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Work and Well-Being of Informal Caregivers in Europe

Abstract

Informal caregivers provide valuable services to elderly persons with long-term care needs, but the consequences of caregiving on caregivers are not yet fully understood. This paper illustrates the interrelation between caregiving and caregivers' labour force participation, cognitive ability, and health in a simple theoretical model, and estimates the effects of caregiving using panel data from thirteen European countries, which allows to analyze the effect of institutions on caregivers' outcomes. The results show that caregiving severely and signicantly reduces caregivers' probability of being employed, but only in countries with few formal care alternatives. Furthermore, caregivers in all countries suffer from worse mental health when caregiving is prompted by poor parental health. The results for the effects of caregiving on physical health and cognitive ability are mixed.

JEL Classification: I12, J14, J18, J22

Keywords: Informal care; labour supply; cognitive ability; physical and mental health

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1 Introduction

When a parent's health declines, adult children often volunteer their time to assist the parent with personal care or household chores. Such informal care far exceeds formal care in the number of hours of care provided, as well as in terms of monetary value (OECD, 2005). While the need for informal care is growing quickly due to the increase in life expectancy, the supply of informal caregivers is decreasing due to low birthrates, because children tend to live further away from their parents, and because labour market participation among women, who traditionally account for the vast majority of informal caregivers, is increasing (Colombo et al., 2011). In response to the growing need for care, policymakers in several countries have aimed to encourage informal caregiving to reduce the financial pressure on public long term care (LTC) systems. However, the effects of caregiving on caregivers are not yet fully understood.

To better understand these effects, I analyze the impact of care provision to an elderly parent on adult daughters aged 50 to 70 in three important areas: labour force participation, cognitive ability, and health. These outcomes represent valuable indicators of caregivers' quality of life, well-being, and risk of financial vulnerability and are of relevance both to the individual caregivers and to society. While mature caregivers make up a significant portion of informal caregivers in the European Union (Glendinning et al., 2009), they have a lower attachment to the labour force and may be more prone to negatively react to the stress of caregiving than younger caregivers. In addition, parental caregiving may be more emotionally challenging and thus lead to more severe consequences for the caregiver than care provision to a friend or neighbour due to close emotional ties between parents and their children.[2]

This paper proceeds in two steps. First, I present the trade off between leisure time, caregiving activities, and work in a simple theoretical framework and relate the daughter's decision to provide care to individual characteristics, the parent's need for care, and the availability of formal LTC options. Second, I estimate the causal effects of caregiving on the caregiver while carefully controlling for the endogeneity of caregiving using longitudinal data from the Survey of Health, Ageing, and Retirement (SHARE) collected in 2004/2005, 2006/2007, and 2011/2012. This data set provides rich demographic and socio-economic information of the population 50+ in Europe and offers the unique opportunity to study the influence of institutional characteristics.

As caregiving may depend on unobserved individual characteristics, such as the emotional closeness to the care receiver or the caregiver's sense of duty, controlling for the endogeneity of the caregiving decision is paramount. I use a fixed effects instrument variable (FE-IV) approach to account for time-constant as well as time-varying endogeneity, which provides a more careful treatment of the endogeneity of caregiving than previous cross-sectional studies allow for. Furthermore, I analyze the influence of the intensity

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[2]Caregiving to parents-in-law is not considered due to data limitations.

of caregiving on caregivers' outcomes as measured by the frequency of care and by the institutional caregiving context. Specifically, I separately consider daily, weekly, and any frequency of caregiving and test for heterogeneous effects of caregiving in "formal care countries" with relatively generous formal care alternatives and "family care countries" where elderly care is predominantly provided by the family. Comparing the effects of caregiving in family and formal care countries will increase our understanding of the influence of the institutional background on the effects of caregiving on informal caregivers and inform the policy debate about the optimal provision of LTC. Moreover, to the best of my knowledge, this study is the first to look at cognitive ability of parental caregivers in a longitudinal, multi-country context.

To preview my results, I find caregiving decreases employment rates in family care countries by 34 to 60 percentage points depending on the frequency of care but has no impact on caregivers' employment probability in formal care countries. Contrary, caregiving increases the number of depressive symptoms in both family and formal care countries by nearly 3 and 4 additional symptoms, respectively. The effects on physical health and cognitive ability are mixed and vary with the institutional background.

The remainder of this paper is organized as follows. Section 2, summarizes the possible pathways through which caregiving may affect caregivers and links the caregiving context to the intensity of caregiving. Section 3 introduces the theoretical framework, Section 4 discusses the estimation strategy, Section 5 describes the SHARE data, and Section 6 presents the results. Section 7 concludes.

2   Background and literature

Given the often considerable time commitment of informal caregiving and the potential loss of productivity if caregivers reduce their labour supply, the effect of caregiving on labour market outcomes has received much attention. Labour market outcomes for mature caregivers are especially important since caregivers close to the retirement age are less attached to the labour force than younger caregivers. As early retirement is generally linked to a reduction in pension benefits, understanding whether caregiving and work are compatible for elderly caregivers is important to evaluate caregivers' risk of financial vulnerability.

Theoretically, the direction of the effect of caregiving on labour market outcomes is uncertain. Caregiving may reduce employment or hours worked if caregivers substitute work time with care time, or if increased absenteeism of caregivers to fulfill caregiving obligations leads to job loss (Heitmueller and Inglis, 2007). Yet, labour market participation may increase if work offers respite from caregiving or if caregivers require additional income (Carmichael and Charles, 1998, 2003). Empirically, determining causal effects, however, is challenging due to reverse causality. Persons with less attachment to the labour

market or a low time cost are more likely to become caregivers (Ettner, 1995, 1996; Heitmueller, 2007; Carmichael et al., 2010). In addition, labour force participation and caregiving may be influenced by the same unobserved characteristics, which would produce a spurious correlation. For example, individuals with high (unobserved) ability may be more productive employees and may also be more productive at providing informal care (He and McHenry, 2013). As a result, cross-sectional studies may not always be able to detect causal relationships. In a review of the literature, Lilly et al. (2007) conclude that caregiving is generally associated with a moderate reduction in hours worked, intensive caregiving leads to negative consequences for both hours worked and labour force participation. Infrequent caregivers, however, are sometimes found to be less likely to retire (Carmichael and Charles, 1998; Dentinger and Clarkberg, 2002). While most of the analyzed studies rely on cross-sectional data and are thus subject to above mentioned concerns, the results have been largely mirrored by recent longitudinal studies (Heitmueller, 2007; King and Pickard, 2013; van Houtven et al., 2013).

However, the vast majority of evidence relies on U.S. or U.K. data, two countries with very "liberal" welfare regimes (Haberkern and Szydlik, 2010).[3] For continental Europe, the effects of caregiving may not necessarily be the same since these countries have different welfare arrangements and the effect of caregiving on labour supply under different institutional settings is still ambiguous. Ciani (2012) finds small or insignificant negative effects on employment of co-residential caregiving, with a slightly larger effect in Southern European countries in some specifications, while Viitanen (2010) finds caregiving only significantly reduces women's employment probability in Germany.[4] Contrary, Crespo and Mira (2010) find a negligible effect of daily parental caregiving on employment in Northern and Central European countries but a 50% decline in the employment probability in Southern European countries. Looking at cross-sectional data, Bolin et al. (2008b) find a negative effect on hours worked in Central European countries, but no effect on employment, whereas Crespo (2006) finds caregiving reduces women's probability of employment by 30-40% with slightly more adverse effects in Central Europe than in Southern Europe.[5] My paper complements and extends these studies by addressing time-varying and time-constant sources of endogeneity, analyzing different frequencies of care and institutional settings, studying a longer time span, and including two Eastern European countries, Poland and the Czech Republic.

Similar to labour market outcomes, interest in the health effects of caregiving is not limited to the individual caregiver. While informal caregiving helps to reduce public expenditures in the short run, long run effects are uncertain as negative health outcomes for caregivers may increase their health care needs in the future. Moreover, poor health may inhibit caregivers to tend to their caregiving duties.

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[3]Notable exceptions that control for the endogeneity of caregiving are Casado-Marín et al. (2011) and Meng (2013) who study co-residential caregiving in Spain and Germany, respectively.

[4]For single women, Viitanen (2010) also finds significant effects in Greece, Italy, and the Netherlands.

[5]Bolin et al. (2008b) also find a positive effect of caregiving on wages for women; men experience negative effects on employment and, in Central European countries, negative effects on hours worked.

Whether to expect positive or negative effects of caregiving on caregivers' physical and mental health is again ambiguous in theory. For one, according to the stress process model proposed by Aneshensel (1995), caregiving may lead to a decline in health due to increased stress or a change in health behaviour or diet in response to a reduction in personal time. Physiological responses to stress consistent with this theory have been documented in both medical and psychological studies (see, for example, Vitaliano et al. (2007)). For another, caregiving may increase physical activity and lead to health improvements. This view is expressed by the "healthy caregiver hypothesis" (Fredman et al., 2008). Further, caregiving can be rewarding as it conveys the feeling that the caregiver is needed, yet it might lead to loneliness if caregiving prevents other social activities, which can lead to positive or negative effects for mental health, respectively. Which effect dominates is still debated (see Pinquart and Sörensen (2003, 2007) for an overview). While Coe and van Houtven (2009) find continued caregiving decreases self-rated health and increases depressive symptoms over time, Brown et al. (2009) find decreased mortality rates of caregivers compared to non-caregivers. Moreover, health effects are influenced by the intensity of caregiving and caregivers' characteristics, with intensive caregivers and caregivers from lower socioeconomic background generally experiencing worse outcomes (Schulz et al., 1997; Hirst, 2005; Pinquart and Sörensen, 2005).

Cognitive effects of caregiving have so far received little attention in studies using large representative population surveys. However, like health, cognitive ability is of significant personal and public interest since preserving cognitive ability is essential for a self-determined and independent life and should thus be considered as an outcome of interest. Higher levels of stress have been shown to impact cognitive ability negatively, but caregiving may also provide cognitive stimulation and hence have positive effects on cognitive ability (Vitaliano et al., 2007; Lee et al., 2004; Bertrand et al., 2012). The empirical evidence is still inconclusive and more research is needed.[6] Positive results on cognitive ability are generally found for social participation and volunteering (Glei et al., 2005; Green et al., 2008; Engelhardt et al., 2010; Dobrescu and Christelis, 2012). Though caregiving is sometimes included as one possible volunteering activity, caregiving differs substantially from participating in a political, cultural or religious organization or club (Hsu, 2007). In particular, caregiving is usually motivated by the care receivers need for care and social norms and is thus likely to be more stressful than other volunteering activities. Hence, the effects of caregiving on cognitive ability may differ from the effects reported for social engagement.

2.1 Institutions and caregiver burden

While the frequency of care provides an intuitive measure of the care intensity and more frequent caregiving has been associated with worse outcomes for caregivers as outlined above, institutional dif-

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[6]Ambiguous results are found in studies focusing on broadly defined spousal caregiving, while mostly negative effects are found for caregivers to persons suffering from dementia; see, for example, Caswell et al. (2003), de Vugt et al. (2006), Leipold et al. (2008), and Mackenzie et al. (2009).

ferences have been less studied due to data limitations but may be equally important in explaining differential effects of caregiving. For one, Matire and Schulz (2012) emphasize that the magnitude and direction of the effects of caregiving are influenced by caregivers' appraisal of the caregiving demands and adaptive capacities. When caregivers feel capable of dealing with the caregiving demands, positive outcomes on cognitive ability and health are more likely than when caregivers feel overwhelmed. Thus, the institutional setting may influence caregivers' appraisal of caregiving demands, for example, by determining the extent to which formal care options are available or by offering financial support for informal caregivers. For another, formal care alternatives may reduce negative consequences for caregivers by directly reducing the caregiving burden (Bass et al., 1996).

To analyze the influence of the intensity of caregiving, I separate countries into family and formal care countries based on their spending level on LTC. This grouping corresponds to separating countries into what are commonly thought of as countries with strong formal LTC, and countries with strong family based LTC. Haberkern and Szydlik (2010) evaluate countries based on whether and to what extent there is a legal obligation to support relatives in need, the services that the state provides or funds, and public opinion about whether the state or the family should in general be responsible for the care and support of dependent elderly people. Countries with strong formal-care systems include the Scandinavian countries, the Netherlands, and Switzerland. Belgium and France are intermediate cases between family and formal based LTC; I group them with formal care countries based on their public LTC spending. The countries with family based care systems include the Mediterranean countries, Germany, and Austria. I group the Czech Republic and Poland, which are not part of Haberkern and Szydlik's study, with the family care countries as both countries have very low public expenditures on LTC. Consistent with the motivation for the group selection, the two country groups also differ with respect to other institutional characteristics related to LTC as well as in their public opinion related to elderly care as shown in Table 1. Compared to formal care countries, family care countries have on average a lower share of public health expenditure, fewer nursing home beds per population in need, less financial support for informal caregivers, and elderly care is generally considered to be the responsibility of the family rather than the state.[7] These institutional characteristics and cultural values have been shaped over a long period of time and are influenced by the political process. However, while the institutional setting is endogenous, changing a country's LTC care system or society's view on elderly care requires time. Consequently, the formal help available to a potential caregiver through the LTC system can

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[7] A caregiver allowance is a public benefit paid directly to the caregiver (Columbo et al., 2011).

Table 1: Institutional characteristics and social values

	Public LTC exp. (% of GDP)[a]	Public health exp. (% of total)[b]	Nursing home beds (per 1000 pop 65+)[c]	Caregiver allowance[d]	Elderly care state responsibility[e]	Old age dep. ratio[f]
Countries with predominantly family based LTC						
Poland	0.70	70.28	17.10	0	2.34	19.40
Czechia	0.80	84.18	43.30	0	2.45	23.40
Spain	0.80	73.05	29.30	0	2.86	25.80
Germany	1.40	76.45	50.30	1	2.76	31.20
Greece	1.40	65.05	1.40	0	2.30	29.90
Austria	1.60	67.83	38.70	0	2.93	26.20
Italy	1.90	77.84	16.60	0	2.75	31.60
Average	1.23	73.53	28.10	0.14	2.64	26.79
Countries with strong formal LTC						
Switzerland	2.16	64.89	68.90	1	3.00	25.30
France	2.20	76.75	51.80	0	3.42	26.60
Belgium	2.30	75.91	70.80	1	3.23	26.40
Netherlands	3.80	85.60	68.40	1	3.58	24.40
Sweden	3.90	81.62	80.40	1	3.74	29.20
Denmark	4.50	85.31	52.30	1	4.14	26.70
Average	3.14	78.35	65.43	0.83	3.52	26.43

[a]European Commission (2012) and Eurostat; 2010 values. [b]OECD Health Data 2013; 2011 or nearest year available. [c]OECD Health Data 2012 - Long-Term Care Data; 2009; Greece: 2000. [d]Colombo et al. 2011. [e]SHARE; Average of the SHARE respondents' answers to the questions who - the family (1) or the state (5) - should bear the responsibility for help with household chores/personal care for older persons. N=2,181. [f]Eurostat; 2012 values.

be considered an exogenous factor in an individual's decision whether to provide informal care or not. As formal care may be used to complement or substitute informal care, caregiving may be more strenuous in countries with few formal care options compared to countries with more generous formal care alternatives (Bolin et al., 2008a; Bonsang, 2009).

3   Theoretical framework

This section presents the described interrelation between work, caregiving, cognitive ability, and health in a simple theoretical model to demonstrate how this interrelation may be influenced by the caregiving context. The sole decision maker in my model is the adult daughter who is altruistic towards her elderly parent. The daughter's utility is given by

$$U^D = U^D(C, L, U^P), \tag{1}$$

where C, L, and U^P denote consumption, leisure, and parental well-being, respectively, while the parent's utility is given by

$$U^P = U^P(CG, OC), \tag{2}$$

where CG represents informal care provided by the daughter, and OC indicates other care or consumption.[8] Hence, the model does not rule out the possibility of formal care or informal care provided by another family member. However, I assume that informal care received from the daughter has a special value to the parent and care provided by someone else is not a perfect substitute. For this reason, I also do not allow for the option of substituting informal caregiving with a monetary transfer to the parent. The daughter's altruism may be rooted in the desire to support her parent but may also arise from family obligations or social and cultural norms to provide care. I assume that both the daughter's and the parent's utility are increasing in each input with decreasing marginal utility.

The daughter's time constraint is given by

$$T = H + L + CG, \tag{3}$$

where T is the individual's total time endowment and H denotes hours worked. If a daughter wants to increase the amount of time devoted to informal care, she is forced to either reduce her leisure time or

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[8]Since this paper focuses on the daughter as the sole decision maker, I abstract from possible altruism of the parent towards the daughter.

her work hours. Her budget constraint is given by

$$C = Y^* + w(S)H - c(CG), \tag{4}$$

where Y^* represents outside income, w denotes the wage, which depends on the daughter's stock of health capital and cognitive ability - for ease of notation represented by a composite measure S - with $S > 0$, $\partial w(S)/\partial S \geq 0$, and $c(CG)$ captures the cost of caregiving. This cost can be interpreted as a combination of monetary effort cost and additional expenditures for medication or equipment for the care recipient. A more generous LTC system may reduce the monetary cost component by providing coverage for care related expenditures or by offering financial benefits to caregivers. I assume a quadratic cost of caregiving and set $c(CG) = \frac{e}{2}CG^2$.

Lastly, the stock of health capital and cognitive ability evolves according to

$$S = S_0 + \gamma CG, \tag{5}$$

where S_0 represents the initial level of health capital and cognitive ability and γ represent the effectiveness of caregiving as an investment in the production of health capital and cognitive ability (Grossman, 1972).[9] If γ is positive, caregiving increases the stock of health capital and cognitive ability, otherwise caregiving is detrimental to the caregiver's health or cognitive ability.[10]

The daughter chooses the amount of consumption, leisure, work hours, and hours providing care in order to maximize her utility subject to her time and budget constraints and the law of motion for health capital and cognitive ability. Her maximization problem is equivalent to maximizing the Lagrangian:

$$\begin{aligned}
\mathcal{L} = {} & U^D(C, L, U^P(CG, OC)) \\
& + \lambda_1(Y^* + w(S)H - \frac{e}{2}CG^2 - C) \\
& + \lambda_2(T - H - L - CG) \\
& + \lambda_3(S - S_0 - \gamma CG).
\end{aligned} \tag{6}$$

where λ_1 to λ_3 are the Lagrange multipliers for the budget constraint, the time constraint and the law of motions for health capital and cognitive ability. Assuming the daughter chooses a strictly positive

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[9]For simplicity, I abstract from other possible investments and use a combined measure of both health and cognitive ability. Differential effects of caregiving on these outcomes can easily be incorporated by allowing for different coefficients for each outcome.

[10]Extending the model to a multi-period set-up or allowing for the depreciation of health capital and cognitive ability will affect the magnitude of health and cognitive benefits derived from caregiving if investments in health or cognitive capital persist (caregiving in one period will increase - or decrease - utility in future periods by increasing - or decreasing - the stock of health or cognitive capital) but does not change the qualitative findings of the model.

amount of consumption and leisure and defining $U_X \equiv \frac{\partial U}{\partial X}$, an optimal solution to her maximization problem is characterized by the following necessary first-order conditions (FOCs):

$$i)\ \ U_C^D - \lambda_1 = 0,$$

$$ii)\ \ U_L^D - \lambda_2 = 0,$$

$$iii)\ \ w(S)\lambda_1 - \lambda_2 \leq 0,\ \ H \geq 0,$$

$$iv)\ \ U_{U^P}^D U_{CG}^P - eCG\lambda_1 - \lambda_2 - \gamma\lambda_3 \leq 0,\ \ CG \geq 0,$$

$$v)\ \ \frac{\partial w(S)}{\partial S}H\lambda_1 + \lambda_3 = 0,$$

where in $iii)$ and $iv)$ at most one inequality can be strict.

After substituting and rearranging terms, the FOCs can be expressed as:

$$w(S)U_C^D \leq U_L^D,\ \ H \geq 0, \tag{7}$$

which characterizes the typical trade-off between the returns and costs of work from increased consumption and foregone leisure, respectively, and determines whether the individual will work or not, and

$$CG \geq \frac{1}{eU_C^D}\left[U_{U^P}^D U_{CG}^P + U_C^D \frac{\partial w(S)}{\partial S}H\gamma - U_L^D \right],\ \ CG \geq 0, \tag{8}$$

which determines whether the individual will provide care or not.[11] Again, both inequalities in the same line cannot be strict. For a positive level of care, the daughter equalizes the marginal benefits and costs of providing care. Consequently, the hours of care provided increase in the marginal benefit derived from the parent's well-being ($U_{U^P}^D$) times the parent's marginal utility from caregiving (U_{CG}^P) and decreases in the cost of providing care (e) weighted by the marginal utility of consumption (U_C^D) and in the marginal utility of leisure (U_L^D). Depending on whether caregiving increases ($\gamma > 0$) or decreases ($\gamma < 0$) health and cognitive ability, caregiving increases or decreases in the marginal benefit of an increase in health and cognitive ability ($U_C^D \frac{\partial w(S)}{\partial S}H$).[12]

4   Empirical strategy

Using y_{it} to denote individual i's labour market, cognitive, or health outcome of interest at time t and rewriting the FOCs in terms of the outcome, the effect of caregiving can be approximated by the

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[11]If the daughter is employed, Equations 8 can be explicitly expressed in terms of the wage: $CG \geq \frac{1}{eU_C^D}\left[U_{U^P}^D U_{CG}^P + U_C^D \frac{\partial w(S)}{\partial S}H\gamma - w(S)U_C^D \right]$

[12]An empirical analysis of the relationship between socio-demographic and institutional characteristics and caregiving behaviour is provided in Heger (2014).

linear estimation equation

$$y_{it} = \alpha_1 CG_{it} + \alpha_2 X_{it} + c_i + u_{it}, \tag{9}$$

where y_{it} is a function of caregiving activity, CG_{it}, individual demographic and socioeconomic characteristics, X_{it}, an individual specific error term, c_i, and an idiosyncratic error term, u_{it}.

As unobserved time-invariant individual characteristics captured by the individual specific error term c_i may be correlated with caregiving behaviour, I estimate Equation 9 using fixed effects methods. Fixed effects estimation assumes strict exogeneity of the explanatory variables conditional on the individual fixed effects but allows for arbitrary correlation between the observed independent variables and c_i, that is $E(CG_i'c_i) \neq 0$ and $E(X_i'c_i) \neq 0$ (Wooldridge, 2002). Allowing for unobserved, time-invariant heterogeneity in this way appropriately describes the data because individual characteristics and personality traits, such as closeness to the parent, selflessness, or upbringing, may influence caregiving behaviour but can reasonably be assumed to be constant over time for individuals aged 50 and above. However, time-varying endogeneity may still be an issue. For example, as work and caregiving activities both compete for the individual's time endowment, an unobserved shock may change the daughter's time cost and impact both labour supply and caregiving activities.

To account for such time-varying endogeneity, I use an indicator for whether at least one parent suffers from poor health as an instrument for caregiving behaviour.[13] Poor parental health increases the parent's need for care and thus encourages the daughter to provide care by increasing the benefits of care provision as depicted by Equation 8. Likewise, an improvement of the parent's health status or the death of the parent reduces or eliminates the need for informal care.[14] In order for parental health (PH) to be a valid instrument, parental health must influence the daughter's outcome under consideration only by affecting caregiving behaviour. Thus, in addition to $corr(CG_{it}, PH_{it}) \neq 0$, $E(u_{it}|PH_{it}) = 0$ must hold. While the level of parental health does not represent a valid instrument, fixed effects estimation only considers within individual variation, which means a change in parental health serves as an instrument for a change in caregiving behaviour. Arguably, after controlling for all other covariates, a worsening of the parent's health status only influences the adult daughter's labour supply, cognitive ability or health through its effect on caregiving behaviour.[15] Since the goal is to estimate separate effects for family

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[13]The measure is based on the daughter's assessment of her mother's and father's health. The possible categories for parental health changed from "very good", "good", "fair", "poor", and "very poor" in wave 1 to "excellent", "very good", "good", "fair", and "poor" in waves 2 and 4. Jürges et al. (2008) show that it is still possible to obtain a consistent measure by combining the categories "poor" and "very poor" and "very good" and "excellent". Poor parental health indicates poor health based on the newly constructed health variable. If two parents are alive parental health is defined as the health status of the parent in worse health.

[14]While self-perceived individual health is not necessarily a good objective measure of individual health, the daughter's decision to provide care depends on her perception of her parent's health rather than on the parent's objective health level. Hence, potential subjectivity of the measure is less of a concern in this study. Besides, systematic misreporting of parental health does not appear to be a problem (see Appendix A for a further discussion).

[15]While this argument has also been made by Van Houtven et al. (2013) in their analysis of the effect of caregiving on work for mature men and women in the U.S., Bobinac et al. (2010) find a direct health effect of the declining health of a

and formal care countries, I use a change in parental health interacted with the indicators for each country group as instruments, as a change in parental health may have a differential effect on daughters' caregiving decision based on the availability of formal care alternatives.[16]

Which variables are included in X_{it} depends on the outcome of interest. In all regressions I control for the number of chronic conditions, limitations with activities of daily living (ADL), and instrumental ADL (IADL). Changes in these health measures capture relatively severe changes in health and I treat them as exogenous since it is unlikely that caregiving impacts these measures within the observed time horizon. Since the death of or separation from a partner may impact the outcome under consideration, I control for whether a person is married or living in a registered partnership and household size. To capture changes over time, I control for a linear and quadratic effect of the respondent's age. Time-invariant covariates cannot be included in fixed effects estimation as they are part of the individual specific fixed effects. Hence, educational attainment cannot be used as explanatory variables since educational levels usually no longer change for individuals over the age of 50. However, life expectancy, population health, and the general education level differ across countries. As a result, the natural deterioration rate of cognitive ability or health might also differ across countries. To capture this effect, I include country dummies interacted with age (both linear and quadratic terms). To pick up additional variation over time due to a change in the economic situation or as respondents become familiar with the type of cognitive skills questions, I include two wave dummies. Finally, I control for household net wealth by including dummies for country specific wealth quartiles.

For labour market outcomes, I also control for being above the country specific official retirement age.[17] As few individuals actually work until the official retirement age, I further include two indicators for being within two and within five years of the country specific official retirement age.

Labour market participation may in turn affect cognitive ability and health by providing cognitive stimulation or affecting physical activity and stress levels. When analyzing cognitive and health outcomes, I control for whether a person is employed (including self-employed). Similarly, social participation may also serve as an investment in cognitive ability or health. I capture such activities by an indicator variable which equals one if the respondent participated in any of the following activities: voluntary or charity work; attended an educational or training course; gone to a sport, social or other kind of club; taken part in activities of a religious organization; or taken part in a political or community-related organization. Moreover, when studying daughters' mental health, I include an indicator for parental loss, which equals one if a parent passed away since the last interview. As I focus on mature daughters it

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close relative. I provide further evidence of the suitability of the instrument in Subsection 6.1.

[16]Estimation is performed using the Stata command xtivreg2 (Schaffer, 2012).

[17]Information for country specific retirement ages is based on the official retirement age in 2010 reported by the OECD. Country specific retirement ages are listed in Table 8 in the Appendix.

seems reasonable to assume that the declining health of a parent is seen as a natural occurrence, which does not directly affect the daughter's mental health after controlling for all other covariates including the loss of a parent.[18]

5 Data

The data comes from wave 1, 2 and 4 of the Survey for Health, Ageing and Retirement in Europe (SHARE) collected in 2004/2005, 2006/2007, and 2011/2012 covering the population 50+ in Europe.[19] SHARE is the first data set to include information on health, cognitive ability, socio-economic status, and social engagement of the elderly at a pan-European level, which provides the unique opportunity to study the effect of institutional differences.[20] I limit my sample to women aged 50 to 70 who participated in two or more interviews and who have at least one living parent at the time of their first interview.[21] Countries participating in all three waves are Austria, Germany, Sweden, the Netherlands, Spain, Italy, France, Denmark, Switzerland, and Belgium. Greece participated in wave 1 and 2; Czechia and Poland are part of SHARE since wave 2. After deleting observations with missing information, my sample includes 3,309 individuals or 7,591 person-wave observations.[22]

Sample size and caregiving rates by country and country group are shown in Table 2.[23] In addition, Table 9 in the Appendix shows changes in caregiving activities over time. Infrequent caregiving is more common in formal care countries, whereas daily caregiving is more common in family care countries.[24] Descriptive statistics for all further variables are presented in Table 3 for the total sample and separately for individuals who never provide care (never caregivers) and individuals who state they are caregivers in at least one interview (ever caregivers). Ever caregivers tend to be healthier, have higher cognitive test scores, and are more educated, underlining the need to account for the endogeneity of caregiving. Not surprisingly, ever caregivers also have more frequently a parent in poor health.

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[18] Also see the discussion in Subsection 6.1.

[19] Wave 3 of SHARE consists of a special retrospective survey (SHARELIFE), which does not ask about caregiving activities. The SHARE questionnaires and data are available at www.share-project.org.

[20] Data is collected using a computer-assisted personal interviewing technique (CAPI). Sample selection varies across countries from simple random selection of households to multi-stage designs due to varying institutional conditions regarding sampling (Börsch-Supan and Jürges, 2005, Ch.5). All results presented in this paper are weighted using population weights based on individuals' first observation.

[21] For older individuals, the labour market outcomes are largely irrelevant, the importance of investments in health and human capital is declining, and the number of respondents with a living parent is very small.

[22] SHARE provides five imputed data sets to deal with missing information in key variables (see Christelis (2011) for details). The results in this study are based on the first of these data sets. Item non-response is minor for non-financial questions and the results are not sensitive to which imputed data set is used

[23] Caregiving is measured by an indicator variable for whether a daughter provided care during the 12 months prior to the interview and includes help with personal care (e.g. dressing, bathing) or practical household help (e.g. help with home repairs, shopping, household chores) provided outside or insight the household. In wave 2, respondents who have been interviewed in wave 1 are asked whether they have provided care since the last interview, which corresponds to approximately 24 months. To distinguish between help during a short-term sickness, a daughter providing help to a co-residing parent is only considered a caregiver if this help occurs almost daily during at least three months.

[24] Equality of caregiving rates in all countries can be rejected with a p-value of 0.000 for all frequencies of care.

Table 2: Sample size and caregiving rates by country

Country	Sample size	Caregiving rates		
		Any	Weekly	Daily
Poland	112	0.20	0.16	0.11
Italy	285	0.26	0.22	0.14
Austria	132	0.27	0.21	0.12
Greece	275	0.27	0.21	0.13
Spain	213	0.29	0.20	0.18
France	404	0.29	0.17	0.07
Switzerland	175	0.37	0.20	0.06
Germany	276	0.40	0.25	0.08
Denmark	247	0.40	0.19	0.02
Czechia	113	0.43	0.27	0.05
Sweden	377	0.44	0.17	0.03
Netherlands	312	0.45	0.29	0.05
Belgium	388	0.46	0.35	0.14
Total	3,309	0.33	0.21	0.10
Family care countries	1,406	0.31	0.22	0.12
Formal care countries	1,903	0.35	0.20	0.07

Countries ordered by caregiving rates (any frequency).
Weighted values based on individuals' first observation.

Outcome variables

Labour force participation is measured by an indicator for whether the daughter is employed or self-employed and the total number of hours a respondent worked in her main or secondary job per week.

Next, I use four measures of cognitive ability. First, verbal fluency is measured by the number of animals the respondent can name. Each acceptable animal counts as one point up to a maximum score of 100. Second, short term word recall is tested by the respondent's ability to remember a list of ten words the interviewer reads to her. The score is given by the number of correctly recalled words. At the end of the cognitive function module, the respondent is asked to state as many of the words as she remembers from the list read to her earlier to measure long term word recall. The score is again given by the number of correctly recalled words. Finally, numeracy skills are assessed based on a series of four math questions taken from everyday life situations. The numeracy score ranges from 1 (poor numeracy skills) to 5 (good numeracy skills).[25]

Furthermore, I consider both mental and physical health outcomes of caregivers. Mental health is measured by the EURO-D depression scale ranging from 0 (not depressed) to 12 (very depressed). This measure has been developed to capture symptoms of depression (including, for example, feelings of guilt, loss of interest, trouble sleeping, fatigue, or tearfulness).[26] Besides, I analyze changes in self-

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[25]SHARE also includes a fifth measure of cognitive ability, which tests respondents' knowledge of the year, month, and day of the interview. However, most respondents perform well on this test and the measure includes too little variation for an informative analysis. The time limit for each cognitive test is one minute.

[26]For more information see Castro-Costa et al. (2008).

Table 3: Descriptive statistics based on first observations

	Never caregivers		Ever caregivers			
	Mean	N	Mean	N	Diff.	Sig.
Labour force participation						
Employed	0.47	1,649	0.51	1,653	0.04	
Weekly hours worked (if hours>0)	34.82	806	34.54	916	-0.28	
Cognitive ability						
Verbal fluency	19.73	1,636	21.85	1,649	2.12	1%
Short-term word recall	5.31	1,641	5.71	1,652	0.40	1%
Long-term word recall	3.90	1,642	4.40	1,652	0.50	1%
Numeracy	3.29	1,651	3.48	1,654	0.19	1%
Health						
Depression (EURO-D)	2.91	1,631	2.67	1,648	-0.24	5%
Self perceived health	2.92	1,653	2.69	1,656	-0.23	1%
Grip strength	28.99	1,551	30.15	1,617	1.16	1%
Socioeconomic and demographic information						
Age	55.59	1,653	55.67	1,656	0.08	
Age squared/100	31.09	1,653	31.16	1,656	0.07	
Married	0.72	1,653	0.72	1,656	0.00	
Household size	2.44	1,653	2.40	1,656	-0.04	
Number of chronic conditions	1.20	1,653	1.10	1,656	-0.10	10%
Number of limitatins with ADL	0.10	1,653	0.03	1,656	-0.07	1%
Number of limitatins with IADL	0.18	1,653	0.08	1,656	-0.10	1%
Other activities	0.32	1,642	0.46	1,651	0.14	1%
Reached off, retirement age	0.13	1,653	0.11	1,656	-0.02	
2 years to off, retirement age	0.21	1,653	0.20	1,656	-0.01	
5 years to off, retirement age	0.40	1,653	0.37	1,656	-0.03	
Household net worth	320,084	1,653	364,184	1,656	44,100	
Primary education or less	0.25	1,649	0.16	1,653	-0.09	1%
Secondary education	0.51	1,649	0.52	1,653	0.01	
Post-secondary education	0.24	1,649	0.32	1,653	0.08	1%
Parental information						
Parent in poor health	0.27	1,573	0.34	1,593	0.07	1%
Parent in fair health	0.36	1,573	0.36	1,593	0.00	
Parent in good health	0.30	1,573	0.23	1,593	-0.07	1%
Parent in very good health	0.07	1,573	0.07	1,593	0.00	

Weighted values based on individuals' first observation. N=3,309

perceived general health based on the categories excellent (1), very good (2), good (3), fair (4), and poor (5). While self-perceived health is a strong predictor of future morbidity and mortality (Idler and Benyamini, 1997; Maddox and Douglass, 1973), respondents' perception of their own may change when faced with the declining health of a parent. To complement self-perceived health, I use grip strength as an objective indicator of physical health (Ziebarth, 2010; Jürges, 2007). Grip strength is measured in a gripping exercise where respondents are asked to squeeze their hand as hard as they can for a couple of seconds.[27][28]

6 Results

This section presents the estimation results for the effect of caregiving on labour force participation, cognitive ability, and health in turn. Results are presented for the fixed effects estimation with parental health as an instrument for caregiving activities (FE-IV) and without (FE); the full regression results and first stage regressions are shown in the Appendix.[29] I test whether individual fixed effects are needed to account for time constant endogeneity by comparing OLS-IV and FE-IV estimates (Fletcher and Lehrer, 2009). Tests of joint significance of the individual specific fixed effects are statistically significant at the 1% significance level for all specifications. Since for caregiving in family (formal) care countries only having a parent in poor health interacted with the dummy for family (formal) care country is informative, I report Angrist-Pischke F tests for weak instruments, which test weak identification of one instrument while partialling out the effect of the other instrument (Angrist and Pischke, 2009, pp. 217-18, Baum et al., 2010). Critical values are not available, but the critical values for the Cragg-Donald F statistic with one endogenous variable reported by Stock and Yogo (2005) can be used as reference.[30] Weak instruments can be rejected for all but one specification: When hours worked is the dependent variable, poor parental health is not a strong predictor for caregiving behaviour.[31]

Table 4 shows the estimated effects of caregiving on employment and hours worked in family and formal care countries. The FE regression results show a slight increase in employment of 4 percentage points for weekly and any frequency of caregiving in formal care countries but no effect on hours. However, individuals may self-select into caregiving if their job allows them to combine work and caregiving. For

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[27]Two measures are taken for each hand; I use the maximum result of the four measures.

[28]The measures of cognitive ability, self-perceived health, and grip strength show a progressive decline with age, underlining the importance of efforts to increase or preserve these outcomes in later life (Heger, 2014).

[29]If exogeneity of caregiving cannot be rejected, both the FE and FE-IV estimates can be interpreted as causal effects. Results can differ due to the smaller sample size when using the instrument and because the FE-IV specification captures the effect of caregiving as a result of poor parental health. Such caregiving is likely to be more physical or emotionally demanding.

[30]The critical values as computed by Stock and Yogo (2005) for 10, 15, 20, and 25% maximal IV size bias in Wald tests are 16.38, 8.96, 6.66, and 5.53, respectively (Stock and Yogo, 2005).

[31]Since FE-IV is very data hungry, this result is not too surprising given the reduced sample size since only individuals who work positive hours are included. In addition, working individuals may be less likely to change their caregiving behaviour in response to a change in parental health than non-working individuals.

Table 4: The effect of informal caregiving on labour force participation

	FE			FE-IV		
Frequency of care:	Any	Weekly	Daily	Any	Weekly	Daily
	Employed					
Caregiver	-0.028	-0.013	-0.016	-0.344**	-0.370**	-0.600**
(family care country)	(0.025)	(0.027)	(0.030)	(0.144)	(0.168)	(0.272)
Caregiver	0.042**	0.042*	-0.021	0.018	0.023	0.038
(formal care country)	(0.020)	(0.024)	(0.037)	(0.149)	(0.194)	(0.257)
Equality of effects (p-value)	0.030	0.133	0.931	0.082	0.125	0.090
Exogeneity (p-value)				0.041	0.037	0.040
AP F-Stat (family)				34.60	30.07	18.92
AP F-Stat (formal)				20.52	18.46	21.75
	Hours worked					
Caregiver	2.032	0.911	1.714	2.474	1.928	2.054
(family care country)	(1.482)	(1.506)	(1.602)	(15.060)	(10.637)	(11.609)
Caregiver	0.441	0.054	0.082	2.480	5.585	5.354
(formal care country)	(0.845)	(1.095)	(2.266)	(6.748)	(15.726)	(14.489)
Equality of effects (p-value)	0.353	0.647	0.566	1.000	0.850	0.858
Exogeneity (p-value)				0.966	0.939	0.937
AP F-Stat (family)				2.05	4.51	7.25
AP F-Stat (formal)				11.39	2.76	6.68

Standard errors clustered at household level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

employment, exogeneity of caregiving is rejected at the 5% level. The FE-IV regressions estimate the effect of caregiving when caregiving is triggered by a decline in parental health and thus account for the endogeneity of caregiving. When the daughter responds to the parent's need for care, any frequency, weekly, and daily caregiving reduces the probability that the daughter is employed by 34, 37, and 60 percentage points, respectively, in family care countries, while caregiving in formal care countries has no effect on caregivers' employment probability. The large effect found for family care countries and the absence of an effect in formal care countries is in line with the finding by Crespo and Mira (2010) who find a 50% drop in the employment probability in Southern European countries and no change for Northern European countries but contradicts studies that find no or only negligible effects in all countries as well as studies that report negative effects in Northern European countries.[32] As mentioned above, the FE-IV regressions for hours worked suffer from weak instrument problems and results are only shown for completeness. Bolin et al. (2008b) cannot reject time varying exogeneity of hours worked with respect to caregiving analyzing similar countries, in which case the FE estimation results can be interpreted as causal effects.[33]

Table 5 shows the results for verbal fluency, short- and long-term word recall, and numeracy skills.

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[32]While the distinction between family and formal care countries is not based on geography, in general, Northern countries generally belong to formal care countries, while Southern and Eastern countries are family care countries.
[33]However, Van Houtven et al. (2013) reject exogeneity for the U.S., thus the result that caregiving does not affect hours worked should be interpreted with some caution.

Table 5: The effect of informal caregiving on cognitive ability

Frequency of care:	FE			FE-IV		
	Any	Weekly	Daily	Any	Weekly	Daily
Verbal fluency						
Caregiver	1.136***	0.845**	1.158**	3.739**	4.145*	6.405*
(family care country)	(0.389)	(0.425)	(0.504)	(1.873)	(2.149)	(3.478)
Caregiver	-0.235	0.329	-0.503	-1.132	-1.425	-1.999
(formal care country)	(0.339)	(0.421)	(0.771)	(2.340)	(2.992)	(4.051)
Equality of effects (p-value)	0.007	0.383	0.069	0.111	0.135	0.116
Exogeneity (p-value)				0.383	0.265	0.259
AP F-Stat (family)				34.30	28.79	19.29
AP F-Stat (formal)				21.02	20.24	21.16
Sort-term word recall						
Caregiver	0.042	-0.050	-0.145	-0.352	-0.386	-0.583
(family care country)	(0.111)	(0.126)	(0.132)	(0.563)	(0.622)	(0.985)
Caregiver	0.093	0.214**	0.283**	0.452	0.579	0.797
(formal care country)	(0.088)	(0.093)	(0.134)	(0.658)	(0.817)	(1.140)
Equality of effects (p-value)	0.719	0.093	0.023	0.360	0.351	0.358
Exogeneity (p-value)				0.659	0.753	0.804
AP F-Stat (family)				34.20	28.72	19.22
AP F-Stat (formal)				21.82	20.39	21.51
Long-term word recall						
Caregiver	-0.132	-0.232*	-0.264*	-0.286	-0.330	-0.545
(family care country)	(0.109)	(0.125)	(0.136)	(0.608)	(0.678)	(1.055)
Caregiver	0.120	0.168*	0.331*	-0.856	-1.097	-1.502
(formal care country)	(0.090)	(0.092)	(0.189)	(0.688)	(0.904)	(1.224)
Equality of effects (p-value)	0.074	0.010	0.010	0.540	0.499	0.552
Exogeneity (p-value)				0.330	0.343	0.294
AP F-Stat (family)				34.20	28.72	19.22
AP F-Stat (formal)				21.82	20.39	21.51
Numeracy						
Caregiver	0.014	0.034	-0.070	-0.411	-0.457	-0.708
(family care country)	(0.044)	(0.048)	(0.062)	(0.262)	(0.296)	(0.456)
Caregiver	-0.012	-0.029	-0.014	0.060	0.073	0.106
(formal care country)	(0.033)	(0.035)	(0.055)	(0.270)	(0.333)	(0.456)
Equality of effects (p-value)	0.647	0.299	0.500	0.219	0.240	0.209
Exogeneity (p-value)				0.212	0.179	0.289
AP F-Stat (family)				34.04	28.63	19.15
AP F-Stat (formal)				20.73	20.55	21.65

Standard errors clustered at household level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Exogeneity of caregiving cannot be rejected for any cognitive measure. I find caregiving increases individuals' verbal fluency scores by approximately one additional word in family care countries but has no statistically significant effect in formal care countries. Caregiving initiated by poor parental health leads to even larger increases in verbal fluency scores in family care countries (4 to 6 additional words for any frequency of caregiving and daily caregiving, respectively), though standard errors also increase. While the effects in formal care countries remain statistically insignificant, the point estimates are consistently negative.

Short-term word recall is considered a more difficult cognitive skill than verbal fluency. I find significant positive effects for weekly and daily caregiving in formal care countries in the FE specification of 0.21 and 0.28 words, respectively. Caregiving induced by a change in parental health does not lead to statistically significant effects. However, the point estimates are negative in family care countries and positive in formal care countries and increase (in absolute terms) with the frequency of care.

Long-term word recall and numeracy are even more difficult cognitive skills. Like short-term word recall, weekly and daily caregiving increases long-term word recall in formal care countries in the FE specification by 0.23 and 0.26 words, respectively. Contrary, in family care countries caregiving decreases long-term word recall by 0.17 and 0.33 words for weekly and daily caregiving, respectively. The effects are significant at the 10% level. Unlike before, however, the point estimates in the FE-IV specification are negative for both family and formal care countries, though not statistically significant. No significant effects are found for numeracy skills. Possibly, the stress of caregiving has more negative consequences for difficult cognitive skills (Arpino and Bordone, 2012).

Results for health outcomes are reported in Table 6. Caregiving does not affect mental health in the FE specification. However, caregiving in response to a parent's declining health leads to between 2 and 4 additional depressive symptoms; the effects are not significantly different between family and formal care countries. Caring for a parent in poor health is arguably much more emotionally demanding than general caregiving, which can explain the large difference between the FE and IV-FE results.

I find a slight improvement in self-perceived health as a result of weekly and any frequency of caregiving in formal care countries using the FE specification. The point estimates in family care countries as well as all estimates using the FE-IV specification are positive, that is they suggest a detrimental effect of caregiving on self-perceived health, but are statistically insignificant.

The beneficial health effects of caregiving in formal care countries, however, are not mirrored by the objective grip strength measure, which casts doubt on the reliability of self-perceived health as a valid health measure in this context because caregiving may change caregivers' point of reference for good health. Weekly caregiving decreases grip strength in formal care countries by 0.50 kg, whereas in family care countries, caregiving increases grip strength by 0.67 kg and 0.65 kg for weekly and any frequency

Table 6: The effect of informal caregiving on health

	FE			FE-IV		
Frequency of care:	Any	Weekly	Daily	Any	Weekly	Daily
EURO-D						
Caregiver	0.202	0.204	0.115	1.849**	1.935*	2.931*
(family care country)	(0.133)	(0.150)	(0.174)	(0.935)	(1.022)	(1.610)
Caregiver	0.104	-0.014	0.328	2.585**	3.179**	3.783**
(formal care country)	(0.110)	(0.126)	(0.313)	(1.070)	(1.278)	(1.547)
Equality of effects (p-value)	0.568	0.265	0.551	0.596	0.441	0.715
Exogeneity (p-value)				0.003	0.002	0.004
AP F-Stat (family)				31.12	28.17	19.93
AP F-Stat (formal)				19.54	18.72	21.78
Self-perceived health						
Caregiver	0.002	0.035	0.069	0.223	0.244	0.410
(family care country)	(0.053)	(0.058)	(0.065)	(0.296)	(0.319)	(0.522)
Caregiver	-0.109**	-0.111**	-0.133	0.407	0.522	0.713
(formal care country)	(0.043)	(0.051)	(0.086)	(0.398)	(0.509)	(0.705)
Equality of effects (p-value)	0.102	0.058	0.061	0.715	0.647	0.730
Exogeneity (p-value)				0.293	0.353	0.352
AP F-Stat (family)				34.32	30.08	19.07
AP F-Stat (formal)				21.80	20.38	21.51
Grip stregth						
Caregiver	0.646**	0.667**	0.324	1.912	2.121	3.405
(family care country)	(0.306)	(0.335)	(0.364)	(1.533)	(1.742)	(2.927)
Caregiver	-0.343	-0.499*	-0.302	-2.246	-2.708	-3.650
(formal care country)	(0.243)	(0.289)	(0.445)	(1.560)	(1.822)	(2.465)
Equality of effects (p-value)	0.011	0.008	0.277	0.061	0.058	0.066
Exogeneity (p-value)				0.322	0.357	0.218
AP F-Stat (family)				31.68	26.04	15.77
AP F-Stat (formal)				18.67	19.58	22.14

Standard errors clustered at household level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

of caregiving. Using the FE-IV specification leads to larger positive and larger negative effects if family and formal care countries, respectively, but the effects are statistically insignificant.

6.1 Robustness checks

In this subsection, I test the sensitivity of my results with respect to the choices and assumptions regarding covariates and instruments. I provide different robustness checks for the various outcomes of interest. For labour force participation, I re-estimate the model without the dummies for wealth quartiles due to possible endogeneity concerns. Excluding these covariates does not change the results. Likewise, replacing the dummies for wealth quartiles by an indicator for positive income from other household members also does not alter my findings. Results are available upon request.

Next, since being retired might change the rate of cognitive decline or affect health outcomes, I add dummies for having been retired in $t-1$ and, when observed, in $t-2$ to the models for cognitive ability and health outcomes. Again, the findings remain the same; results are available upon request.

Further, the exclusion restriction of my instrument, which relies on the assumption that a decline in parental health does not directly affect the daughter's outcome variable after controlling for all other covariates, is arguably strongest with respect to mental health, where a direct effect might seem plausible (Bobinac et al., 2010). To address this concern, I present estimates of the mental health outcome using a dummy for having only one living parent as an instrument, which allows me to use poor parental health as explanatory variable. Only having one parent increases the probability of becoming a caregiver since the living parent's spouse can no longer provide care, but it should not have a direct effect on the adult daughter's mental health (note that I still control for parental loss). Unfortunately, having a single parent is not an overly strong predictor of caregiving behaviour in family care countries nor of frequent caregiving in formal care countries. Thus I present estimates for any frequency of caregiving only, both for family and formal care countries combined and separately for formal care countries (see Table 23 in the Appendix). The negative effect of caregiving is no longer significant in the combined sample. Since caregiving to a single parent might not be as stressful as caregiving to a parent in poor health, this finding does not contradict my earlier results. In formal care countries, caregiving increases the EURO-D score by 1.7; the effect is statistically significant at the 10% level. Importantly, only the effect of losing a parent but not the effect of having a parent in poor health is significant in the combined sample and neither effect is significant in formal care countries, which supports the use of poor parental health as an instrument.

7 Discussion and conclusion

While care receivers as well as policymakers concerned about LTC expenditures usually prefer informal care provided by a family member, care provision requires caregivers to reduce leisure time or work time and exposes them to additional stress, which may affect their work and well-being. This paper shows the breadth of the effects of parental caregiving on mature daughters by studying labour force participation, cognitive ability, and health outcomes in thirteen European countries and shows that caregiving can lead to both positive and negative effects.[34] To better understand the role of LTC institutions as an important determinant of whether positive or negative effects prevail, I estimate the effects of caregiving in countries with strong formal LTC and countries with predominantly family based LTC. My results show that the effects of caregiving can differ drastically between these groups. Moreover, the frequency of care and whether care is induced by a change in parental health affect the severity of the effects. Contradictory effects of caregiving reported in earlier studies might therefore be driven by institutional differences and by differences in the definition of caregiving.

My results have important implications for the design of LTC systems. For one, they suggest that policies aimed at increasing informal caregiving rates will likely lead to a further reduction in employment rates for mature women in family care countries and additional formal care options could increase the compatibility of work and caregiving obligations in these countries. For another, an important policy goal in both family and formal care countries would be to reduce the mental burden of caregiving. Since mental health problems may reduce the ability of informal caregivers to provide adequate care, such policies would not only help caregivers but would also benefit care receivers. Besides, the positive effects of caregiving should also be noted. Caregiving can increase health and cognitive ability similar to other forms of social engagement. While the institutional context appears to be an influencing factor, exploring the conditions under which caregiving leads to such positive effects in detail deserves further attention.

To conclude, some caveats are in order. First, due to the limited sample size, this study focuses exclusively on daughters. While women tend to provide care more often than men, a growing number of men are becoming caregivers as the traditional gender roles soften and extending the analysis to sons hence represents a natural extension of this study. In particular, the social pressure to provide informal care may be weaker for men but support from co-workers or supervisors may also be weaker, which could provide additional insight about the influence of the cultural and institutional caregiving context on the effects of caregiving. Second, this study can only address short term effects of caregiving, that is it analyzes the change in outcomes after a person starts or ends to provide care and the duration of caregiving is not considered. While these short run effects are greatly relevant to the individual

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[34] Allowing for feedback effects between the health or cognitive outcomes and employment would be a very interesting exercise but is beyond the scope of this study.

caregivers, it would be also extremely interesting to see how caregivers are affected in the long run both from an individual and a policy perspective.

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Appendix

A   Assessing reporting bias in parental health

Systematic misreporting of parental health would question the reliability of using the variable as an instrument, for example, if daughters misstate their parents' health to justify not providing informal care. As daughters living close to their parents may feel more pressured to justify not providing care to their parents, I can test for such behaviour by comparing parental health for parents living close to their daughters and parents living further away from their daughters. Results are presented in Table 7. I find no significant differences in parental health based on the distance to the daughter. Besides, the question about parental health is asked at the beginning of the SHARE interview, whereas the questions about caregiving behaviour are asked later on, which further limits the possibility for strategic answering behaviour.

Table 7: Parental health and distance to the parent

| | Distance to the parent | | | | | |
Parental health	≤5 km	>5 km		≤25 km	>25 km	
poor	0.29	0.31	(0.290)	0.29	0.31	(0.286)
fair	0.34	0.37	(0.395)	0.35	0.37	(0.474)
good	0.29	0.25	(0.132)	0.29	0.25	(0.135)
very good	0.07	0.07	(0.485)	0.07	0.07	(0.648)

Weighted values for individuals with at least on living parent based on individuals' first observation. Two sided p-values of adjusted Wald test of equality of means in parentheses. N=3,172

B   Additional tables

Table 8: Official retirement age for women in SHARE countries

Country	Retirement age	Comments
Austria	60	
Belgium	65	Workers can retire at age 60 with 40 years of contributions.
Czech Republic	61	
Denmark	65	
France	60	Workers can retire at age 60 with 40 years of contributions.
Germany	65	
Greece	62	Workers can retire at age 59 with 35 years of contributions.
Italy	60	Workers can retire at 57 (56 for manual workers) with 35 years of contributions.
Netherlands	65	
Poland	60	
Spain	65	
Switzerland	64	
Sweden	65	

Source: OECD Statistics on average effective age and official age of retirement
in OECD countries (official retirement age for 2010)

Table 9: Changes in caregiving behaviour over time

	Number of individuals
Never caregiver	1,653
Ever caregiver	1,656
Continuous caregivers	496
Begin caregiving	504
End caregiving	795
Ever weekly caregiver	1,164
Continuous caregivers	294
Begin caregiving	417
End caregiving	551
Ever daily caregiver	550
Continuous caregivers	118
Begin caregiving	215
End caregiving	263

Table 10: FE results: Labour force participation

Frequency of care:	Employed			Hours worked		
	any	weekly	daily	any	weekly	daily
Caregiver	-0.028	-0.013	-0.016	2.032	0.911	1.714
(family care country)	(0.025)	(0.027)	(0.030)	(1.482)	(1.506)	(1.602)
Caregiver	0.042**	0.042*	-0.021	0.441	0.054	0.082
(formal care country)	(0.020)	(0.024)	(0.037)	(0.845)	(1.095)	(2.266)
Chronic conditions	-0.004	-0.005	-0.005	-0.906*	-0.916*	-0.928*
	(0.007)	(0.007)	(0.007)	(0.494)	(0.501)	(0.505)
ADL	-0.006	-0.006	-0.005	-1.133	-1.125	-1.098
	(0.019)	(0.019)	(0.019)	(1.014)	(1.009)	(0.999)
IADL	0.024	0.023	0.023	1.645	1.671	1.668
	(0.017)	(0.017)	(0.017)	(1.321)	(1.333)	(1.332)
Age	-0.113	-0.112	-0.107	4.185	4.091	4.203
	(0.074)	(0.075)	(0.075)	(7.909)	(7.937)	(7.941)
Age squared/100	0.114*	0.114*	0.109*	-4.057	-4.024	-4.085
	(0.062)	(0.062)	(0.062)	(6.791)	(6.811)	(6.819)
Wave 2	-0.104***	-0.107***	-0.105***	-0.033	0.050	-0.017
	(0.035)	(0.035)	(0.035)	(1.924)	(1.939)	(1.948)
Wave 4	-0.219**	-0.228**	-0.223**	2.485	2.800	2.525
	(0.097)	(0.097)	(0.097)	(5.027)	(5.051)	(5.072)
Married	0.031	0.031	0.030	-2.367	-2.318	-2.321
	(0.049)	(0.049)	(0.049)	(1.513)	(1.488)	(1.485)
Household size	-0.026**	-0.026**	-0.026**	0.499	0.556	0.556
	(0.011)	(0.011)	(0.011)	(0.601)	(0.596)	(0.597)
1st wealth quartile	0.019	0.018	0.018	-0.431	-0.496	-0.479
	(0.030)	(0.030)	(0.031)	(1.505)	(1.493)	(1.494)
2nd wealth quartile	0.017	0.017	0.017	-1.159	-1.176	-1.174
	(0.024)	(0.024)	(0.024)	(1.253)	(1.249)	(1.255)
3rd wealth quartile	0.015	0.015	0.015	-1.347	-1.342	-1.320
	(0.021)	(0.021)	(0.021)	(1.005)	(0.999)	(1.002)
Reached off. ret. age	-0.076***	-0.075***	-0.077***	-2.137	-2.323	-2.173
	(0.028)	(0.028)	(0.028)	(2.894)	(2.916)	(2.882)
2 years to off. ret. age	-0.067***	-0.068***	-0.068***	-1.051	-1.009	-1.044
	(0.025)	(0.025)	(0.025)	(1.542)	(1.532)	(1.548)
5 years to off. ret. age	-0.076***	-0.075***	-0.074***	-1.545	-1.518	-1.503
	(0.026)	(0.026)	(0.026)	(1.234)	(1.231)	(1.234)
Observations	7,559	7,559	7,559	3,143	3,143	3,143
Within R-squared	0.110	0.109	0.108	0.066	0.063	0.063
Unique individuals	3,296	3,296	3,296	1,409	1,409	1,409

Standard errors clustered at household level in parentheses. *** p<0.01, ** p<0.05,
* p<0.1. Regressions include age*country and age squared/100*country interaction terms.

Table 11: FE results: Health

Frequency of care:	EURO-D			Self-perceived health			Grip strength		
	any	weekly	daily	any	weekly	daily	any	weekly	daily
Caregiver	0.202	0.204	0.115	0.002	0.035	0.069	0.646**	0.667**	0.324
(family care country)	(0.133)	(0.150)	(0.174)	(0.053)	(0.058)	(0.065)	(0.306)	(0.335)	(0.364)
Caregiver	0.104	-0.014	0.328	-0.109**	-0.111**	-0.133	-0.343	-0.499*	-0.302
(formal care country)	(0.110)	(0.126)	(0.313)	(0.043)	(0.051)	(0.086)	(0.243)	(0.289)	(0.445)
Parental loss	0.077	0.071	0.064						
	(0.107)	(0.106)	(0.106)						
Chronic conditions	0.226***	0.225***	0.227***	0.161***	0.161***	0.161***	-0.469***	-0.471***	-0.465***
	(0.055)	(0.055)	(0.055)	(0.018)	(0.018)	(0.018)	(0.127)	(0.127)	(0.127)
ADL	-0.069	-0.071	-0.070	0.048	0.047	0.046	-0.464	-0.475	-0.484
	(0.132)	(0.132)	(0.132)	(0.040)	(0.040)	(0.041)	(0.383)	(0.383)	(0.381)
IADL	0.331**	0.333**	0.332**	0.113***	0.114***	0.116***	-0.173	-0.164	-0.162
	(0.151)	(0.151)	(0.151)	(0.036)	(0.036)	(0.036)	(0.270)	(0.270)	(0.270)
Age	-0.421	-0.422	-0.433	-0.171	-0.171	-0.178	2.004*	2.001*	1.967*
	(0.445)	(0.446)	(0.444)	(0.220)	(0.219)	(0.218)	(1.063)	(1.061)	(1.060)
Age squared/100	0.325	0.320	0.334	0.128	0.127	0.135	-1.473*	-1.490*	-1.442*
	(0.358)	(0.359)	(0.357)	(0.186)	(0.185)	(0.185)	(0.871)	(0.870)	(0.868)
Wave 2	-0.111	-0.106	-0.111	0.217**	0.223**	0.219**	-0.530	-0.482	-0.510
	(0.256)	(0.256)	(0.255)	(0.095)	(0.095)	(0.095)	(0.528)	(0.527)	(0.527)
Wave 4	0.004	0.024	-0.007	0.459*	0.477*	0.468*	-2.542*	-2.389	-2.492*
	(0.695)	(0.694)	(0.693)	(0.256)	(0.256)	(0.255)	(1.472)	(1.470)	(1.470)
Married	-0.569	-0.573	-0.577	-0.021	-0.023	-0.018	-0.184	-0.189	-0.154
	(0.366)	(0.367)	(0.366)	(0.111)	(0.111)	(0.110)	(0.734)	(0.733)	(0.738)
Household size	0.008	0.010	0.007	0.001	0.001	0.003	0.119	0.126	0.133
	(0.097)	(0.097)	(0.096)	(0.028)	(0.028)	(0.028)	(0.170)	(0.169)	(0.170)
Employed	0.066	0.066	0.066	0.004	0.003	0.001	-0.137	-0.149	-0.166
	(0.134)	(0.134)	(0.134)	(0.045)	(0.045)	(0.045)	(0.364)	(0.365)	(0.365)
Other activities	-0.117	-0.113	-0.110	-0.093**	-0.094**	-0.094**	-0.267	-0.264	-0.251
	(0.101)	(0.101)	(0.101)	(0.037)	(0.037)	(0.037)	(0.256)	(0.255)	(0.256)
1st wealth quartile	0.176	0.171	0.182	0.019	0.017	0.016	-0.155	-0.175	-0.137
	(0.176)	(0.175)	(0.176)	(0.063)	(0.063)	(0.063)	(0.377)	(0.378)	(0.379)
2nd wealth quartile	-0.047	-0.045	-0.047	0.005	0.004	0.003	-0.149	-0.154	-0.155

Continued on next page

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Table 11 – continued from previous page

Frequency of care:	EURO-D			Self-perceived health			Grip strength		
	any	weekly	daily	any	weekly	daily	any	weekly	daily
3rd wealth quartile	-0.181	-0.181	-0.179	-0.017	-0.018	-0.020	-0.240	-0.248	-0.245
	(0.145)	(0.145)	(0.145)	(0.050)	(0.050)	(0.050)	(0.306)	(0.307)	(0.307)
	(0.124)	(0.123)	(0.123)	(0.046)	(0.046)	(0.045)	(0.261)	(0.262)	(0.261)
Observations	7,274	7,274	7,274	7,526	7,526	7,526	7,018	7,018	7,018
Within R-squared	0.037	0.037	0.037	0.080	0.080	0.080	0.058	0.058	0.056
Unique individuals	3,180	3,180	3,180	3,282	3,282	3,282	3,075	3,075	3,075

Standard errors clustered at household level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Regressions include age*country and age squared/100*country interaction terms.

Table 12: FE results: Cognitive ability (I)

Frequency of care:	Verbal fluency			Short-term word recall		
	any	weekly	daily	any	weekly	daily
Caregiver	1.136***	0.845**	1.158**	0.042	-0.050	-0.145
(family care country)	(0.389)	(0.425)	(0.504)	(0.111)	(0.126)	(0.132)
Caregiver	-0.235	0.329	-0.503	0.093	0.214**	0.283**
(formal care country)	(0.339)	(0.421)	(0.771)	(0.088)	(0.093)	(0.134)
Chronic conditions	0.238*	0.238*	0.240*	0.010	0.011	0.012
	(0.133)	(0.134)	(0.134)	(0.039)	(0.039)	(0.039)
ADL	-0.177	-0.202	-0.197	0.003	0.001	0.004
	(0.251)	(0.251)	(0.253)	(0.083)	(0.084)	(0.083)
IADL	-0.419*	-0.406*	-0.387*	0.021	0.021	0.017
	(0.217)	(0.218)	(0.218)	(0.066)	(0.066)	(0.067)
Age	1.515	1.432	1.504	0.349	0.334	0.346
	(1.184)	(1.172)	(1.178)	(0.320)	(0.320)	(0.318)
Age squared/100	-1.482	-1.418	-1.477	-0.249	-0.233	-0.247
	(0.966)	(0.956)	(0.962)	(0.265)	(0.266)	(0.264)
Wave 2	1.085	1.117	1.106	0.076	0.069	0.076
	(0.737)	(0.737)	(0.739)	(0.178)	(0.177)	(0.178)
Wave 4	1.478	1.588	1.544	0.067	0.043	0.059
	(1.979)	(1.979)	(1.983)	(0.483)	(0.480)	(0.482)
Married	-0.362	-0.311	-0.349	0.641**	0.652**	0.642**
	(0.770)	(0.765)	(0.762)	(0.253)	(0.253)	(0.253)
Household size	-0.084	-0.063	-0.059	-0.054	-0.053	-0.057
	(0.172)	(0.174)	(0.173)	(0.050)	(0.051)	(0.051)
Employed	0.074	0.037	0.045	0.100	0.096	0.102
	(0.350)	(0.351)	(0.350)	(0.092)	(0.092)	(0.091)
Other activities	0.168	0.189	0.192	-0.062	-0.058	-0.058
	(0.305)	(0.305)	(0.305)	(0.079)	(0.079)	(0.080)
1st wealth quartile	-0.232	-0.226	-0.227	0.072	0.080	0.084
	(0.446)	(0.449)	(0.442)	(0.122)	(0.121)	(0.122)
2nd wealth quartile	-0.134	-0.127	-0.144	0.114	0.116	0.117
	(0.333)	(0.335)	(0.333)	(0.111)	(0.111)	(0.111)
3rd wealth quartile	-0.065	-0.061	-0.080	-0.079	-0.077	-0.074
	(0.307)	(0.308)	(0.307)	(0.087)	(0.086)	(0.086)
Observations	7,501	7,501	7,501	7,516	7,516	7,516
Within R-squared	0.040	0.038	0.038	0.047	0.048	0.048
Unique individuals	3,270	3,270	3,270	3,277	3,277	3,277

Standard errors clustered at household level in parentheses. *** p<0.01, ** p<0.05,
* p<0.1. Regressions include age*country and age squared/100*country interaction terms.

Table 13: FE results: Cognitive ability (II)

Frequency of care:	Long-term word recall			Numeracy		
	any	weekly	daily	any	weekly	daily
Caregiver	-0.132	-0.232*	-0.264*	0.014	0.034	-0.070
(family care country)	(0.109)	(0.125)	(0.136)	(0.044)	(0.048)	(0.062)
Caregiver	0.120	0.168*	0.331*	-0.012	-0.029	-0.014
(formal care country)	(0.090)	(0.092)	(0.189)	(0.033)	(0.035)	(0.055)
Chronic conditions	-0.026	-0.024	-0.024	-0.020	-0.020	-0.019
	(0.043)	(0.043)	(0.043)	(0.014)	(0.014)	(0.014)
ADL	0.026	0.027	0.030	0.010	0.010	0.008
	(0.087)	(0.088)	(0.087)	(0.035)	(0.035)	(0.035)
IADL	-0.026	-0.028	-0.034	-0.021	-0.021	-0.021
	(0.083)	(0.084)	(0.083)	(0.040)	(0.040)	(0.040)
Age	0.023	0.020	0.023	0.233	0.235	0.232
	(0.423)	(0.422)	(0.426)	(0.155)	(0.155)	(0.154)
Age squared/100	0.170	0.179	0.171	-0.218*	-0.220*	-0.216*
	(0.352)	(0.351)	(0.355)	(0.125)	(0.125)	(0.124)
Wave 2	-0.118	-0.131	-0.122	0.135	0.137	0.137
	(0.202)	(0.202)	(0.201)	(0.095)	(0.095)	(0.095)
Wave 4	-0.439	-0.484	-0.457	0.226	0.232	0.228
	(0.552)	(0.552)	(0.551)	(0.245)	(0.244)	(0.244)
Married	0.454	0.458	0.451	0.095	0.094	0.099
	(0.415)	(0.415)	(0.415)	(0.107)	(0.107)	(0.107)
Household size	-0.047	-0.049	-0.053	-0.005	-0.005	-0.005
	(0.061)	(0.061)	(0.060)	(0.021)	(0.021)	(0.021)
Employed	-0.142	-0.141	-0.136	0.060	0.060	0.058
	(0.112)	(0.113)	(0.112)	(0.045)	(0.045)	(0.045)
Other activities	0.036	0.037	0.035	-0.003	-0.004	-0.002
	(0.088)	(0.088)	(0.088)	(0.029)	(0.029)	(0.029)
1st wealth quartile	-0.014	-0.003	-0.007	0.005	0.003	0.010
	(0.141)	(0.140)	(0.140)	(0.056)	(0.055)	(0.056)
2nd wealth quartile	0.010	0.011	0.015	0.016	0.016	0.017
	(0.120)	(0.120)	(0.120)	(0.044)	(0.044)	(0.044)
3rd wealth quartile	-0.199*	-0.197*	-0.193*	0.005	0.005	0.006
	(0.104)	(0.104)	(0.104)	(0.040)	(0.040)	(0.040)
Observations	7,516	7,516	7,516	7,514	7,514	7,514
Within R-squared	0.077	0.078	0.079	0.017	0.018	0.018
Unique individuals	3,277	3,277	3,277	3,277	3,277	3,277

Standard errors clustered at household level in parentheses. *** p<0.01, ** p<0.05,
* p<0.1. Regressions include age*country and age squared/100*country interaction terms.

Table 14: First and second stage results: Employed

Dependent variable:	Employed	family[a]	formal[b]	Employed	family	formal	Employed	family	formal
Caregiver (family care country)	-0.344**			-0.370**			-0.600**		
	(0.144)			(0.168)			(0.272)		
Caregiver (formal care country)	0.018			0.023			0.038		
	(0.149)			(0.194)			(0.257)		
Chronic conditions	0.001	0.013	-0.001	0.004	0.018**	0.002	0.003	0.010	-0.001
	(0.008)	(0.009)	(0.005)	(0.008)	(0.008)	(0.004)	(0.009)	(0.006)	(0.003)
ADL	-0.011	-0.018	0.018	-0.006	-0.005	0.013	-0.007	-0.005	-0.004
	(0.020)	(0.018)	(0.013)	(0.020)	(0.017)	(0.011)	(0.021)	(0.013)	(0.007)
IADL	0.028	0.019	-0.006	0.024	0.007	0.001	0.016	-0.008	0.007
	(0.018)	(0.015)	(0.009)	(0.017)	(0.014)	(0.007)	(0.018)	(0.010)	(0.005)
Age	-0.153*	-0.005	0.068	-0.152*	-0.002	0.050	-0.150*	0.002	0.023
	(0.079)	(0.036)	(0.127)	(0.079)	(0.033)	(0.107)	(0.079)	(0.027)	(0.079)
Age squared/100	0.150**	0.012	-0.074	0.158**	0.030	-0.065	0.148**	0.004	-0.025
	(0.065)	(0.028)	(0.105)	(0.067)	(0.026)	(0.091)	(0.066)	(0.023)	(0.066)
Wave 2	-0.110***	0.005	-0.016	-0.126***	-0.036	0.034	-0.112***	0.000	0.011
	(0.038)	(0.029)	(0.044)	(0.039)	(0.026)	(0.035)	(0.038)	(0.020)	(0.033)
Wave 4	-0.245**	-0.039	-0.066	-0.302***	-0.182**	0.083	-0.254**	-0.034	0.038
	(0.105)	(0.093)	(0.107)	(0.111)	(0.085)	(0.087)	(0.108)	(0.071)	(0.080)
Married	0.030	0.068	-0.013	0.039	0.086**	-0.030	0.039	0.056	0.018
	(0.053)	(0.044)	(0.049)	(0.055)	(0.040)	(0.048)	(0.056)	(0.037)	(0.025)
Household size	-0.028**	0.016	-0.004	-0.035***	-0.005	-0.005	-0.034**	0.000	0.012
	(0.013)	(0.014)	(0.008)	(0.013)	(0.013)	(0.007)	(0.014)	(0.010)	(0.007)
1st wealth quartile	0.042	0.072**	-0.002	0.055	0.101***	-0.006	0.055	0.062**	-0.003
	(0.036)	(0.031)	(0.021)	(0.038)	(0.028)	(0.016)	(0.039)	(0.025)	(0.013)
2nd wealth quartile	0.021	0.004	0.015	0.025	0.015	-0.001	0.031	0.019	0.000
	(0.027)	(0.024)	(0.017)	(0.027)	(0.024)	(0.014)	(0.028)	(0.020)	(0.011)
3rd wealth quartile	0.016	0.007	0.010	0.019	0.013	-0.000	0.025	0.017	-0.006
	(0.023)	(0.023)	(0.016)	(0.023)	(0.021)	(0.011)	(0.025)	(0.018)	(0.008)
Reached off. ret. age	-0.085***	0.012	-0.011	-0.087***	0.006	-0.036*	-0.080**	0.016	0.002
	(0.032)	(0.031)	(0.023)	(0.032)	(0.030)	(0.020)	(0.034)	(0.026)	(0.023)
2 years to off. ret. age	-0.066**	-0.014	-0.009	-0.068**	-0.018	0.010	-0.065**	-0.007	-0.006
	(0.028)	(0.024)	(0.021)	(0.028)	(0.022)	(0.018)	(0.029)	(0.018)	(0.017)
5 years to off. ret. age	-0.078***	-0.009	0.045***	-0.084***	-0.025	0.011	-0.079***	-0.007	0.013*
	(0.028)	(0.027)	(0.015)	(0.028)	(0.025)	(0.011)	(0.029)	(0.021)	(0.007)

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Table 14 – continued from previous page

Dependent variable:	Employed	family	formal	Employed	family	formal	Employed	family	formal
Parent in poor health (family care country)		0.198***	0.003		0.184***	0.000		0.113***	-0.001
		(0.034)	(0.002)		(0.034)	(0.002)		(0.026)	(0.001)
Parent in poor health (formal care country)		0.001	0.153***		0.001	0.117***		0.002	0.089***
		(0.003)	(0.034)		(0.003)	(0.027)		(0.002)	(0.019)
Observations	6,991	6,991	6,991	6,991	6,991	6,991	6,991	6,991	6,991
Within R-squared	0.030	0.096	0.055	0.018	0.083	0.034	-0.058	0.050	0.028
Unique individuals	3,070	3,070	3,070	3,070	3,070	3,070	3,070	3,070	3,070

Standard errors clustered at household level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Regressions include age*country and age squared/100*country interaction terms.

[a] Caregiver in family care country; [b] Caregiver in formal care country.

Table 15: First and second stage results: Hours

Dependent variable:	Hours	family[a]	formal[b]	Hours	family	formal	Hours	family	formal
Caregiver	2.474			1.928			2.054		
(family care country)	(15.060)			(10.637)			(11.609)		
Caregiver	2.480			5.585			5.354		
(formal care country)	(6.748)			(15.726)			(14.489)		
Chronic conditions	-0.765	-0.001	0.007	-0.792	0.014	0.003	-0.773	0.017	-0.002
	(0.518)	(0.017)	(0.011)	(0.559)	(0.015)	(0.010)	(0.584)	(0.011)	(0.007)
ADL	-0.893	0.003	-0.018	-1.002	0.017	0.007	-0.898	-0.006	-0.003
	(1.316)	(0.038)	(0.027)	(1.284)	(0.027)	(0.022)	(1.293)	(0.015)	(0.009)
IADL	1.533	0.010	0.008	1.555	-0.010	0.007	1.484	0.000	0.017
	(1.411)	(0.036)	(0.018)	(1.461)	(0.028)	(0.013)	(1.479)	(0.015)	(0.014)
Age	-1.043	-0.040	-0.041	-2.288	0.042	0.172	-0.773	-0.021	-0.080
	(5.628)	(0.088)	(0.327)	(6.155)	(0.078)	(0.280)	(6.002)	(0.065)	(0.161)
Age squared/100	0.172	0.017	0.061	1.279	-0.005	-0.162	-0.074	0.019	0.075
	(4.839)	(0.080)	(0.292)	(5.463)	(0.073)	(0.251)	(5.171)	(0.064)	(0.144)
Wave 2	0.690	0.042	-0.090	0.722	-0.061	-0.006	0.604	-0.008	-0.003
	(2.078)	(0.046)	(0.057)	(2.132)	(0.039)	(0.047)	(2.014)	(0.029)	(0.032)
Wave 4	4.105	0.140	-0.285**	4.300	-0.222*	-0.023	3.765	0.003	-0.005
	(5.738)	(0.147)	(0.138)	(5.763)	(0.122)	(0.116)	(5.295)	(0.104)	(0.076)
Married	-3.384*	0.088	0.052	-3.581	0.157**	0.043	-3.245*	0.074	0.010
	(2.029)	(0.074)	(0.085)	(2.301)	(0.078)	(0.078)	(1.707)	(0.068)	(0.045)
Household size	0.343	0.025	-0.003	0.409	-0.008	0.001	0.338	0.000	0.011**
	(0.709)	(0.025)	(0.011)	(0.650)	(0.019)	(0.010)	(0.646)	(0.013)	(0.005)
1st wealth quartile	-1.283	-0.011	-0.019	-1.238	0.046	-0.037	-1.263	-0.011	-0.013
	(1.587)	(0.049)	(0.039)	(1.715)	(0.035)	(0.032)	(1.590)	(0.020)	(0.021)
2nd wealth quartile	-1.677	-0.015	0.024	-1.607	0.014	-0.013	-1.720	-0.004	0.014
	(1.372)	(0.036)	(0.026)	(1.302)	(0.037)	(0.024)	(1.364)	(0.022)	(0.017)
3rd wealth quartile	-1.294	-0.000	-0.012	-1.238	-0.006	-0.014	-1.257	-0.023	-0.004
	(1.078)	(0.032)	(0.020)	(1.085)	(0.031)	(0.019)	(1.116)	(0.023)	(0.012)
Reached off. ret. age	-2.316	-0.103	-0.044	-2.256	-0.042	-0.061	-2.190	-0.112*	-0.049
	(3.449)	(0.067)	(0.070)	(3.339)	(0.079)	(0.062)	(3.503)	(0.066)	(0.048)
2 years to off. ret. age	-0.758	0.055	-0.080	-0.735	0.039	-0.029	-0.835	0.036	-0.011
	(1.885)	(0.054)	(0.059)	(1.714)	(0.049)	(0.052)	(1.723)	(0.033)	(0.041)
5 years to off. ret. age	-1.472	-0.001	0.017	-1.365	-0.001	-0.011	-1.442	-0.013	0.007
	(1.303)	(0.043)	(0.030)	(1.280)	(0.040)	(0.024)	(1.318)	(0.029)	(0.017)

Table 15 – continued from previous page

Dependent variable:	Hours	family	formal	Hours	family	formal	Hours	family	formal
Parent in poor health		0.102	0.013**		0.144**	0.001		0.131***	0.003
(family care country)		(0.071)	(0.006)		(0.068)	(0.004)		(0.049)	(0.003)
Parent in poor health		0.001	0.149***		0.005	0.065*		-0.002	0.070***
(formal care country)		(0.007)	(0.044)		(0.007)	(0.039)		(0.005)	(0.027)
Observations	2,916	2,916	2,916	2,916	2,916	2,916	2,916	2,916	2,916
Within R-squared	0.066	0.115	0.041	0.053	0.088	0.022	0.061	0.098	0.051
Unique individuals	1,313	1,313	1,313	1,313	1,313	1,313	1,313	1,313	1,313

Standard errors clustered at household level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Regressions include age*country and age squared/100*country interaction terms.

[a] Caregiver in family care country; [b] Caregiver in formal care country.

Table 16: First and second stage results: Mental health

Dependent variable:	EURO-D	family^a	formal^b	EURO-D	family	formal	EURO-D	family	formal
Caregiver (family care country)	1.849**			1.935*			2.931*		
	(0.935)			(1.022)			(1.610)		
Caregiver (formal care country)	2.585**			3.179**			3.783**		
	(1.070)			(1.278)			(1.547)		
Parental loss	0.278**	-0.007	-0.023	0.217*	-0.006	0.000	0.096	0.025	0.010
	(0.130)	(0.019)	(0.015)	(0.124)	(0.018)	(0.014)	(0.122)	(0.017)	(0.012)
Chronic conditions	0.221***	0.011	-0.002	0.199***	0.016**	0.002	0.210***	0.010	-0.001
	(0.062)	(0.009)	(0.005)	(0.063)	(0.008)	(0.005)	(0.062)	(0.007)	(0.003)
ADL	-0.076	-0.017	0.021	-0.093	-0.003	0.014	-0.038	-0.001	-0.003
	(0.153)	(0.018)	(0.014)	(0.153)	(0.017)	(0.011)	(0.150)	(0.013)	(0.007)
IADL	0.287*	0.022	-0.009	0.292*	0.009	-0.002	0.305*	-0.008	0.006
	(0.160)	(0.015)	(0.010)	(0.162)	(0.015)	(0.008)	(0.157)	(0.011)	(0.006)
Age	-0.287	-0.005	0.037	-0.324	0.007	0.034	-0.250	-0.001	0.013
	(0.549)	(0.022)	(0.125)	(0.572)	(0.019)	(0.106)	(0.535)	(0.013)	(0.077)
Age squared/100	0.197	0.012	-0.046	0.233	0.020*	-0.054	0.142	0.006	-0.016
	(0.442)	(0.012)	(0.103)	(0.466)	(0.011)	(0.089)	(0.433)	(0.007)	(0.065)
Wave 2	-0.033	0.003	-0.007	-0.120	-0.031	0.042	-0.065	-0.003	0.007
	(0.298)	(0.030)	(0.045)	(0.299)	(0.026)	(0.037)	(0.289)	(0.020)	(0.034)
Wave 4	0.405	-0.046	-0.055	0.209	-0.176**	0.098	0.168	-0.038	0.033
	(0.802)	(0.095)	(0.109)	(0.813)	(0.086)	(0.089)	(0.793)	(0.073)	(0.082)
Married	-0.564	0.073	-0.035	-0.526	0.090**	-0.053	-0.778*	0.062	0.021
	(0.435)	(0.047)	(0.047)	(0.472)	(0.042)	(0.045)	(0.445)	(0.039)	(0.027)
Household size	0.029	0.017	-0.004	0.070	-0.004	-0.004	0.003	0.000	0.012
	(0.102)	(0.014)	(0.008)	(0.104)	(0.013)	(0.007)	(0.100)	(0.010)	(0.008)
Employed	0.055	-0.011	0.030*	0.010	0.011	0.025*	0.103	0.006	-0.002
	(0.163)	(0.025)	(0.015)	(0.164)	(0.024)	(0.014)	(0.154)	(0.017)	(0.010)
Other activities	-0.158	0.031	0.008	-0.108	0.017	-0.001	-0.107	0.011	-0.001
	(0.125)	(0.021)	(0.015)	(0.121)	(0.018)	(0.012)	(0.119)	(0.013)	(0.010)
1st wealth quartile	-0.001	0.074**	-0.007	-0.043	0.100***	-0.011	-0.063	0.065**	-0.003
	(0.220)	(0.032)	(0.022)	(0.230)	(0.029)	(0.017)	(0.238)	(0.026)	(0.013)
2nd wealth quartile	-0.156	0.008	0.016	-0.115	0.011	-0.003	-0.161	0.021	-0.001
	(0.168)	(0.024)	(0.017)	(0.165)	(0.023)	(0.014)	(0.174)	(0.021)	(0.011)
3rd wealth quartile	-0.197	0.009	0.008	-0.178	0.012	-0.001	-0.193	0.020	-0.006
	(0.145)	(0.023)	(0.017)	(0.138)	(0.022)	(0.011)	(0.146)	(0.019)	(0.008)

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Table 16 – continued from previous page

Dependent variable:	EURO-D	family	formal	EURO-D	family	formal	EURO-D	family	formal
Parent in poor health		0.194***	-0.002		0.179***	0.003		0.118***	0.002
(family care country)		(0.035)	(0.005)		(0.034)	(0.005)		(0.026)	(0.004)
Parent in poor health		0.000	0.153***		0.000	0.124***		0.011*	0.096***
(formal care country)		(0.008)	(0.035)		(0.007)	(0.029)		(0.007)	(0.021)
Observations	6,845	6,845	6,845	6,845	6,845	6,845	6,845	6,845	6,845
Within R-squared	-0.174	0.097	0.056	-0.193	0.083	0.035	-0.183	0.050	0.029
Unique individuals	3,009	3,009	3,009	3,009	3,009	3,009	3,009	3,009	3,009

Standard errors clustered at household level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Regressions include age*country and age squared/100*country interaction terms.

[a] Caregiver in family care country; [b] Caregiver in formal care country.

Table 17: First and second stage results: Self-perceived health (SPH)

Dependent variable:	SPH	family^a	formal^b	SPH	family	formal	SAH	family	formal
Caregiver (family care country)	0.223 (0.296)			0.244 (0.319)			0.410 (0.522)		
Caregiver (formal care country)	0.407 (0.398)			0.522 (0.509)			0.713 (0.705)		
Chronic conditions	0.164*** (0.019)	0.012 (0.009)	-0.001 (0.005)	0.161*** (0.020)	0.017** (0.008)	0.002 (0.004)	0.163*** (0.020)	0.011 (0.007)	-0.001 (0.003)
ADL	0.053 (0.047)	-0.019 (0.018)	0.020 (0.013)	0.052 (0.046)	-0.007 (0.016)	0.014 (0.011)	0.062 (0.046)	-0.005 (0.013)	-0.003 (0.007)
IADL	0.109*** (0.037)	0.020 (0.015)	-0.010 (0.009)	0.108*** (0.036)	0.007 (0.014)	-0.000 (0.007)	0.107*** (0.037)	-0.008 (0.010)	0.007 (0.005)
Age	-0.227 (0.225)	-0.004 (0.021)	0.073 (0.125)	-0.235 (0.227)	0.008 (0.019)	0.067 (0.106)	-0.215 (0.226)	-0.003 (0.014)	0.025 (0.077)
Age squared/100	0.184 (0.188)	0.011 (0.011)	-0.078 (0.103)	0.192 (0.192)	0.018* (0.011)	-0.081 (0.090)	0.169 (0.189)	0.009 (0.007)	-0.026 (0.065)
Wave 2	0.246** (0.104)	0.001 (0.030)	-0.007 (0.044)	0.230** (0.101)	-0.032 (0.026)	0.041 (0.036)	0.237** (0.103)	-0.001 (0.020)	0.010 (0.034)
Wave 4	0.514* (0.279)	-0.050 (0.093)	-0.043 (0.108)	0.477* (0.277)	-0.176** (0.084)	0.098 (0.088)	0.474* (0.275)	-0.040 (0.072)	0.038 (0.081)
Married	-0.088 (0.118)	0.069 (0.045)	-0.034 (0.045)	-0.080 (0.124)	0.085** (0.040)	-0.052 (0.043)	-0.121 (0.122)	0.056 (0.037)	0.017 (0.025)
Household size	-0.005 (0.031)	0.017 (0.014)	-0.004 (0.008)	0.000 (0.030)	-0.003 (0.013)	-0.004 (0.007)	-0.011 (0.031)	0.001 (0.010)	0.012 (0.007)
Employed	-0.003 (0.052)	-0.013 (0.025)	0.031** (0.015)	-0.007 (0.052)	0.008 (0.024)	0.022* (0.014)	0.009 (0.050)	0.002 (0.017)	-0.004 (0.010)
Other activities	-0.089** (0.039)	0.033 (0.020)	0.004 (0.015)	-0.083** (0.039)	0.020 (0.018)	-0.004 (0.012)	-0.084** (0.038)	0.012 (0.013)	-0.001 (0.009)
1st wealth quartile	-0.013 (0.067)	0.071** (0.032)	-0.006 (0.022)	-0.019 (0.071)	0.096*** (0.028)	-0.009 (0.016)	-0.023 (0.073)	0.063** (0.026)	-0.004 (0.013)
2nd wealth quartile	0.016 (0.053)	0.005 (0.024)	0.013 (0.017)	0.022 (0.053)	0.008 (0.023)	-0.004 (0.014)	0.015 (0.055)	0.020 (0.021)	-0.001 (0.011)
3rd wealth quartile	-0.008 (0.047)	0.008 (0.023)	0.008 (0.016)	-0.004 (0.047)	0.010 (0.021)	-0.002 (0.011)	-0.005 (0.049)	0.018 (0.018)	-0.006 (0.008)
Parent in poor health (family care country)		0.198*** (0.034)	0.005** (0.002)		0.184*** (0.034)	0.002 (0.002)		0.114*** (0.026)	-0.001 (0.001)

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Table 17 – continued from previous page

Dependent variable:	SPH	family	formal	SPH	family	formal	SAH	family	formal
Parent in poor health		0.002	0.159***		0.002	0.124***		0.002	0.090***
(formal care country)		(0.003)	(0.034)		(0.003)	(0.027)		(0.002)	(0.019)
Observations	6,961	6,961	6,961	6,961	6,961	6,961	6,961	6,961	6,961
Within R-squared	0.035	0.098	0.055	0.035	0.085	0.035	0.034	0.050	0.028
Unique individuals	3,057	3,057	3,057	3,057	3,057	3,057	3,057	3,057	3,057

Standard errors clustered at household level in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Regressions include age*country and age squared/100*country interaction terms.
[a] Caregiver in family care country; [b] Caregiver in formal care country.

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Table 18: First and second stage results: Grip strength (GS)

Dependent variable:	GS	family[a]	formal[b]	GS	family	formal	GS	family	formal
Caregiver (family care country)	1.912 (1.533)			2.121 (1.742)			3.405 (2.927)		
Caregiver (formal care country)	-2.246 (1.560)			-2.708 (1.822)			-3.650 (2.465)		
Chronic conditions	-0.485*** (0.127)	0.014 (0.010)	0.002 (0.006)	-0.491*** (0.129)	0.019** (0.009)	0.005 (0.005)	-0.510*** (0.133)	0.013* (0.008)	-0.001 (0.004)
ADL	-0.172 (0.354)	-0.017 (0.021)	0.023 (0.015)	-0.214 (0.352)	-0.000 (0.019)	0.016 (0.012)	-0.256 (0.344)	-0.001 (0.016)	0.000 (0.006)
IADL	-0.234 (0.267)	0.010 (0.016)	-0.012 (0.009)	-0.192 (0.272)	0.001 (0.016)	-0.001 (0.007)	-0.145 (0.280)	-0.010 (0.013)	0.003 (0.004)
Age	1.771 (1.187)	-0.004 (0.023)	0.095 (0.131)	1.697 (1.177)	0.007 (0.021)	0.060 (0.112)	1.710 (1.177)	-0.005 (0.015)	0.039 (0.082)
Age squared/100	-1.357 (0.971)	0.013 (0.012)	-0.088 (0.109)	-1.368 (0.969)	0.019 (0.012)	-0.072 (0.095)	-1.279 (0.963)	0.009 (0.008)	-0.031 (0.070)
Wave 2	-0.479 (0.542)	-0.001 (0.032)	-0.030 (0.047)	-0.254 (0.542)	-0.029 (0.028)	0.037 (0.038)	-0.455 (0.538)	0.002 (0.022)	-0.009 (0.034)
Wave 4	-2.253 (1.493)	-0.064 (0.032)	-0.102 (0.116)	-1.553 (1.516)	-0.173* (0.091)	0.083 (0.095)	-2.078 (1.485)	-0.028 (0.078)	-0.008 (0.082)
Married	-0.058 (0.782)	0.078 (0.050)	-0.032 (0.050)	-0.187 (0.812)	0.093** (0.045)	-0.057 (0.047)	0.021 (0.829)	0.062 (0.042)	0.019 (0.028)
Household size	0.040 (0.165)	0.015 (0.015)	-0.002 (0.008)	0.069 (0.161)	-0.002 (0.015)	-0.004 (0.008)	0.112 (0.171)	0.003 (0.011)	0.013 (0.008)
Employed	0.143 (0.344)	-0.019 (0.026)	0.030* (0.016)	0.088 (0.348)	0.006 (0.025)	0.023 (0.014)	0.026 (0.350)	0.001 (0.018)	-0.003 (0.010)
Other activities	-0.249 (0.256)	0.031 (0.022)	0.006 (0.016)	-0.265 (0.254)	0.022 (0.019)	-0.006 (0.013)	-0.254 (0.250)	0.012 (0.014)	-0.003 (0.010)
1st wealth quartile	-0.486 (0.432)	0.069** (0.034)	-0.007 (0.024)	-0.577 (0.458)	0.100*** (0.030)	-0.009 (0.018)	-0.630 (0.489)	0.074*** (0.028)	-0.011 (0.013)
2nd wealth quartile	-0.068 (0.326)	0.008 (0.025)	0.015 (0.019)	-0.132 (0.328)	0.017 (0.025)	-0.004 (0.015)	-0.214 (0.348)	0.031 (0.022)	-0.006 (0.011)
3rd wealth quartile	-0.199 (0.270)	0.008 (0.024)	0.008 (0.017)	-0.240 (0.273)	0.014 (0.022)	-0.003 (0.012)	-0.314 (0.283)	0.024 (0.019)	-0.008 (0.008)
Parent in poor health (family care country)		0.206*** (0.037)	0.005** (0.002)		0.183*** (0.036)	0.002 (0.002)		0.111*** (0.028)	-0.001 (0.001)

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Table 18 – continued from previous page

Dependent variable:	GS	family	formal	GS	family	formal	GS	family	formal
Parent in poor health		0.003	0.154***		0.002	0.128***		0.002	0.095***
(formal care country)		(0.003)	(0.036)		(0.003)	(0.029)		(0.002)	(0.020)
Observations	6,486	6,486	6,486	6,486	6,486	6,486	6,486	6,486	6,486
Within R-squared	0.036	0.096	0.055	0.037	0.082	0.036	0.014	0.050	0.031
Unique individuals	2,859	2,859	2,859	2,859	2,859	2,859	2,859	2,859	2,859

Standard errors clustered at household level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Regressions include age*country and age squared/100*country interaction terms.

[a] Caregiver in family care country; [b] Caregiver in formal care country.

Table 19: First and second stage results: Verbal fluency (VF)

Dependent variable:	VF	family[a]	formal[b]	VF	family	formal	VF	family	formal
Caregiver (family care country)	3.739** (1.873)			4.145* (2.149)			6.405* (3.478)		
Caregiver (formal care country)	-1.132 (2.340)			-1.425 (2.992)			-1.999 (4.051)		
Chronic conditions	0.265* (0.141)	0.012 (0.009)	-0.001 (0.005)	0.245* (0.145)	0.017** (0.008)	0.002 (0.004)	0.242* (0.147)	0.010 (0.007)	-0.002 (0.003)
ADL	-0.203 (0.273)	-0.019 (0.018)	0.020 (0.013)	-0.251 (0.268)	-0.007 (0.016)	0.014 (0.011)	-0.272 (0.281)	-0.005 (0.013)	-0.003 (0.007)
IADL	-0.452** (0.223)	0.019 (0.015)	-0.010 (0.009)	-0.398* (0.226)	0.007 (0.014)	-0.000 (0.007)	-0.302 (0.232)	-0.008 (0.010)	0.007 (0.006)
Age	1.505 (1.261)	-0.004 (0.021)	0.073 (0.125)	1.476 (1.271)	0.006 (0.019)	0.067 (0.106)	1.479 (1.236)	-0.003 (0.014)	0.025 (0.077)
Age squared/100	-1.408 (1.028)	0.010 (0.011)	-0.079 (0.103)	-1.470 (1.047)	0.018* (0.011)	-0.081 (0.090)	-1.388 (0.997)	0.009 (0.007)	-0.026 (0.065)
Wave 2	0.889 (0.765)	0.002 (0.030)	-0.008 (0.045)	1.086 (0.771)	-0.029 (0.026)	0.041 (0.036)	0.931 (0.773)	-0.001 (0.020)	0.010 (0.034)
Wave 4	0.930 (2.055)	-0.046 (0.094)	-0.045 (0.109)	1.627 (2.096)	-0.163* (0.084)	0.098 (0.089)	1.121 (2.084)	-0.037 (0.072)	0.038 (0.081)
Married	-0.648 (0.851)	0.070 (0.045)	-0.034 (0.045)	-0.772 (0.885)	0.085** (0.040)	-0.051 (0.043)	-0.678 (0.888)	0.057 (0.037)	0.017 (0.025)
Household size	-0.070 (0.186)	0.016 (0.014)	-0.004 (0.008)	0.005 (0.193)	-0.004 (0.013)	-0.004 (0.007)	0.014 (0.200)	0.001 (0.010)	0.012 (0.008)
Employed	0.070 (0.386)	-0.013 (0.025)	0.029* (0.015)	-0.011 (0.383)	0.008 (0.024)	0.023* (0.014)	-0.033 (0.369)	0.002 (0.017)	-0.004 (0.008)
Other activities	0.133 (0.317)	0.031 (0.021)	0.004 (0.015)	0.147 (0.322)	0.022 (0.018)	-0.003 (0.012)	0.180 (0.320)	0.009 (0.013)	-0.001 (0.009)
1st wealth quartile	-0.512 (0.466)	0.073** (0.032)	-0.006 (0.022)	-0.646 (0.505)	0.097*** (0.028)	-0.009 (0.017)	-0.652 (0.521)	0.065** (0.026)	-0.003 (0.013)
2nd wealth quartile	-0.175 (0.350)	0.006 (0.024)	0.012 (0.017)	-0.208 (0.355)	0.009 (0.023)	-0.003 (0.014)	-0.308 (0.374)	0.022 (0.021)	-0.001 (0.011)
3rd wealth quartile	-0.105 (0.319)	0.010 (0.023)	0.006 (0.016)	-0.124 (0.321)	0.012 (0.021)	-0.001 (0.011)	-0.213 (0.330)	0.020 (0.019)	-0.006 (0.008)
Parent in poor health (family care country)		0.200*** (0.034)	0.005** (0.002)		0.180*** (0.034)	0.002 (0.002)		0.116*** (0.026)	-0.001 (0.001)

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Table 19 – continued from previous page

Dependent variable:	VF	family	formal	VF	family	formal	VF	family	formal
Parent in poor health		0.002	0.156***		0.002	0.124***		0.002	0.090***
(formal care country)		(0.003)	(0.034)		(0.003)	(0.027)		(0.002)	(0.020)
Observations	6,935	6,935	6,935	6,935	6,935	6,935	6,935	6,935	6,935
Within R-squared	0.019	0.099	0.053	0.004	0.083	0.034	-0.019	0.051	0.028
Unique individuals	3,044	3,044	3,044	3,044	3,044	3,044	3,044	3,044	3,044

Standard errors clustered at household level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Regressions include age*country and age squared/100*country interaction terms.

[a] Caregiver in family care country; [b] Caregiver in formal care country.

Table 20: First and second stage results: Short-term word recall (STWR)

Dependent variable:	STWR	family^a	formal^b	STWR	family	formal	STWR	family	formal
Caregiver (family care country)	-0.352 (0.563)			-0.386 (0.622)			-0.583 (0.985)		
Caregiver (formal care country)	0.452 (0.658)			0.579 (0.817)			0.797 (1.140)		
Chronic conditions	0.011 (0.042)	0.012 (0.009)	-0.001 (0.005)	0.011 (0.042)	0.017** (0.008)	0.002 (0.004)	0.013 (0.041)	0.010 (0.007)	-0.001 (0.003)
ADL	-0.001 (0.092)	-0.019 (0.018)	0.020 (0.013)	0.005 (0.092)	-0.007 (0.016)	0.014 (0.011)	0.015 (0.092)	-0.005 (0.013)	-0.003 (0.007)
IADL	0.036 (0.071)	0.019 (0.015)	-0.010 (0.009)	0.027 (0.069)	0.007 (0.014)	-0.000 (0.007)	0.014 (0.069)	-0.008 (0.010)	0.007 (0.006)
Age	0.320 (0.340)	-0.004 (0.021)	0.073 (0.125)	0.318 (0.343)	0.006 (0.019)	0.067 (0.106)	0.333 (0.339)	-0.004 (0.014)	0.025 (0.077)
Age squared/100	-0.184 (0.281)	0.011 (0.011)	-0.079 (0.103)	-0.170 (0.287)	0.018* (0.011)	-0.081 (0.090)	-0.198 (0.279)	0.009 (0.007)	-0.026 (0.065)
Wave 2	0.025 (0.187)	0.003 (0.030)	-0.007 (0.044)	-0.013 (0.184)	-0.028 (0.026)	0.041 (0.036)	0.013 (0.186)	-0.000 (0.020)	0.010 (0.034)
Wave 4	-0.136 (0.509)	-0.045 (0.093)	-0.043 (0.108)	-0.258 (0.503)	-0.162* (0.084)	0.097 (0.088)	-0.190 (0.503)	-0.036 (0.072)	0.038 (0.081)
Married	0.672** (0.282)	0.070 (0.045)	-0.034 (0.045)	0.694** (0.284)	0.085** (0.040)	-0.051 (0.043)	0.651** (0.279)	0.057 (0.037)	0.017 (0.025)
Household size	-0.051 (0.055)	0.016 (0.014)	-0.004 (0.008)	-0.057 (0.053)	-0.004 (0.013)	-0.004 (0.007)	-0.067 (0.054)	0.001 (0.010)	0.012 (0.008)
Employed	0.053 (0.101)	-0.013 (0.025)	0.031** (0.015)	0.061 (0.100)	0.008 (0.024)	0.022* (0.014)	0.076 (0.097)	0.002 (0.017)	-0.004 (0.010)
Other activities	-0.030 (0.089)	0.031 (0.021)	0.004 (0.015)	-0.029 (0.088)	0.022 (0.018)	-0.004 (0.012)	-0.033 (0.086)	0.009 (0.013)	-0.002 (0.009)
1st wealth quartile	0.078 (0.145)	0.073** (0.032)	-0.006 (0.022)	0.092 (0.152)	0.096*** (0.028)	-0.009 (0.016)	0.090 (0.153)	0.064** (0.026)	-0.004 (0.013)
2nd wealth quartile	0.097 (0.121)	0.006 (0.024)	0.013 (0.017)	0.106 (0.121)	0.009 (0.023)	-0.003 (0.014)	0.114 (0.123)	0.022 (0.021)	-0.001 (0.011)
3rd wealth quartile	-0.116 (0.093)	0.010 (0.023)	0.008 (0.016)	-0.111 (0.092)	0.012 (0.021)	-0.002 (0.011)	-0.100 (0.095)	0.020 (0.018)	-0.006 (0.008)
Parent in poor health (family care country)		0.200*** (0.034)	0.005** (0.002)		0.179*** (0.033)	0.002 (0.002)		0.115*** (0.026)	-0.001 (0.001)

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Table 20 – continued from previous page

Dependent variable:	STWR	family	formal	STWR	family	formal	STWR	family	formal
Parent in poor health		0.002	0.159***		0.002	0.124***		0.002	0.090***
(formal care country)		(0.003)	(0.034)		(0.003)	(0.027)		(0.002)	(0.019)
Observations	6,950	6,950	6,950	6,950	6,950	6,950	6,950	6,950	6,950
Within R-squared	0.037	0.098	0.055	0.041	0.083	0.035	0.042	0.050	0.028
Unique individuals	3,051	3,051	3,051	3,051	3,051	3,051	3,051	3,051	3,051

Standard errors clustered at household level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Regressions include age*country and age squared/100*country interaction terms.

[a] Caregiver in family care country; [b] Caregiver in formal care country.

Table 21: First and second stage results: Long-term word recall (LTWR)

Dependent variable:	LTWR	family[a]	formal[b]	LTWR	family	formal	LTWR	family	formal
Caregiver (family care country)	-0.286			-0.330			-0.545		
	(0.608)			(0.678)			(1.055)		
Caregiver (formal care country)	-0.856			-1.097			-1.502		
	(0.688)			(0.904)			(1.224)		
Chronic conditions	-0.036	0.012	-0.001	-0.031	0.017**	0.002	-0.035	0.010	-0.001
	(0.046)	(0.009)	(0.005)	(0.047)	(0.008)	(0.004)	(0.047)	(0.007)	(0.003)
ADL	0.071	-0.019	0.020	0.072	-0.007	0.014	0.052	-0.005	-0.003
	(0.099)	(0.018)	(0.013)	(0.096)	(0.016)	(0.011)	(0.098)	(0.013)	(0.007)
IADL	-0.055	0.019	-0.010	-0.051	0.007	-0.000	-0.046	-0.008	0.007
	(0.090)	(0.015)	(0.009)	(0.089)	(0.014)	(0.007)	(0.090)	(0.010)	(0.006)
Age	0.139	-0.004	0.073	0.153	0.006	0.067	0.113	-0.004	0.025
	(0.434)	(0.021)	(0.125)	(0.443)	(0.019)	(0.106)	(0.422)	(0.014)	(0.077)
Age squared/100	0.102	0.011	-0.079	0.084	0.018*	-0.081	0.133	0.009	-0.026
	(0.361)	(0.011)	(0.103)	(0.371)	(0.011)	(0.090)	(0.347)	(0.007)	(0.065)
Wave 2	-0.226	0.003	-0.007	-0.186	-0.028	0.041	-0.206	-0.000	0.010
	(0.218)	(0.030)	(0.044)	(0.221)	(0.026)	(0.036)	(0.226)	(0.020)	(0.034)
Wave 4	-0.775	-0.045	-0.043	-0.671	-0.162*	0.097	-0.688	-0.036	0.038
	(0.596)	(0.093)	(0.108)	(0.604)	(0.084)	(0.088)	(0.613)	(0.072)	(0.081)
Married	0.507	0.070	-0.034	0.488	0.085**	-0.051	0.573	0.057	0.017
	(0.456)	(0.045)	(0.045)	(0.456)	(0.040)	(0.043)	(0.450)	(0.037)	(0.025)
Household size	-0.053	0.016	-0.004	-0.060	-0.004	-0.004	-0.036	0.001	0.012
	(0.070)	(0.014)	(0.008)	(0.067)	(0.013)	(0.007)	(0.070)	(0.010)	(0.008)
Employed	-0.138	-0.013	0.031**	-0.133	0.008	0.022*	-0.165	0.002	-0.004
	(0.123)	(0.025)	(0.015)	(0.123)	(0.024)	(0.014)	(0.120)	(0.017)	(0.010)
Other activities	0.099	0.031	0.004	0.089	0.022	-0.004	0.089	0.009	-0.002
	(0.094)	(0.021)	(0.015)	(0.094)	(0.018)	(0.012)	(0.095)	(0.013)	(0.009)
1st wealth quartile	-0.057	0.073**	-0.006	-0.051	0.096***	-0.009	-0.044	0.064**	-0.004
	(0.156)	(0.032)	(0.022)	(0.163)	(0.028)	(0.016)	(0.163)	(0.026)	(0.013)
2nd wealth quartile	-0.016	0.006	0.013	-0.030	0.009	-0.003	-0.018	0.022	-0.001
	(0.129)	(0.024)	(0.017)	(0.129)	(0.023)	(0.014)	(0.130)	(0.021)	(0.011)
3rd wealth quartile	-0.263**	0.010	0.008	-0.270**	0.012	-0.002	-0.271**	0.020	-0.006
	(0.109)	(0.023)	(0.016)	(0.110)	(0.021)	(0.011)	(0.112)	(0.018)	(0.008)
Parent in poor health (family care country)		0.200***	0.005**		0.179***	0.002		0.115***	-0.001
		(0.034)	(0.002)		(0.033)	(0.002)		(0.026)	(0.001)

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Table 21 – continued from previous page

Dependent variable:	LTWR	family	formal	LTWR	family	formal	LTWR	family	formal
Parent in poor health		0.002	0.159***		0.002	0.124***		0.002	0.090***
(formal care country)		(0.003)	(0.034)		(0.003)	(0.027)		(0.002)	(0.019)
Observations	6,950	6,950	6,950	6,950	6,950	6,950	6,950	6,950	6,950
Within R-squared	0.061	0.098	0.055	0.056	0.083	0.035	0.054	0.050	0.028
Unique individuals	3,051	3,051	3,051	3,051	3,051	3,051	3,051	3,051	3,051

Standard errors clustered at household level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Regressions include age*country and age squared/100*country interaction terms.

[a] Caregiver in family care country; [b] Caregiver in formal care country.

Table 22: First and second stage results: Numeracy

Dependent variable:	numeracy	family[a]	formal[b]	numeracy	family	formal	numeracy	family	formal
Caregiver (family care country)	-0.411 (0.262)			-0.457 (0.296)			-0.708 (0.456)		
Caregiver (formal care country)	0.060 (0.270)			0.073 (0.333)			0.106 (0.456)		
Chronic conditions	-0.021 (0.015)	0.013 (0.009)	-0.001 (0.005)	-0.018 (0.015)	0.017** (0.008)	0.002 (0.004)	-0.018 (0.015)	0.011 (0.007)	-0.002 (0.003)
ADL	-0.017 (0.037)	-0.020 (0.018)	0.020 (0.013)	-0.012 (0.038)	-0.007 (0.016)	0.014 (0.011)	-0.012 (0.039)	-0.005 (0.013)	-0.003 (0.007)
IADL	-0.006 (0.041)	0.020 (0.015)	-0.009 (0.009)	-0.011 (0.042)	0.007 (0.014)	-0.000 (0.007)	-0.021 (0.044)	-0.008 (0.010)	0.008 (0.005)
Age	0.239 (0.167)	-0.004 (0.022)	0.076 (0.125)	0.243 (0.167)	0.007 (0.019)	0.065 (0.106)	0.240 (0.166)	-0.003 (0.014)	0.024 (0.077)
Age squared/100	-0.217 (0.134)	0.011 (0.011)	-0.080 (0.103)	-0.212 (0.135)	0.018* (0.011)	-0.080 (0.090)	-0.217 (0.133)	0.009 (0.007)	-0.025 (0.065)
Wave 2	0.131 (0.100)	0.001 (0.011)	-0.012 (0.044)	0.113 (0.099)	-0.030 (0.026)	0.043 (0.036)	0.128 (0.100)	-0.001 (0.020)	0.011 (0.034)
Wave 4	0.213 (0.260)	-0.050 (0.030)	-0.054 (0.108)	0.147 (0.261)	-0.166** (0.084)	0.103 (0.089)	0.198 (0.259)	-0.040 (0.072)	0.041 (0.082)
Married	0.162 (0.120)	0.069 (0.045)	-0.034 (0.045)	0.173 (0.123)	0.084** (0.040)	-0.051 (0.043)	0.169 (0.120)	0.056 (0.037)	0.017 (0.025)
Household size	-0.004 (0.025)	0.017 (0.014)	-0.003 (0.008)	-0.012 (0.024)	-0.003 (0.013)	-0.004 (0.007)	-0.011 (0.025)	0.001 (0.010)	0.012 (0.007)
Employed	0.042 (0.051)	-0.013 (0.025)	0.031** (0.015)	0.051 (0.051)	0.008 (0.024)	0.022* (0.014)	0.051 (0.049)	0.002 (0.017)	-0.004 (0.010)
Other activities	0.007 (0.034)	0.033 (0.021)	0.006 (0.015)	0.005 (0.034)	0.024 (0.018)	-0.004 (0.012)	0.002 (0.033)	0.011 (0.013)	-0.002 (0.009)
1st wealth quartile	0.036 (0.064)	0.071** (0.032)	-0.006 (0.022)	0.050 (0.068)	0.095*** (0.028)	-0.009 (0.016)	0.051 (0.067)	0.063** (0.026)	-0.004 (0.013)
2nd wealth quartile	0.003 (0.048)	0.005 (0.024)	0.011 (0.017)	0.006 (0.049)	0.007 (0.023)	-0.003 (0.014)	0.017 (0.050)	0.021 (0.021)	-0.001 (0.011)
3rd wealth quartile	-0.004 (0.043)	0.008 (0.023)	0.007 (0.016)	-0.002 (0.044)	0.010 (0.021)	-0.001 (0.011)	0.007 (0.044)	0.018 (0.019)	-0.006 (0.008)
Parent in poor health (family care country)		0.200*** (0.034)	0.005** (0.002)		0.180*** (0.034)	0.002 (0.002)		0.116*** (0.026)	-0.001 (0.001)

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Table 22 – continued from previous page

Dependent variable:	numeracy	family	formal	numeracy	family	formal	numeracy	family	formal
Parent in poor health		0.002	0.155***		0.001	0.125***		0.002	0.091***
(formal care country)		(0.003)	(0.034)		(0.003)	(0.028)		(0.002)	(0.020)
Observations	6,948	6,948	6,948	6,948	6,948	6,948	6,948	6,948	6,948
Within R-squared	-0.026	0.099	0.054	-0.033	0.083	0.035	-0.042	0.050	0.028
Unique individuals	3,051	3,051	3,051	3,051	3,051	3,051	3,051	3,051	3,051

Standard errors clustered at household level in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Regressions include age*country and age squared/100*country interaction terms.

[a] Caregiver in family care country; [b] Caregiver in formal care country.

Table 23: FE-IV results for mental health using "single parent" as alternative instrument

Dependent variable:	All countries		Formal care countries	
	EURO-D	caregiver	EURO-D	caregiver
Caregiver	0.950		1.702*	
	(0.993)		(0.887)	
Parent in poor health	0.203	0.183***	0.109	0.150***
	(0.217)	(0.026)	(0.209)	(0.035)
Parental loss	0.233**	-0.076***	0.122	-0.134***
	(0.117)	(0.025)	(0.174)	(0.036)
Chronic conditions	0.228***	0.007	0.223***	-0.011
	(0.059)	(0.010)	(0.076)	(0.013)
ADL	-0.058	0.005	-0.098	0.048
	(0.145)	(0.023)	(0.187)	(0.033)
IADL	0.294*	0.017	0.166	-0.015
	(0.158)	(0.018)	(0.129)	(0.028)
Age	-0.231	-0.005	-0.304	-0.010
	(0.475)	(0.126)	(0.513)	(0.128)
Age squared/100	0.132	-0.005	0.135	0.010
	(0.380)	(0.103)	(0.405)	(0.104)
Wave 2	-0.046	0.001	0.062	-0.021
	(0.271)	(0.053)	(0.310)	(0.056)
Wave 4	0.261	-0.090	0.776	-0.159
	(0.745)	(0.142)	(0.863)	(0.155)
Married	-0.557	0.020	-0.322	-0.065
	(0.403)	(0.069)	(0.381)	(0.085)
Household size	0.038	0.016	0.134	-0.009
	(0.096)	(0.016)	(0.122)	(0.024)
Employed	0.097	0.017	-0.342*	0.071*
	(0.145)	(0.030)	(0.198)	(0.036)
Other activities	-0.117	0.041	0.062	0.026
	(0.113)	(0.026)	(0.136)	(0.032)
1st wealth quartile	0.052	0.065*	-0.357	-0.007
	(0.196)	(0.038)	(0.223)	(0.053)
2nd wealth quartile	-0.122	0.021	-0.206	0.038
	(0.156)	(0.029)	(0.194)	(0.040)
3rd wealth quartile	-0.175	0.016	-0.200	0.013
	(0.131)	(0.028)	(0.188)	(0.037)
Single parent		0.213***		0.316***
		(0.052)		(0.072)
Observations	6,845	6,845	4,100	4,100
Within R-squared	0.005	0.088	-0.123	0.084
Unique individuals	3,009	3,009	1,755	1,755
Exogeneity (p-value)	0.358		0.031	
First stage F statistic	17.06		19.22	

Standard errors clustered at household level in parentheses. *** p<0.01,
** p<0.05, * p<0.1. Regressions include age*country and
age squared/100*country interaction terms.