild care on social activity (when significant) is smaller when weekly involvement is also included. These results indicate that the competition effect of grandchild care on the number of social activities in which women engage is stronger when daily grandchild care is considered. The robustness checks all confirm the main analysis. Not only do the sign and significance of the effect of daily grandchild care not vary, but its magnitude is also quite stable.

In Table 6 we reported the 2SLS estimates of grandchild care on participation in each activity separately. Again, when less frequent grandchild care is included in

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9 The SHARE questionnaire asks whether each child lives “in the same household”, “in the same building”, “<1 km away”, “1–5 km away”, “5–25 km away”, “25–100 km away”, “100–500 km away”, “more than 500 km away”, “more than 500 km away in another country”. We used this information for each child who has at least one child of its own to build the instrumental variable described in the text, namely, the smallest geographical distance to children with own children.
the definition of the explanatory variable, its effect is reduced but it remains negative and significant in the same cases where daily grandchild care also was. The remaining robustness checks analysis indicates that 2SLS estimates do not substantially change with respect to the main findings in Table 4. The only exception is engagement in educational courses for men that in some cases is negatively affected by grandchild care but the effects are only marginally significant.

5 Discussion and concluding remarks

Drawing on the active ageing framework, defined as a means for discussing how to optimise opportunities for health, participation, and security in later life (Zaidi et al. 2013; WHO 2002), several studies tried to identify what individuals and societies can do to maintain vitality in old age. One of the main components identified is continuing engagement in social activities (e.g., Engelhardt et al. 2010; Hultsch et al. 1999; Menec 2003; Rowe and Kahn 1998). In this paper we provided an analysis of the effect of grandchild care on several variables related to engagement in social activities, which included the scope (i.e., the number of social activities) and the type of social activities in which individuals engage.

Using Two-Stage Least Squares regressions on SHARE data, we found that carrying out regular grandchild care has no significant effect on participating in at least one social activity. However, we did find a negative effect on the number of social activities in which grandmothers engage. When we considered participation in the different types of social activities separately, we found that regular grandchild care reduces the engagement in voluntary or charity work, educational or training courses and participation in political or community-related organisations only for women.

A limitation of our empirical analyses is that our IV estimates rely on the availability of grandchildren as the only instrumental variable for grandchild care. Having only one instrument we could not implement tests of exclusion restrictions and of endogeneity. We could however report the test of relevance (i.e., strong correlation between the instrument and the endogenous variable) that was easily passed in all the analyses.

Previous studies showed mixed evidence on the gendered effects of grandchild care (see, for example, the studies on satisfaction reviewed by Winefield and Air 2010). Some studies found different effects by gender of caring for grandchildren on health (see e.g., Hughes et al. 2007) and subjective age (i.e., how old a person feel to be; Bordone and Arpino 2016), while others did not find substantial differences by gender (see e.g., Arpino and Bordone 2014 on cognitive functioning). The negative effects of grandchild care on participation in social activities that we found for grandmothers and not for grandfathers can be explained by the fact that grandchild care provided by grandfathers is likely to be partially mediated by the role of grandmothers. In fact, Hank and Buber (2009) found that living with a partner has a significant effect on the likelihood of doing grandchild care for men but not for women, suggesting that grandfathers living in a couple may declare to provide
childcare when their partner is actually doing it. If this is the case, it is likely that while grandmothers look after the child, grandfathers may still engage in other non-childcare-related activities.

Moreover, the level of responsibility in childcare tends to be gendered and traditional gender divisions seem to persist in terms of the type of childcare that grandparents provide. According to previous studies reviewed by Winefield and Air (2010), grandmothers are more engaged in the welfare of the child and take on a more caregiving role (e.g., feeding, changing clothing/nappies, and bathing their grandchild). Grandfathers, on the other hand, tend to be involved more often in entertainment of the grandchildren, playing with them, taking them for walks, and showing them how to make things. Therefore, grandfathers are more likely than grandmothers to be involved in social activities, possibly done with the grandchild. In this respect, we acknowledge that our study is limited by a lack of information on what grandparents do when they are with their grandchildren. This information could help explain why we found different results by gender and for the different types of activities.

Drawing on the distinction proposed by Bukov et al. (2002) between activities that require only time and those that require special abilities and competences, we could argue that, among the five social activities we considered, volunteering, participation in education programs, and taking part in political organisations are the most demanding ones. While participation in a sport club or in religious organisations mainly requires time, being enrolled, for example, in a language course requires in addition basic language knowledge to be refreshed, homework to be done before class, and concentration during class. Similarly, volunteering and political activities also imply substantial efforts. Regular grandchild care not only reduces the time available for other activities, but it may also be physically and mentally tiring. Therefore, grandparents regularly involved in grandchild care are more likely to drop out of more demanding activities. As argued above, grandmothers are likely to have a higher level of responsibility and suffer more stress because of regular provision of grandchild care and this may help explain the negative effects found for grandmothers and not for grandfathers.

Our results contribute to different strands of the literature. First, we contribute to the literature on social capital by highlighting the importance of considering possible conflicts between grandchild care and participation in social activities. Second, we contribute to the literature on the consequences of grandchild care for grandparents, hinting that the possible benefits of grandchild care can be lowered by reduced participation in other beneficial activities with relevant consequences for the debate on active ageing.

We however believe that our results can be interpreted in a moderately optimistic way. Indeed, also when controlling for endogeneity of grandchild care there is no general negative effect (competition effect) on participation in social activities. In fact, both for women and men there is no evidence of competition between regular provision of childcare and participation in at least one of the considered social activities. Future research could further explore this issue by studying the conditions under which grandchild care can be cumulated with social participation in order to maximise the benefits of family and social integration.
Finally, we notice that the differential effects that we found by gender show the persistently gendered division of responsibilities across the life course. Gender equality studies should also take into consideration that unequal division of chores in late life may have important consequences in terms of lower opportunities for active ageing for women.

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**Appendix**

See Tables 7, 8, 9, 10.

**Table 7** First stage estimates of two-stage least square models predicting participation in at least one activity or number of activities by gender

| Independent variables | At least one activity | Number of activities |
|-----------------------|-----------------------|----------------------|
|                       | Women | Men   | Women | Men   |
| Has grandchildren     | 0.133*** | 0.091*** | 0.133*** | 0.091*** |
|                       | (0.004) | (0.004) | (0.004) | (0.004) |
| Age: (ref. 50–55)     |       |       |       |       |
| 56–60                 | 0.011*  | −0.003 | 0.011*  | −0.003 |
|                       | (0.005) | (0.005) | (0.005) | (0.005) |
| 61–65                 | 0.003  | 0.000  | 0.003  | 0.000  |
|                       | (0.006) | (0.006) | (0.006) | (0.006) |
| 66–70                 | −0.028*** | −0.003 | −0.028*** | −0.003 |
|                       | (0.007) | (0.007) | (0.007) | (0.007) |
| 71–75                 | −0.076*** | −0.024** | −0.076*** | −0.024** |
|                       | (0.007) | (0.007) | (0.007) | (0.007) |
| 76–80                 | −0.102*** | −0.055*** | −0.102*** | −0.055*** |
|                       | (0.008) | (0.008) | (0.008) | (0.008) |
| 81–85                 | −0.126*** | −0.071*** | −0.126*** | −0.071*** |
|                       | (0.009) | (0.009) | (0.009) | (0.009) |
| Education: (ref. low) |       |       |       |       |
| Middle                | −0.011** | −0.007 | −0.011** | −0.007 |
|                       | (0.004) | (0.004) | (0.004) | (0.004) |
| High                  | −0.016** | −0.015*** | −0.016** | −0.015*** |
|                       | (0.005) | (0.004) | (0.005) | (0.004) |
Table 7 continued

| Independent variables | At least one activity | Number of activities |
|-----------------------|-----------------------|----------------------|
|                       | Women                 | Men                  | Women               | Men                  |
| Not living with partner (ref. yes) | -0.007* (0.004) | -0.032*** (0.004) | -0.007* (0.004) | -0.032*** (0.004) |
| N. children           | -0.001 (0.001)       | -0.001 (0.001)       | -0.001 (0.001)     | -0.001 (0.001)       |
| Job: (ref. retired)   |                       |                      |                     |                     |
| Working               | -0.033*** (0.005)    | -0.022*** (0.005)    | -0.033*** (0.005)  | -0.022*** (0.005)   |
| Other                 | 0.001 (0.001)        | -0.016 (0.009)       | 0.001 (0.005)      | -0.016 (0.009)       |
| N. of depressive symptoms | 0.000 (0.001)    | -0.001 (0.001)       | 0.000 (0.001)      | -0.001 (0.001)       |
| Poor self-perceived health | -0.000 (0.002)  | -0.001 (0.002)       | -0.000 (0.002)     | -0.001 (0.002)       |
| ADL                   | -0.010*** (0.002)    | -0.003 (0.002)       | -0.010*** (0.002)  | -0.003 (0.002)       |
| Rural area (ref. not) | 0.002 (0.004)        | -0.002 (0.004)       | 0.002 (0.004)      | -0.002 (0.004)       |
| Interview year: (ref. 2004) |              |                      |                     |                     |
| 2005                  | 0.015 (0.009)        | 0.001 (0.008)        | 0.015 (0.009)      | 0.001 (0.008)        |
| 2006                  | -0.011 (0.010)       | -0.021* (0.009)      | -0.011 (0.010)     | -0.021* (0.009)      |
| 2007                  | -0.009 (0.006)       | -0.009 (0.006)       | -0.009 (0.006)     | -0.009 (0.006)       |
| 2010                  | -0.014 (0.014)       | 0.020 (0.015)        | -0.014 (0.014)     | 0.020 (0.015)        |
| 2011                  | 0.007 (0.006)        | 0.002 (0.005)        | 0.007 (0.006)      | 0.002 (0.005)        |
| 2012                  | -0.118** (0.040)     | -0.013 (0.047)       | -0.118** (0.040)   | -0.013 (0.047)       |
| Country: (ref. France) |                       |                      |                     |                     |
| Austria               | 0.018* (0.008)       | 0.003 (0.008)        | 0.018* (0.008)     | 0.003 (0.008)        |
| Germany               | 0.030** (0.010)      | 0.009 (0.010)        | 0.030** (0.010)    | 0.009 (0.010)        |
| Sweden                | -0.021* (0.010)      | -0.029** (0.009)     | -0.021* (0.010)    | -0.029** (0.009)     |
Table 7 continued

| Independent variables | At least one activity |        | Number of activities |        |
|-----------------------|-----------------------|--------|----------------------|--------|
|                       | Women                 | Men    | Women                | Men    |
|                       |                       |        |                      |        |
| Netherlands           | −0.022*               | −0.024** | −0.022*              | −0.024** |
|                       | (0.010)               | (0.009) | (0.010)              | (0.009) |
| Spain                 | 0.087***              | 0.057*** | 0.087***             | 0.057*** |
|                       | (0.009)               | (0.009) | (0.009)              | (0.009) |
| Italy                 | 0.120***              | 0.075*** | 0.120***             | 0.075*** |
|                       | (0.009)               | (0.009) | (0.009)              | (0.009) |
| Denmark               | −0.020                | −0.016  | −0.020               | −0.016  |
|                       | (0.011)               | (0.010) | (0.011)              | (0.010) |
| Greece                | 0.116***              | 0.061*** | 0.116***             | 0.061*** |
|                       | (0.011)               | (0.009) | (0.011)              | (0.009) |
| Switzerland           | 0.011                 | −0.002  | 0.011               | −0.002  |
|                       | (0.010)               | (0.009) | (0.010)              | (0.009) |
| Belgium               | 0.030***              | 0.020**  | 0.030***             | 0.020**  |
|                       | (0.009)               | (0.008) | (0.009)              | (0.008) |
| Israel                | 0.071***              | 0.052*** | 0.071***             | 0.052*** |
|                       | (0.013)               | (0.012) | (0.013)              | (0.012) |
| Czech Republic        | 0.031***              | 0.012    | 0.031***             | 0.012    |
|                       | (0.008)               | (0.008) | (0.008)              | (0.008) |
| Poland                | 0.166***              | 0.116*** | 0.166***             | 0.116*** |
|                       | (0.012)               | (0.012) | (0.012)              | (0.012) |
| Ireland               | 0.078***              | 0.055*** | 0.078***             | 0.055*** |
|                       | (0.017)               | (0.015) | (0.017)              | (0.015) |
| Hungary               | 0.041***              | 0.026*   | 0.041***             | 0.026*   |
|                       | (0.011)               | (0.011) | (0.011)              | (0.011) |
| Portugal              | 0.077***              | 0.057*** | 0.077***             | 0.057*** |
|                       | (0.012)               | (0.011) | (0.012)              | (0.011) |
| Slovenia              | 0.081***              | 0.067*** | 0.081***             | 0.067*** |
|                       | (0.010)               | (0.010) | (0.010)              | (0.010) |
| Estonia               | 0.021*                | −0.009  | 0.021*              | −0.009  |
|                       | (0.009)               | (0.009) | (0.009)              | (0.009) |
| Constant              | −0.003                | 0.021*   | −0.003              | 0.021*   |
|                       | (0.011)               | (0.010) | (0.011)              | (0.010) |
| N                     | 26,161                | 19,807  | 26,161              | 19,807  |

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$
Table 8  Second stage estimates of two-stage least square models predicting participation in at least one activity or number of activities by gender

| Independent variables          | At least one activity | Number of activities |
|-------------------------------|-----------------------|----------------------|
|                               | Women     | Men     | Women     | Men     |
| Daily grandchild care         | −0.064    | 0.003   | −0.357*** | −0.175  |
|                               | (0.057)   | (0.093) | (0.101)   | (0.173) |
| Age: (ref. 50–55)             |           |         |           |         |
| 56–60                         | 0.018     | −0.028**| 0.019     | −0.010  |
|                               | (0.009)   | (0.011) | (0.017)   | (0.020) |
| 61–65                         | 0.048***  | −0.004  | 0.064***  | 0.011   |
|                               | (0.011)   | (0.013) | (0.019)   | (0.023) |
| 66–70                         | 0.070***  | −0.008  | 0.090***  | 0.013   |
|                               | (0.011)   | (0.014) | (0.020)   | (0.026) |
| 71–75                         | 0.030*    | −0.029  | 0.005     | −0.022  |
|                               | (0.012)   | (0.015) | (0.022)   | (0.027) |
| 76–80                         | 0.028*    | −0.062***| −0.006  | −0.093**|
|                               | (0.013)   | (0.016) | (0.024)   | (0.029) |
| 81–85                         | −0.025    | −0.107***| −0.106***| −0.195***|
|                               | (0.015)   | (0.019) | (0.027)   | (0.035) |
| Education: (ref. low)         |           |         |           |         |
| Middle                        | 0.076***  | 0.069***| 0.146***  | 0.130***|
|                               | (0.007)   | (0.008) | (0.013)   | (0.016) |
| High                          | 0.224***  | 0.186***| 0.493***  | 0.433***|
|                               | (0.009)   | (0.010) | (0.016)   | (0.018) |
| Not living with partner (ref. yes) | 0.012    | −0.019*| 0.015     | −0.064***|
|                               | (0.006)   | (0.009) | (0.011)   | (0.017) |
| N. children                   | 0.008**   | 0.009***| 0.027***  | 0.030***|
|                               | (0.002)   | (0.003) | (0.004)   | (0.005) |
| Job: (ref. retired)           |           |         |           |         |
| Working                       | 0.061***  | 0.027*  | 0.087***  | 0.062** |
|                               | (0.009)   | (0.010) | (0.017)   | (0.020) |
| Other                         | 0.018*    | −0.059**| 0.011     | −0.095**|
|                               | (0.009)   | (0.019) | (0.016)   | (0.035) |
| N. of depressive symptoms     | −0.007*** | −0.010***| −0.011***| −0.012***|
|                               | (0.001)   | (0.002) | (0.002)   | (0.004) |
| Poor self-perceived health    | −0.044*** | −0.041***| −0.084***| −0.084***|
|                               | (0.003)   | (0.004) | (0.006)   | (0.007) |
### Table 8 continued

| Independent variables          | At least one activity | Number of activities |
|-------------------------------|-----------------------|----------------------|
|                               | Women | Men | Women | Men |
| **ADL**                       |       |     |       |     |
| -0.024***                    | (0.004) | (0.006) | -0.027*** | (0.008) | (0.011) |
| Rural area (ref. not)         | 0.040*** | 0.021** | 0.076*** | 0.058*** |
|                             | (0.007) | (0.008) | (0.012) | (0.015) |
| Interview year: (ref. 2004)   |       |     |       |     |
| 2005                          | 0.019 | -0.005 | 0.045 | -0.014 |
|                             | (0.016) | (0.017) | (0.028) | (0.031) |
| 2006                          | 0.046* | 0.001 | 0.072* | 0.027 |
|                             | (0.018) | (0.019) | (0.032) | (0.036) |
| 2007                          | 0.009 | -0.016 | 0.029 | -0.011 |
|                             | (0.011) | (0.012) | (0.019) | (0.022) |
| 2010                          | 0.148*** | 0.112*** | 0.295*** | 0.256*** |
|                             | (0.024) | (0.032) | (0.042) | (0.060) |
| 2011                          | 0.157*** | 0.144*** | 0.267*** | 0.309*** |
|                             | (0.010) | (0.011) | (0.017) | (0.020) |
| 2012                          | 0.384*** | 0.157 | 0.377** | 0.146 |
|                             | (0.070) | (0.099) | (0.124) | (0.185) |
| Country: (ref. France)        |       |     |       |     |
| Austria                       | 0.035* | 0.045** | 0.077** | 0.091** |
|                             | (0.014) | (0.017) | (0.025) | (0.031) |
| Germany                       | 0.010 | -0.004 | 0.019 | 0.011 |
|                             | (0.018) | (0.020) | (0.032) | (0.038) |
| Sweden                        | 0.093*** | 0.079*** | 0.151*** | 0.145*** |
|                             | (0.018) | (0.020) | (0.032) | (0.037) |
| Netherlands                   | 0.191*** | 0.124*** | 0.337*** | 0.263*** |
|                             | (0.017) | (0.019) | (0.030) | (0.035) |
| Spain                         | -0.062*** | -0.152*** | -0.089** | -0.262*** |
|                             | (0.017) | (0.019) | (0.030) | (0.036) |
| Italy                         | -0.100*** | -0.153*** | -0.127*** | -0.253*** |
|                             | (0.017) | (0.019) | (0.030) | (0.035) |
| Denmark                       | 0.127*** | 0.106*** | 0.175*** | 0.137*** |
|                             | (0.019) | (0.020) | (0.033) | (0.038) |
| Greece                        | 0.210*** | -0.027 | 0.215*** | -0.093* |
|                             | (0.019) | (0.020) | (0.034) | (0.037) |
Table 8 continued

| Independent variables | At least one activity | Number of activities |
|-----------------------|----------------------|----------------------|
|                       | Women                | Men                  | Women                | Men                  |
| Switzerland           | 0.114***             | 0.120***             | 0.278***             | 0.259***             |
|                       | (0.017)              | (0.018)              | (0.030)              | (0.034)              |
| Belgium               | 0.038*               | 0.075***             | 0.097***             | 0.167***             |
|                       | (0.015)              | (0.017)              | (0.027)              | (0.031)              |
| Israel                | 0.050*               | 0.038                | 0.075                | −0.016               |
|                       | (0.023)              | (0.025)              | (0.041)              | (0.047)              |
| Czech Republic        | −0.083***            | −0.074***            | −0.140***            | −0.188***            |
|                       | (0.014)              | (0.016)              | (0.025)              | (0.031)              |
| Poland                | −0.133***            | −0.134***            | −0.163***            | −0.215***            |
|                       | (0.023)              | (0.027)              | (0.041)              | (0.051)              |
| Ireland               | 0.155***             | 0.201***             | 0.286***             | 0.371***             |
|                       | (0.030)              | (0.032)              | (0.053)              | (0.060)              |
| Hungary               | −0.109***            | −0.169***            | −0.174***            | −0.321***            |
|                       | (0.019)              | (0.022)              | (0.033)              | (0.042)              |
| Portugal              | −0.118***            | −0.212***            | −0.230***            | −0.412***            |
|                       | (0.022)              | (0.024)              | (0.039)              | (0.046)              |
| Slovenia              | −0.002               | −0.016               | −0.055               | −0.088*              |
|                       | (0.019)              | (0.021)              | (0.033)              | (0.040)              |
| Estonia               | −0.113***            | −0.189***            | −0.195***            | −0.370***            |
|                       | (0.015)              | (0.019)              | (0.027)              | (0.036)              |
| Constant              | 0.348***             | 0.451***             | 0.502***             | 0.623***             |
|                       | (0.020)              | (0.022)              | (0.035)              | (0.041)              |
| N                     | 26,161               | 19,807               | 26,161               | 19,807               |

* p < 0.05; ** p < 0.01; *** p < 0.001
Table 9 First stage estimates of two-stage least square models predicting participation in each activity by gender

| Independent variables | Volunteering | Education | Sport or other club | Political organisation | Religious organisation |
|-----------------------|--------------|-----------|---------------------|------------------------|-----------------------|
|                       | Women        | Men       | Women               | Men                    | Women                 | Men       |
| Has grandchildren     | 0.133***     | 0.091***  | 0.133***            | 0.091***               | 0.133***              | 0.091***  |
|                       | (0.004)      | (0.004)   | (0.004)             | (0.004)                | (0.004)               | (0.004)   |
| Age: (Ref. 50–55)     |              |           |                     |                        |                       |
| 56–60                 | 0.011*       | −0.003    | 0.011*              | −0.003                 | 0.011*                | −0.003    |
|                       | (0.005)      | (0.005)   | (0.005)             | (0.005)                | (0.005)               | (0.005)   |
| 61–65                 | 0.003        | 0.000     | 0.003               | 0.000                  | 0.003                 | 0.000     |
|                       | (0.006)      | (0.006)   | (0.006)             | (0.006)                | (0.006)               | (0.006)   |
| 66–70                 | −0.028***    | −0.003    | −0.028***           | −0.003                 | −0.028***             | −0.003    |
|                       | (0.007)      | (0.007)   | (0.007)             | (0.007)                | (0.007)               | (0.007)   |
| 71–75                 | −0.076***    | −0.024**  | −0.076***           | −0.024**               | −0.076***             | −0.024**  |
|                       | (0.007)      | (0.007)   | (0.007)             | (0.007)                | (0.007)               | (0.007)   |
| 76–80                 | −0.102***    | −0.055*** | −0.102***           | −0.055***              | −0.102***             | −0.055*** |
|                       | (0.008)      | (0.008)   | (0.008)             | (0.008)                | (0.008)               | (0.008)   |
| 81–85                 | −0.126***    | −0.071*** | −0.126***           | −0.071***              | −0.126***             | −0.071*** |
|                       | (0.009)      | (0.009)   | (0.009)             | (0.009)                | (0.009)               | (0.009)   |
| Education: (ref. low) |              |           |                     |                        |                       |
| Middle                | −0.011**     | −0.007    | −0.011**            | −0.007                 | −0.011**              | −0.007    |
|                       | (0.004)      | (0.004)   | (0.004)             | (0.004)                | (0.004)               | (0.004)   |
| High                  | −0.016**     | −0.015*** | −0.016**            | −0.015***              | −0.016**              | −0.015*** |
|                       | (0.005)      | (0.005)   | (0.005)             | (0.005)                | (0.005)               | (0.005)   |
| Not living with partner (ref. yes) | −0.007*        | −0.032*** | −0.007*            | −0.032***              | −0.007*               | −0.032*** |
|                       | (0.004)      | (0.004)   | (0.004)             | (0.004)                | (0.004)               | (0.004)   |
| Independent variables | Volunteering | Education | Sport or other club | Political organisation | Religious organisation |
|-----------------------|-------------|-----------|---------------------|------------------------|------------------------|
|                       | Women | Men | Women | Men | Women | Men | Women | Men | Women | Men | Women | Men | Women | Men |
| N. children            | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 |
| Job: (ref. retired)    |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Working               | -0.033*** | -0.022*** | -0.033*** | -0.022*** | -0.033*** | -0.022*** | -0.033*** | -0.022*** | -0.033*** | -0.022*** | -0.033*** | -0.022*** | -0.033*** | -0.022*** |
| Other                 | 0.001  | -0.016 | 0.001  | -0.016 | 0.001  | -0.016 | 0.001  | -0.016 | 0.001  | -0.016 | 0.001  | -0.016 | 0.001  | -0.016 |
| N. depressive symptoms| 0.000  | -0.001 | 0.000  | -0.001 | 0.000  | -0.001 | 0.000  | -0.001 | 0.000  | -0.001 | 0.000  | -0.001 | 0.000  | -0.001 |
| Poor self-perceived health | -0.000 | -0.001 | -0.000 | -0.001 | -0.000 | -0.001 | -0.000 | -0.001 | -0.000 | -0.001 | -0.000 | -0.001 | -0.000 | -0.001 |
| ADL                   | -0.010*** | -0.003 | -0.010*** | -0.003 | -0.010*** | -0.003 | -0.010*** | -0.003 | -0.010*** | -0.003 | -0.010*** | -0.003 | -0.010*** | -0.003 |
| Rural area (ref. not) | 0.002  | -0.002 | 0.002  | -0.002 | 0.002  | -0.002 | 0.002  | -0.002 | 0.002  | -0.002 | 0.002  | -0.002 | 0.002  | -0.002 |
| Interview year: (ref. 2004) |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 2005                  | 0.015  | 0.001 | 0.015  | 0.001 | 0.015  | 0.001 | 0.015  | 0.001 | 0.015  | 0.001 | 0.015  | 0.001 | 0.015  | 0.001 |
| 2006                  | -0.011 | -0.021* | -0.011 | -0.021* | -0.011 | -0.021* | -0.011 | -0.021* | -0.011 | -0.021* | -0.011 | -0.021* | -0.011 | -0.021* |
| 2007                  | -0.009 | -0.009 | -0.009 | -0.009 | -0.009 | -0.009 | -0.009 | -0.009 | -0.009 | -0.009 | -0.009 | -0.009 | -0.009 | -0.009 |
| Independent variables | Volunteering | Education | Sport or other club | Political organisation | Religious organisation |
|-----------------------|--------------|-----------|---------------------|------------------------|------------------------|
|                       | Women | Men | Women | Men | Women | Men | Women | Men | Women | Men | Women | Men |
| 2010                  | -0.014 | 0.020 | -0.014 | 0.020 | -0.014 | 0.020 | -0.014 | 0.020 | -0.014 | 0.020 |
|                       | (0.014) | (0.015) | (0.014) | (0.015) | (0.014) | (0.015) | (0.014) | (0.015) | (0.014) | (0.015) |
| 2011                  | 0.007  | 0.002 | 0.007  | 0.002 | 0.007  | 0.002 | 0.007  | 0.002 | 0.007  | 0.002 |
|                       | (0.006) | (0.005) | (0.006) | (0.005) | (0.006) | (0.005) | (0.006) | (0.005) | (0.006) | (0.005) |
| 2012                  | -0.118** | -0.013 | -0.118** | -0.013 | -0.118** | -0.013 | -0.118** | -0.013 | -0.118** | -0.013 |
|                       | (0.040) | (0.047) | (0.040) | (0.047) | (0.040) | (0.047) | (0.040) | (0.047) | (0.040) | (0.047) |
| Country: (ref. France) | Austria | 0.018* | 0.003 | 0.018* | 0.003 | 0.018* | 0.003 | 0.018* | 0.003 |
|                       | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) |
|                       | Germany | 0.030** | 0.009 | 0.030** | 0.009 | 0.030** | 0.009 | 0.030** | 0.009 |
|                       | (0.010) | (0.010) | (0.010) | (0.010) | (0.010) | (0.010) | (0.010) | (0.010) |
|                       | Sweden | -0.021* | -0.029** | -0.021* | -0.029** | -0.021* | -0.029** | -0.021* | -0.029** |
|                       | (0.010) | (0.009) | (0.010) | (0.009) | (0.010) | (0.009) | (0.010) | (0.009) |
|                       | Netherlands | -0.022* | -0.024** | -0.022* | -0.024** | -0.022* | -0.024** | -0.022* | -0.024** |
|                       | (0.010) | (0.009) | (0.010) | (0.009) | (0.010) | (0.009) | (0.010) | (0.009) |
|                       | Spain | 0.087*** | 0.057*** | 0.087*** | 0.057*** | 0.087*** | 0.057*** | 0.087*** | 0.057*** |
|                       | (0.009) | (0.009) | (0.009) | (0.009) | (0.009) | (0.009) | (0.009) | (0.009) |
|                       | Italy | 0.120*** | 0.075*** | 0.120*** | 0.075*** | 0.120*** | 0.075*** | 0.120*** | 0.075*** |
|                       | (0.009) | (0.009) | (0.009) | (0.009) | (0.009) | (0.009) | (0.009) | (0.009) |
|                       | Denmark | -0.020 | -0.016 | -0.020 | -0.016 | -0.020 | -0.016 | -0.020 | -0.016 |
|                       | (0.011) | (0.010) | (0.011) | (0.010) | (0.011) | (0.010) | (0.011) | (0.010) |
|                       | Greece | 0.116*** | 0.061*** | 0.116*** | 0.061*** | 0.116*** | 0.061*** | 0.116*** | 0.061*** |
|                       | (0.011) | (0.009) | (0.011) | (0.009) | (0.011) | (0.009) | (0.011) | (0.009) |
| Independent variables    | Volunteering | Education | Sport or other club | Political organisation | Religious organisation |
|--------------------------|--------------|-----------|---------------------|------------------------|------------------------|
|                          | Women        | Men       | Women               | Men                    | Women                  | Men                    |
| Switzerland              | 0.011        | -0.002    | 0.011               | -0.002                 | 0.011                  | -0.002                 |
|                          | (0.010)      | (0.009)   | (0.010)             | (0.009)                | (0.010)                | (0.009)                |
| Belgium                  | 0.030***     | 0.020**   | 0.030***            | 0.020**                | 0.030***               | 0.020**                |
|                          | (0.009)      | (0.008)   | (0.009)             | (0.008)                | (0.009)                | (0.008)                |
| Israel                   | 0.071***     | 0.052***  | 0.071***            | 0.052***               | 0.071***               | 0.052***               |
|                          | (0.013)      | (0.012)   | (0.013)             | (0.012)                | (0.013)                | (0.012)                |
| Czech Republic           | 0.031***     | 0.012     | 0.031***            | 0.012                  | 0.031***               | 0.012                  |
|                          | (0.008)      | (0.008)   | (0.008)             | (0.008)                | (0.008)                | (0.008)                |
| Poland                   | 0.166***     | 0.116***  | 0.166***            | 0.116***               | 0.166***               | 0.116***               |
|                          | (0.012)      | (0.012)   | (0.012)             | (0.012)                | (0.012)                | (0.012)                |
| Ireland                  | 0.078***     | 0.055***  | 0.078***            | 0.055***               | 0.078***               | 0.055***               |
|                          | (0.017)      | (0.015)   | (0.017)             | (0.015)                | (0.017)                | (0.015)                |
| Hungary                  | 0.041***     | 0.026*    | 0.041***            | 0.026*                 | 0.041***               | 0.026*                 |
|                          | (0.011)      | (0.011)   | (0.011)             | (0.011)                | (0.011)                | (0.011)                |
| Portugal                 | 0.077***     | 0.057***  | 0.077***            | 0.057***               | 0.077***               | 0.057***               |
|                          | (0.012)      | (0.012)   | (0.012)             | (0.012)                | (0.012)                | (0.012)                |
| Slovenia                 | 0.081***     | 0.067***  | 0.081***            | 0.067***               | 0.081***               | 0.067***               |
|                          | (0.010)      | (0.010)   | (0.010)             | (0.010)                | (0.010)                | (0.010)                |
| Estonia                  | 0.021*       | -0.009    | 0.021*              | -0.009                 | 0.021*                 | -0.009                 |
|                          | (0.009)      | (0.009)   | (0.009)             | (0.009)                | (0.009)                | (0.009)                |
| Constant                 | -0.003       | 0.021*    | -0.003              | 0.021*                 | -0.003                 | 0.021*                 |
|                          | (0.011)      | (0.010)   | (0.011)             | (0.010)                | (0.011)                | (0.010)                |
**Table 9** continued

| Independent variables | Volunteering | Education | Sport or other club | Political organisation | Religious organisation |
|-----------------------|--------------|-----------|---------------------|------------------------|------------------------|
|                       | Women | Men | Women | Men | Women | Men | Women | Men | Women | Men | Women | Men |
| N                     | 26,161 | 19,807 | 26,161 | 19,807 | 26,161 | 19,807 | 26,161 | 19,807 | 26,161 | 19,807 |

*p < 0.05; **p < 0.01; ***p < 0.001
Table 10 Second stage estimates of two-stage least square models predicting participation in each activity by gender

| Independent variables       | Volunteering       | Education          | Sport or other club | Political organisation | Religious organisation |
|----------------------------|--------------------|--------------------|---------------------|------------------------|------------------------|
|                            | Women  | Men    | Women  | Men    | Women  | Men    | Women  | Men    | Women  | Men    | Women  | Men    |
| Daily grandchild care       | -0.105** | 0.049  | -0.187*** | -0.104  | -0.063  | -0.088  | -0.049* | -0.021  | 0.047   | -0.011  |
|                            | (0.040)  | (0.069) | (0.035) | (0.055) | (0.047) | (0.083) | (0.022) | (0.051) | (0.040) | (0.058) |
| Age: (ref. 50–55)           |        |        |        |        |        |        |        |        |        |        |
| 56–60                      | 0.011   | 0.013  | -0.005 | -0.017** | 0.001  | -0.013  | 0.004   | 0.004   | 0.009   | 0.002   |
|                            | (0.007) | (0.008) | (0.006) | (0.006) | (0.008) | (0.010) | (0.004) | (0.006) | (0.007) | (0.007) |
| 61–65                      | 0.019*  | 0.028** | -0.010 | -0.039*** | 0.021* | -0.003  | 0.010*  | 0.004   | 0.024** | 0.021** |
|                            | (0.008) | (0.009) | (0.007) | (0.007) | (0.009) | (0.011) | (0.004) | (0.007) | (0.008) | (0.008) |
| 66–70                      | 0.023*** | 0.024*  | -0.022** | -0.041*** | 0.028** | -0.002  | 0.007   | 0.015   | 0.054*** | 0.017   |
|                            | (0.008) | (0.010) | (0.007) | (0.008) | (0.009) | (0.013) | (0.005) | (0.008) | (0.008) | (0.009) |
| 71–75                      | -0.005  | 0.007  | -0.045*** | -0.049*** | 0.005  | -0.020  | -0.000  | 0.008   | 0.050*** | 0.033*** |
|                            | (0.009) | (0.011) | (0.008) | (0.009) | (0.010) | (0.013) | (0.005) | (0.008) | (0.009) | (0.009) |
| 76–80                      | -0.019* | -0.015 | -0.054*** | -0.059*** | -0.002  | -0.044** | 0.003   | -0.001  | 0.067*** | 0.027** |
|                            | (0.009) | (0.012) | (0.008) | (0.009) | (0.011) | (0.014) | (0.005) | (0.009) | (0.010) | (0.010) |
| 81–85                      | -0.047*** | -0.051*** | -0.065*** | -0.061*** | -0.022  | -0.083*** | -0.013* | -0.013  | 0.041*** | 0.013   |
|                            | (0.011) | (0.014) | (0.010) | (0.011) | (0.013) | (0.017) | (0.006) | (0.010) | (0.011) | (0.012) |
| Education: (ref. low)       |        |        |        |        |        |        |        |        |        |        |
| Middle                     | 0.044*** | 0.049*** | 0.034*** | 0.025*** | 0.052*** | 0.037*** | 0.018*** | 0.027*** | -0.003  | -0.008  |
|                            | (0.005) | (0.006) | (0.004) | (0.005) | (0.006) | (0.008) | (0.003) | (0.005) | (0.005) | (0.005) |
| High                       | 0.115*** | 0.122*** | 0.166*** | 0.106*** | 0.136*** | 0.088*** | 0.045*** | 0.084*** | 0.030*** | 0.033*** |
|                            | (0.006) | (0.007) | (0.006) | (0.006) | (0.007) | (0.009) | (0.004) | (0.005) | (0.006) | (0.006) |
| Not living with partner (ref. yes) | 0.002  | -0.015* | 0.008*  | -0.004  | 0.004  | -0.012  | 0.002   | -0.013* | -0.002  | -0.020*** |
|                            | (0.004) | (0.007) | (0.004) | (0.006) | (0.005) | (0.008) | (0.002) | (0.005) | (0.004) | (0.006) |
| Independent variables | Volunteering | Education | Sport or other club | Political organisation | Religious organisation |
|-----------------------|--------------|-----------|---------------------|------------------------|------------------------|
|                       | Women        | Men       | Women               | Men                    | Women                  | Men                    |
| N. children           | 0.005***     | 0.007***  | 0.005***            | 0.004**                | 0.002**                | 0.002                  |
|                       | (0.002)      | (0.002)   | (0.001)             | (0.002)                | (0.001)                | (0.002)                |
| Job: (ref. retired)   |              |           |                     |                        |                        |                        |
| Working               | −0.021**     | −0.007    | 0.092***            | 0.053***               | 0.004                  | 0.002                  |
|                       | (0.007)      | (0.008)   | (0.006)             | (0.006)                | (0.008)                | (0.009)                |
| Other                 | −0.004       | −0.018    | 0.016**             | 0.004                  | −0.013                 | −0.069***              |
|                       | (0.006)      | (0.014)   | (0.005)             | (0.011)                | (0.007)                | (0.017)                |
| N. depressive symptoms| −0.003**     | −0.002    | −0.001              | 0.000                  | −0.006***              | −0.008***              |
|                       | (0.001)      | (0.001)   | (0.001)             | (0.001)                | (0.001)                | (0.001)                |
| Poor self-perceived health | −0.016*** | −0.016*** | −0.017***           | −0.014***              | −0.042***              | −0.039***              |
|                       | (0.002)      | (0.003)   | (0.002)             | (0.002)                | (0.003)                | (0.003)                |
| ADL                   | −0.005       | −0.009*   | −0.001              | −0.003                 | −0.011**               | −0.012*                |
|                       | (0.003)      | (0.004)   | (0.003)             | (0.003)                | (0.004)                | (0.005)                |
| Rural area (ref. not) | 0.018***     | 0.025***  | −0.002              | −0.008                 | 0.018***               | 0.012**                |
|                       | (0.005)      | (0.006)   | (0.004)             | (0.005)                | (0.006)                | (0.007)                |
| Interview year: (ref. 2004) |           |           |                     |                        |                        |                        |
| 2005                  | 0.020        | −0.005    | 0.004               | −0.012                 | 0.021                  | −0.009                 |
|                       | (0.011)      | (0.012)   | (0.010)             | (0.010)                | (0.013)                | (0.015)                |
| 2006                  | −0.001       | 0.027     | 0.012               | 0.002                  | 0.043**                | 0.003                  |
|                       | (0.013)      | (0.014)   | (0.011)             | (0.012)                | (0.015)                | (0.018)                |
| 2007                  | 0.004        | 0.012     | 0.003               | −0.003                 | 0.020**                | 0.002                  |
|                       | (0.008)      | (0.009)   | (0.007)             | (0.007)                | (0.009)                | (0.011)                |

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| Independent variables | Volunteering | Education | Sport or other club | Political organisation | Religious organisation |
|-----------------------|-------------|-----------|---------------------|------------------------|------------------------|
|                       | Women       | Men       | Women               | Men                    | Women                  | Men                    |
| 2010                  | 0.096***    | 0.075**   | 0.067***            | 0.060**                | 0.075***              | 0.076**               | 0.019*               | 0.036*               | 0.038*               | 0.008               |
|                       | (0.017)     | (0.024)   | (0.015)             | (0.019)                | (0.020)               | (0.029)               | (0.009)              | (0.017)              | (0.017)              | (0.020)             |
| 2011                  | 0.073***    | 0.082***  | 0.062***            | 0.068***               | 0.099***              | 0.114***              | 0.004               | 0.028***             | 0.029***             | 0.017*              |
|                       | (0.007)     | (0.008)   | (0.006)             | (0.006)                | (0.008)               | (0.010)               | (0.004)              | (0.006)              | (0.007)              | (0.007)             |
| 2012                  | −0.019      | −0.031    | 0.016               | 0.005                  | 0.061                 | −0.030                | −0.026              | −0.026               | 0.345***             | 0.228***             |
|                       | (0.049)     | (0.073)   | (0.044)             | (0.059)                | (0.057)               | (0.089)               | (0.027)             | (0.054)              | (0.050)              | (0.062)             |
| Country: (ref. France)| Austria     |           |                     |                        |                       |                       |                     |                      |                      |                    |
|                       | −0.048***   | −0.095*** | 0.031***            | 0.019                  | −0.078***             | 0.037**               | −0.001              | 0.002               | 0.172***             | 0.129***             |
|                       | (0.010)     | (0.012)   | (0.009)             | (0.010)                | (0.012)               | (0.015)               | (0.006)             | (0.009)             | (0.010)             | (0.011)             |
|                       | Germany     |           |                     |                        |                       |                       |                     |                      |                      |                    |
|                       | −0.039**    | −0.065*** | 0.008               | 0.009                  | 0.014                 | 0.053**               | −0.031***           | −0.026*             | 0.068***             | 0.040**             |
|                       | (0.013)     | (0.015)   | (0.011)             | (0.012)                | (0.015)               | (0.018)               | (0.007)             | (0.011)             | (0.013)             | (0.013)             |
|                       | Sweden      |           |                     |                        |                       |                       |                     |                      |                      |                    |
|                       | 0.026*      | 0.024     | 0.080***            | 0.074***               | 0.021                 | 0.058**               | −0.018*             | −0.015              | 0.042**              | 0.004               |
|                       | (0.013)     | (0.015)   | (0.011)             | (0.012)                | (0.015)               | (0.018)               | (0.007)             | (0.011)             | (0.013)             | (0.012)             |
|                       | Netherlands |           |                     |                        |                       |                       |                     |                      |                      |                    |
|                       | 0.121***    | 0.054***  | 0.043***            | 0.040***               | 0.108***              | 0.105***              | −0.010              | −0.014              | 0.075***             | 0.078***             |
|                       | (0.012)     | (0.014)   | (0.011)             | (0.011)                | (0.014)               | (0.017)               | (0.007)             | (0.010)             | (0.012)             | (0.012)             |
|                       | Spain       |           |                     |                        |                       |                       |                     |                      |                      |                    |
|                       | −0.078***   | −0.154*** | 0.028***            | −0.004                 | −0.099***             | −0.096***             | −0.015*             | −0.032**            | 0.075***             | 0.025*              |
|                       | (0.012)     | (0.014)   | (0.011)             | (0.011)                | (0.014)               | (0.017)               | (0.007)             | (0.011)             | (0.012)             | (0.012)             |
|                       | Italy       |           |                     |                        |                       |                       |                     |                      |                      |                    |
|                       | −0.033**    | −0.103*** | 0.015               | −0.016                 | −0.129***             | −0.102***             | −0.019**            | −0.028**            | 0.039**              | −0.005              |
|                       | (0.012)     | (0.014)   | (0.011)             | (0.011)                | (0.014)               | (0.017)               | (0.007)             | (0.010)             | (0.012)             | (0.012)             |
|                       | Denmark     |           |                     |                        |                       |                       |                     |                      |                      |                    |
|                       | 0.018       | −0.004    | 0.031***            | 0.034***               | 0.122***              | 0.140***              | −0.021**            | −0.028*             | 0.025                | −0.006              |
|                       | (0.013)     | (0.015)   | (0.012)             | (0.012)                | (0.015)               | (0.018)               | (0.007)             | (0.011)             | (0.013)             | (0.013)             |
|                       | Greece      |           |                     |                        |                       |                       |                     |                      |                      |                    |
|                       | −0.069***   | −0.157*** | 0.026*              | 0.003                  | −0.154***             | −0.108***             | 0.011               | −0.001              | 0.401***             | 0.170***             |
|                       | (0.014)     | (0.015)   | (0.012)             | (0.012)                | (0.016)               | (0.018)               | (0.008)             | (0.011)             | (0.014)             | (0.013)             |
| Independent variables | Volunteering | Education | Sport or other club | Political organisation | Religious organisation |
|-----------------------|--------------|-----------|---------------------|------------------------|------------------------|
|                       | Women        | Men       | Women               | Men                    | Women                  | Men                    |
| Switzerland           | 0.042***     | -0.020    | 0.113***            | 0.094***               | 0.026                  | 0.102***               | 0.102***               | 0.072***               |
|                       | (0.012)      | (0.013)   | (0.010)             | (0.011)                | (0.014)                | (0.007)                | (0.012)                | (0.011)                |
| Belgium               | 0.008        | -0.009    | 0.064***            | 0.066***               | -0.020                 | 0.068***               | 0.021***               | 0.016                  | 0.024*                 | 0.026*                |
|                       | (0.011)      | (0.012)   | (0.009)             | (0.010)                | (0.012)                | (0.015)                | (0.006)                | (0.009)                | (0.011)                | (0.010)                |
| Israel                | 0.020        | -0.106*** | 0.078***            | 0.039**                | 0.008                  | -0.057*                | -0.021*                | -0.023                 | -0.009                 | 0.132***               |
|                       | (0.016)      | (0.019)   | (0.014)             | (0.015)                | (0.019)                | (0.023)                | (0.009)                | (0.014)                | (0.016)                | (0.016)                |
| Czech Republic        | -0.108***    | -0.167*** | 0.031***            | 0.001                  | -0.074***              | -0.007                 | -0.012*                | -0.020*                | 0.022*                 | 0.006                 |
|                       | (0.010)      | (0.012)   | (0.009)             | (0.010)                | (0.011)                | (0.015)                | (0.005)                | (0.009)                | (0.010)                | (0.010)                |
| Poland                | -0.086***    | -0.152*** | 0.035*              | 0.018                  | -0.136***              | -0.128***              | -0.014                 | -0.030*                | 0.039*                 | 0.077***               |
|                       | (0.016)      | (0.020)   | (0.015)             | (0.016)                | (0.019)                | (0.024)                | (0.009)                | (0.015)                | (0.017)                | (0.017)                |
| Ireland               | 0.001        | -0.044    | 0.014               | 0.035                  | -0.001                 | 0.130***               | -0.007                 | -0.028                 | 0.279***               | 0.279***               |
|                       | (0.021)      | (0.024)   | (0.019)             | (0.019)                | (0.024)                | (0.029)                | (0.012)                | (0.018)                | (0.021)                | (0.020)                |
| Hungary               | -0.092***    | -0.150*** | -0.012              | -0.028*                | -0.166***              | -0.137***              | -0.015*                | -0.056***              | 0.111***               | 0.051***               |
|                       | (0.013)      | (0.017)   | (0.012)             | (0.013)                | (0.015)                | (0.020)                | (0.007)                | (0.012)                | (0.013)                | (0.014)                |
| Portugal              | -0.091***    | -0.188*** | -0.009              | -0.020                 | -0.206***              | -0.193***              | -0.023                 | -0.056***              | 0.098***               | 0.045**                |
|                       | (0.015)      | (0.018)   | (0.014)             | (0.014)                | (0.018)                | (0.022)                | (0.009)                | (0.013)                | (0.016)                | (0.015)                |
| Slovenia              | -0.088***    | -0.114*** | 0.012               | -0.017                 | -0.054***              | 0.021                 | -0.035***              | -0.041***              | 0.109***               | 0.061***               |
|                       | (0.013)      | (0.016)   | (0.012)             | (0.013)                | (0.015)                | (0.019)                | (0.007)                | (0.012)                | (0.013)                | (0.013)                |
| Estonia               | -0.126***    | -0.189*** | 0.046***            | 0.007                  | -0.084***              | -0.111***              | -0.021***              | -0.055***              | -0.009                 | -0.022                 |
|                       | (0.011)      | (0.014)   | (0.010)             | (0.011)                | (0.013)                | (0.017)                | (0.006)                | (0.010)                | (0.011)                | (0.012)                |
| Constant              | 0.146***     | 0.165***  | 0.042***            | 0.054***               | 0.300***               | 0.350***               | 0.035***               | 0.052***               | -0.021                 | 0.001                  |
|                       | (0.014)      | (0.016)   | (0.012)             | (0.013)                | (0.016)                | (0.020)                | (0.008)                | (0.012)                | (0.014)                | (0.014)                |
Table 10 continued

| Independent variables | Volunteering | Education | Sport or other club | Political organisation | Religious organisation |
|-----------------------|--------------|-----------|---------------------|------------------------|------------------------|
|                       | Women        | Men       | Women               | Men                    | Women                  | Men                    |
| N                     | 26,161       | 19,807    | 26,161              | 19,807                 | 26,161                 | 19,807                 |

* $p < 0.05; ** p < 0.01; *** p < 0.001
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