ERASMUS UNIVERSITY ROTTERDAM

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MASTER THESIS

The effect of caregiving on employment and mental health examined for midlife European citizens.

Using the first two waves of SHARE data

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Abbreviations

2SLS	two-stage least squares
ADL	activities of daily living
ATE	average treatment effect
ATET	average Treatment Effect on the Treated
et al.	et alia
FE	fixed effects
IADL	instrumental activities of daily living
i.e.	id est
i.i.d.	independent and identically distributed
IV	instrumental variable
LM	last month
OLS	ordinary least squares
pp	percentage points
PPP	purchasing power parity
RE	random effects
SHARE	Survey of Health, Ageing Retirement in Europe

Abstract

As societies are ageing and at the same time we are faced with other demographic changes like increased female labour force participation and decreasing fertility rates, the involvement of men and women in unpaid caregiving can be expected to increase the next coming decades. Even though caregiving may be considered as good to society, it may induce considerable opportunity costs in terms of reduced employment and increased mental health problems. Especially, when these opportunity costs are caused by caregiving per se it may have major consequences on the formal care market and for the social security system. Analysing the first two waves of the Survey of Health Ageing and Retirement (SHARE) we examine the effect of informal caregiving on employment and mental health in an Instrumental Variables framework. We also take advantage of the panel data structure to control for time-invariant individual heterogeneity by employing a Fixed Effects model. Our Fixed Effects results suggest a significant negative effect of informal caregiving on the employment probability of 5-6pp for females only. Examining the effect of caregiving on mental health, the Random Effects results suggest a significant positive effect on the total number of depressive symptoms, ranging from 0.20 (CARE) to 0.48 (PARCARE) also for females only. In the male sample the instrumental variables could not be properly used to identify the caregiving decision, suggesting that we possibly require other types of instrumental variables to examine the effect for males.[1]

[1] This paper uses data from SHARELIFE release 1, as of November 24th 2010 or SHARE release 2.5.0, as of May 24th 2011. The SHARE data collection has been primarily funded by the European Commission through the 5th framework programme (project QLK6-CT-2001- 00360 in the thematic programme Quality of Life), through the 6th framework programme (projects SHARE-I3, RII-CT- 2006-062193, COMPARE, CIT5-CT-2005-028857, and SHARELIFE, CIT4-CT-2006-028812) and through the 7th framework programme (SHARE-PREP, 211909 and SHARE-LEAP, 227822). Additional funding from the U.S. National Institute on Aging (U01 AG09740-13S2, P01 AG005842, P01 AG08291, P30 AG12815, Y1-AG-4553-01 and OGHA 04-064, IAG BSR06-11, R21 AG025169) as well as from various national sources is gratefully acknowledged (see www.share-project.org for a full list of funding institutions).

1. Introduction

As societies are ageing and at the same time we are faced with other demographic changes like increased female labour force participation and decreasing fertility rates, the involvement of men and women in unpaid caregiving can be expected to increase the next coming decades. Hence, maintaining the provision of "care for people needing daily living support over a prolonged period of time" will be a challenge to deal with the next decades (Colombo et al., 2011).[2] Usually, long term care to elderly is provided by family, friends and neighbours and may be considered as good to society. However, there could be considerable opportunity costs in terms of reduced employment, wage penalties, or increased mental health problems caused by caregiving.

If individuals become physically or mentally ill caused by care giving responsibilities per se it could have major implications on the formal care market. Care givers may be forced or choose to quit their caring activities because of their (mental) health status. In that case an increasing demand of formal care services could be expected (under the ceteris paribus condition). An abundance of studies have examined the relationship between informal care giving and mental health and showed associations indicating higher prevalence of distress, depression and anxiety among care givers outcomes (Beach et al., 2000, Cannuscio et al., 2004, Coe and Van Houtven, 2009, Hirst, 2003, 2005, Schulz and Beach, 1999, Schulz et al., 1995, 2003). Especially, increasing the intensity of care (Hirst, 2005) and providing care to a parent with dementia are very likely to increase the probability of negative health outcomes (Schulz et al., 2003).

Further, care givers may be forced (or choose) to quit their paid job or work less hours. We can call this negative effect the *substitution* effect. It is also possible that an informal caregiver increases his/her hours of work to pay for the extra costs related to informal care i.e. *income* effect. Or there is *no* effect of informal care giving on employment. We could think here of an individual that is already working part-time and combines this with care giving without reducing or increasing any hours of work (Carmichael and Charles, 2003).

Recognizing the importance of opportunity costs that may arise because of caregiving our research question addresses how informal care giving affects caregivers' employment status and caregivers' mental health. The analyses on employment and mental health will be carried out for males and females separately, as their attachment to informal care giving and the labour force is not the same and the prevalence of psychological symptoms across women is higher than it is for men along the

[2] As societies are ageing in many OECD countries, an increase in the share of long term care expenditures to GDP can be expected. Long term care public expenditures as a share of GDP vary substantially across countries, from almost 4% in the Netherlands to less than 1% in Spain (see Figure I; 2009; source: OECD health data 2011).

life course (Hirst, 2003). We will use the first two waves of the Survey of Health Ageing and Retirement in Europe (SHARE) database to examine our research question.

If we want to establish a causal relationship it is important to account for potential endogeneity bias arising from simultaneous decision making. As individuals face time constraints, it is possible that the decision to become an informal care giver is affected by the time that is needed to be in employment, and vice versa. In other words, it is possible that these decisions are made simultaneously. And individuals may self-select themselves into and out of care giving, these could be the individuals that already have an ill mental or physical health status (Coe and van Houtven 2009) or these could be the individuals who are already less likely to be in the labour force.

Due to unobserved individual characteristics, like individual preferences for informal care giving, employment and family devotion it is possible that the error term and explanatory regressors are correlated. These unobserved characteristics may be correlated to both the decision to become a care giver and employment/mental health status. Therefore, we employ a method of instrumental variables and a Fixed effects model to account for the time variant and time invariant unobserved individual heterogeneity respectively.

Bolin et al (2008) examined the relationship between parental care giving and employment for males and females separately by using the first wave of SHARE data. They controlled for the potential endogeneity bias by implementing an IV approach and accounted for institutional settings. Differently from Bolin et al (2008) we take advantage of the panel data structure to deal with the unobserved individual heterogeneity in a more direct way. In addition we include several subtypes of caregiving variables in our analysis to examine how this affects the results.

For the United States Coe and Van Houtven 2009 examined the effect of caregiving on physical and mental health using 7 waves of HRS data. They instrumented for selecting into care giving by the number of sisters and brothers. This study adds to the literature, as to our knowledge, the relationship between care giving and mental health for Europe (using SHARE) has not been examined yet. Another contribution is made by taking advantage of a fixed effects (FE) model to account for invariant unobserved individual heterogeneity.

2 Literature review

2.1 Effects on employment

In the last decades informal care giving has become a topic of growing interest in the field of research. Yet, an unequivocal relationship between care giving and employment has not been

established. The differences are mainly due to different labour force outcomes that were studied or due to other differences in research design.

As noted by Ettner (1995) it is important to accommodate for potential endogeneity bias arising from simultaneous decision-making if we want to establish a causal relationship. Therefore, studies reviewed in this thesis, are classified in Table A.2 according to whether the potential endogeneity is addressed and according to whether cross-sectional or panel data is used. Table A.1 displays the definitions for informal care giving and labour outcome used by the authors.

An international evaluation of studies on informal care giving and labour supply decisions is done by Lilly et al 2007. Overall, they highlighted three main conclusions: (1) the probability of being employed is not likely to differ between caregivers and non-caregivers, (2) "intensive" caregivers work fewer hours compared to non-caregivers and (3) only the "intensive" caregivers are significantly more likely to stop working compared to non-caregivers. Factors like age, gender, health status, marital status, co-residence and relationship with the care recipient seem to be important in explaining the variation in the examined outcome variable (Lily et al 2007).

Both Crespo (2007) and Bolin et al (2008) used the first wave of SHARE data to examine the effect of parental care giving on labour market outcomes. Only respondents with living parents/inlaws (including step-parents) were included in their analyses. Results in Crespo (2007) suggest a reduction in the employment probability of midlife women of 6 pp in the Northern Countries and 4 pp in the Southern Countries.[3] In Bolin et al (2008) a somewhat smaller effect was found compared to Crespo (2007); [4] the results indicate a negative effect of 2.8pp and 3.2pp for females and males, respectively.[5] The studies accounted for potential endogeneity bias by employing an IV approach; a dummy for brother(s)/sister(s) alive, a dummy for both parents alive, the parental age and parental health status are used as instruments. Bolin et al (2008) added a dummy for parents living more than 100km away (i.e. geographic proximity) to the aforementioned instruments. The results show a large reduction in the employment probability of 28pp in the Northern Countries and 32pp in the Southern Countries, suggesting an underestimation of the effect under the exogeneity assumption

[3] Crespo (2007) examined the effect for female daughters only. She pooled the countries in two groups of countries with respect to their different long term care systems and female labour force participation: the northern countries (Sweden, Denmark and The Netherlands) and the southern countries (Spain, Italy and Greece).

[4] Bolin et al (2008) examined the effect for males and females, separately. They added a third group of countries compared to Crespo (2007), the Central Countries: Belgium, France, Germany, The Netherlands, Austria and Switzerland.

[5] These results were significant on a 10% significance level.

(Crespo, 2007). In Bolin et al (2008) the IV results were only significant on a 11% significance level, also indicating a large negative effect of 22.4pp.

To examine the relationship for England Heitmueller (2007) employed cross-sectional data and panel data from the British Household Survey Panel (BHPS) from 1991-2002. Cross-section results (of 2002) are comparable to those found by Crespo (2007), they show a significant, negative effect of 6pp of caring responsibilities (both co-residential and extra-residential carers) on the employment probability. The magnitude of the negative effect is larger once we only look at co-residential care: 15.1pp. Using the number of sick or disabled people in the same household and the age of three closest friends as instruments, the IV 2SLS results suggest a significant negative effect of 35.5pp of caring responsibilities on employment. For co-residential care and extra-residential care the effects were not significant. However, the instruments were rather weak. Similar to Crespo (2007) and Bolin et al (2008), the results indicate an underestimation of the effect under the exogeneity assumption. The panel data results indicate a larger effect and indicate that co-residential carers are subject to unobserved heterogeneity. In Heitmueller and Michaud (2010) evidence for a causal link from informal care to employment was found using panel data from the BHPS (1991-2003). Multivariate dynamic panel data methods were used to account for state dependence, feedback effects and correlated unobserved heterogeneity. The results suggest a reduction in the employment rates up to 6 pp for co-residential carers only.

Using panel data from the European Community Household Panel (ECHP) Casado-Marín et al. (2009) examined the effect of informal care giving on female labour behaviour with treatment evaluation matching techniques. They used an Average Treatment Effect on the Treated (ATET) estimator, which indicates how much the outcome of interest changes on average for those individuals who become a caregiver i.e. the “treated” compared to a “control” group, which is similar in all relevant characteristics. Their results indicate that women who are already not working and becoming a caregiver are significantly less likely to enter the labour market: 2.4pp in Southern Countries and 3.5pp in Central Countries. The effects are smaller for women who are already working before becoming a caregiver: 1.6pp in Southern Countries and 1.9 in Central Countries. It seems that employment status *before* becoming a caregiver is very likely to have an impact on the effect of caregiving on employment.

In a later study by Casado-Marín et al. (2011), the relationship is examined for Spain only with a subsample of the ECHP. In this study they accommodated for both potential endogeneity due to simultaneous decision-making and unobserved individual heterogeneity, by estimating two simultaneous equations with dynamics (exogeneity assumption could not be rejected); and

individual fixed effects, respectively. The results suggest opportunity costs for women providing co-residential care; providing co-residential care reduces the probability of employment by 2.7pp. A quite smaller effect compared to the effect of co-residential care on employment in England found by Heitmueller (2007).

Viitanen (2005), Kotsadam (2011) and Ciani (2012) also used ECHP data and found somewhat differing results. Viitanen (2005) examined the relationship for females only. She found that the unobserved heterogeneity accounts for between 45% and 86% of the total variation in labour force participation. A significant negative effect of informal care giving on labour supply was only found for Germany, however, it is a very modest effect of 0.3pp. Kotsadam (2011) found a significant negative association between informal care giving and female labour force participation across Europe: 7pp in SC and 3pp in Central Countries. The most recent study is done by Ciani (2012), his results suggest a significant but small negative effect, on average, of co-residential caregiving on labour supply. He implemented an IV-approach and accounted for unobserved individual heterogeneity by a fixed effects model. Interesting is that the difference between the baseline and IV-estimates are not robust anymore, once controlled for the unobserved heterogeneity.

In Crespo and Mira (2010) they exploit the longitudinal dimension of SHARE to further establish the relationship between parental caregiving and employment decisions (see Crespo, 2007). A time allocation model provided a link to an empirical IV-treatment effects framework. They found a clear and robust north-south gradient in the negative effect of poor parental health on the probability of daily caregiving. The longitudinal results suggest a negative effect of 12pp of a parental health shock on employment in the Southern countries. Data from the Health and Retirement Survey (HRS) is comparable to SHARE data in research design, which is used by Houtven et al (2010) to examine the causal mechanism. They carefully tested for potential endogeneity and unobserved individual heterogeneity. The results suggest that caregivers are about 2 pp less likely to be in labour force; the magnitudes of the effect are quite similar for both males and females. Wage penalties were only found for females, whereas wage premiums are found for males.

Our study adds to the literature by examining the effect of several subtypes of caregiving on employment and by taking advantage of the panel data structure to account for invariant unobserved individual heterogeneity i.e. by employing a FE model.

2.2 Effects on mental health

A substantial body of research shows that care giving is associated with a higher prevalence of depression, distress or other negative mental health outcomes (Beach et al., 2000, Cannuscio et al.,

2004, Coe and Van Houtven, 2009, Hirst, 2003, 2005, Schulz and Beach, 1999, Schulz et al., 1995, 2003,). However, comparing results between studies is quite difficult due to methodological and conceptual differences. Quite some studies that show negative health outcomes are using non-representative samples or too small sample sizes (Hirst, 2003). The relationship between caregiver and care recipient, gender and the mean age of caregivers are found to be important factors in explaining the differences in mental health between caregivers and non-caregivers (Pinquart and Sörensen, 2003).

A meta-analysis on differences between caregivers and non-caregivers in perceived stress, depression, general subjective well-being, physical health and self-efficacy is done by Pinquart and Sörensen (2003). They evaluated 84 studies and concluded that the largest differences between caregivers and non-caregivers were found with respect to mental health i.e. depression and stress. Moreover, differences between dementia caregivers and non-caregivers were found to be larger than differences between "general" caregivers and non-caregivers (Pinquart and Sörensen 2003). Dementia caregivers are usually providing very intensive care on a daily basis and show high levels of depressive symptoms while care giving. The level of depressive symptoms reduces significantly when they stop care giving due to death of the care recipient (Schulz et al., 2003). Providing care to parents with dementia seems to have a considerable impact on caregivers' mental health status (Schulz et al., 1995, 2003). Comparing this type of care givers with non-dementia caregivers shows that the first are more likely to be depressed compared to the latter.

Analysing the first 10 waves of the BHPS Hirst (2003) found that the differences in psychological distress between caregivers providing more than 20h care per week and non-caregivers is more pronounced among women than among men.[6] In general female caregivers and non-caregivers show a higher prevalence of psychological distress compared to their male counterparts, confirming the higher prevalence of psychiatric symptoms across women along the life course (Hirst, 2003).

Some studies show that employment status and tight/weak social ties of caregivers may have an impact on mental health status. Rosenthal, Sulman & Marshall (1993) found that employed caregivers were less likely to be depressed compared to non-employed caregivers (Rosenthal et al., 1993, Cannuscio et al., 2004). While, Taylor, Ford and Dunbar (1995) did not find any differences between employed and non-employed caregivers (Taylor et al., 1995, Cannuscio et al., 2004). In this area Cannuscio et al (2004) – using a cross-section sample of midlife and older women based on 1992 NHS data – found that being employed did not seem to increase any further the mental health risk of informal care givers. Both employed and non-employed caregivers who were providing

[1] >12% of female caregivers providing more than 20h care per week and <6% of their counterpart.

intensive care (+36 h/week) to their spouses were 3.5 times more likely to be depressed compared to their counterparts. Having weak social ties and providing intensive care (+36 h/week) at the same time was found to be associated with an increased risk of experiencing depressive symptoms (Cannuscio et al., 2004).

A *positive* effect of caregiving on anxiety and depression was found by Beach et al. (2000) using a population-based sample. Associations were found between greater caregiving involvement and better mental health. However, increasing intensity of care was associated with poorer (mental) health (Beach et al., 2000).

In a population-based study – using 10 waves of BHPS data – Hirst (2005) examined changes in experienced distress levels between caregivers and non-caregivers around transitions into and out of caregiving. Around the transitions into caregiving the results indicate a small effect on psychological distress, but the effect becomes progressively larger once we look at those providing at least 20h of care per week at the start of the caring episode. More than twice as much female caregivers (34%) reported high distress levels compared to their female counterparts (15%).[7] The health gap is found to be smaller between male caregivers and non-caregivers i.e. 19% and 11%, respectively, reported high distress levels. Females ending caregiving to a parent (or in-law) are at an increased risk of recurrent distress; for males this effect was not found. The results suggest that it takes former female intensive caregivers about 5 years to reach the same level of distress as their female counterparts (Hirst, 2005).

Using 7 waves of the Health and Retirement Survey (HRS) Coe and Van Houtven (2009) examined the effect of care giving to an elderly parent on physical and mental health. They carefully controlled for potential endogeneity of selecting into and out of care giving by the method of instrumental variables. Death of a parent and sibling characteristics are used as instruments. OLS estimates show that providing care over a prolonged period of time increases the number of depressive symptoms by 0.24 compared to those who cease caregiving. Controlling for endogeneity suggests an underestimation of the effect under the exogeneity assumption; the results show an increase of 0.56 in the number of depressive symptoms reported by those continuing caregiving compared to those ceasing caregiving because a parent died (Coe and Van Houtven, 2009).

Schulz and Beach (1999) tried to examine the relationship between spousal caregiving and mortality. The Caregiver Health Effects Study provided them with a population-based dataset encompassing about 400 caregivers and 400 non-caregivers. Controlling for socio-demographic factors, prevalent

[7] High distress level is indicated by reporting more than 3 psychological symptoms on the GHQ scale.

disease and sub-clinical cardiovascular disease the results suggest that caregivers experiencing physical strain face a higher risk of mortality (RR 1.63) compared to their counterparts (after a 4-year follow up) (Schulz and Beach, 1999).

Key contribution of this research is that we carefully control for potential endogeneity by the method of instrumental variables and a FE model will be carried out to deal with unobserved individual time-invariant heterogeneity. To our knowledge, for Europe the relationship between mental health and care giving has not been examined yet.

3. Methodology

3.1 Linear probability model

As a baseline, we employ a linear probability model:

$$y_{i,t} = \beta + x_{i,t}\beta_x + ic_{i,t}\beta_{ic} + u_{i,t}$$

$$= x_{i,t}\beta_x + ic_{i,t}\beta_{ic} + u_{i,t} \qquad (1)$$

As we have two outcomes of interest y denotes employment or mental health, which is described as a function of informal care giving and other explanatory variables. EMP is a binary variable which takes value 1 if individual *i* reported to be (self)employed at time *t* and 0 if otherwise. *MH* is our mental health indicator[8] and x is a vector of observable exogenous regressors which are likely to affect the employment decision and mental health status of an individual and therefore should be controlled for. These are socio-economic and demographic variables (see section 4.4). ic is a binary variable which takes value 1 if individual *i* reported to be a caregiver at time *t* and 0 if otherwise. The residual is denoted by u; we assume that this residual is uncorrelated with our explanatory variables.[9]

The conditional probability that y equals 1 is equal to the conditional expected value of y, given that $E(u|x, ic) = 0$:

[8] We use three mental health indicators:
mh is a binary variable which takes on the value of 1 if individual *i* reported more than three symptoms on the EURO-D scale at time t and 0 if otherwise.
mh is a count variable represented by whole 12-item EURO-D scale (see section 3.3).
mh is a binary variable which takes on the value of 1 if individual *i* reported to be depressed in the last previous month at time *t* and 0 if otherwise.

[9] In this section we assume that there is no correlation with the residual term, in the next section we do accommodate for possible correlation with the residual term.

$$\Pr(y = 1|x, ic) = x\beta + ic\beta \qquad (2)$$

From equation (2) it follows that the expected value of y is a linear function of the explanatory variables. To carry out our LPM we can use an ordinary least squares regression (OLS). We can interpret the β as how much the probability of being employed/depressed changes when one of the regressors changes by one unit under the ceteris paribus condition (Wooldridge, 2009, p. 290-292).

With an OLS regression we assume that the residuals are heteroskedastic. As three of the dependent variables are binary they can only take on two values, consequently the residuals can take on two values. To solve this we carry out the regression with standard errors that are robust to heteroskedasticity.

3.2 Fixed effects model

Many individual characteristics remain unobserved like preferences for employment, unobserved disability, willingness to provide care, family devotion etcetera. These unobserved characteristics vary across individuals and may be correlated to the observable regressors, leading to inconsistent estimators. The advantage of a fixed-effects estimation is that it indicates how an individual's employment/mental health status changes in response to changes in informal care giving over time, and it produces consistent estimates of the coefficients.

To control for the unobserved individual characteristics we assume that the error term $u_{i,t}$ has two components. The first component accommodates for the individual characteristics that do not vary over time by α_i. We allow this α_i to be potentially correlated with the observable regressors $x \; and \; ic$. The second component is the idiosyncratic error term $e_{i,t}$ which does vary across time and across individuals, and which is assumed to be i.i.d (Wooldridge, 2009, p. 251-252). Now, we can rewrite equation (1) into:

$$y_{i,t} = x_{i,t}\beta_x + ic_{i,t}\beta_{ic} + \alpha_i + e_{i,t}$$

With a fixed effects model we make comparisons within (and not between) individuals, by taking the average of the differences across individuals. We obtain the within-transformation:

$$(y_{it} - \bar{y}_i) = (x_{it} - \bar{x}_i)\beta_x + (ic_{it} - \bar{ic}_i)\beta_{ic} + (e_{it} - \bar{e}_i)$$

Even when α_i and the observable regressors are correlated, we have controlled for this by eliminating α_i and we can still estimate consistent βs (Verbeek, 2004, p. 346).

3.3 Negative binomial model

One of our mental health outcomes is the EUROD 12-item count variable. In figure II (see Appendix) we can see that this variable is strongly skewed to the right. As OLS regression might be inappropriate, we perform a negative binomial regression in addition.

Count data is often analysed using some type of Poisson regression. We find that the variance of EUROD is about twice as large as the mean, making Poisson regression inappropriate as there is a violation of the strong assumption underlying this type regression: distribution of mean and variance are equal. Estimating the goodness of fit of the Poisson model, results in a very high chi-square value, also indicating the inappropriateness of the Poisson model. Yet, an appropriate model could be the negative binomial model as we use here, this type of model does allow for the variance to be larger than the mean. In figure III (see Appendix) we can see that a negative binomial model fits our data quite well.

The negative binomial probability distribution is:

$$\Pr(MH_i = y: \delta, \mu_i) = \frac{\boldsymbol{\Gamma}(\delta + y)}{\boldsymbol{\Gamma}(\delta)\boldsymbol{\Gamma}(y+1)}\left(\frac{1}{1+\mu_i}\right)^{\delta}\left(\frac{\mu_i}{1+\mu_i}\right)^{y} \quad y = 0,1,2 \ldots$$

Where $\boldsymbol{\Gamma}$ denotes the Gamma probability distribution and μ_i denotes the variance of the negative binomial distribution. As interpretation of negative binomial regression coefficients is not straightforward, we will compute marginal effects, which can be interpreted as the effect of a one unit change in the explanatory variable on the expected value of the dependent variable (Winkelmann, 2008, p.20).

3.4 Instrumental variables approach

People might self-select themselves into or out of informal care giving for several reasons (Coe and van Houtven, 2009). If it is true that $E\{e_{i,t} ic_{i,t}\} \neq 0$, we obtain biased and inconsistent estimations of the parameters in our baseline model. Therefore, we cannot say anything on the causality effect of changes in our informal care variable on an individual's employment/mental health status (Verbeek, 2004, p. 129-132).

3.4.1 Two-stage least squares

To solve the problem of a potential endogenous explanatory variable we employ a two-stage least squares (2SLS) estimation:

$$(1) \qquad ic_{i,t} = x_{i,t}\delta_x + z_{i,t}\delta_{ic} + e_{i,t}$$

In the first stage of 2SLS informal care giving is regressed on the exogenous regressors and instrument(s). We obtain the predicted value for informal care giving, which is used is the second stage of 2SLS . This way we correct for a direct effect of informal caregiving on our outcome variable; we get:

(2)
$$y_{i,t} = x_{i,t}\beta_x + \widehat{ic_{i,t}}\beta_{ic} + u_{i,t}$$

In this procedure we need an observable variable z_i which is an exogenous regressor in our baseline model.[10] Secondly, z_i should be highly correlated with our endogenous variable ic_i (Wooldridge, 2009, p. 83).[11] If we find instruments fulfilling these conditions, then we can still obtain consistent estimations of our parameters.

If we combine the IV method with the method of fixed effects we might also account for potential correlation between caregiving and time-variant unobserved effects (Coe and Houtven, 2009).

4. Data description

Data for the analyses are drawn from the first two waves of the Survey of Health, Ageing and Retirement in Europe (SHARE) for eleven European countries: Sweden, Denmark, The Netherlands, Austria, Belgium, Germany, France, Switzerland, Spain, Italy and Greece.

SHARE is a multidisciplinary and cross-national panel database, including data of over 45,000 individuals aged 50 and over on health, socio-economic status and social and family networks in 15 European countries. The first wave was drawn in 2004/2005 and the second in 2006/2007. This database not only allows for cross-country comparison, but also across time.

SHARE data is appropriate data in studying the effect of informal care giving on labour market behaviour of mid-life European citizens, as children in their mature ages (45+) are more likely to become informal caregivers to their parents (Attias-Donfut et al., 2005). It is also unique (for Europe) in a way that it provides us with information on family relations between the respondents and their parents; this information can be used as instruments to control for potential endogeneity.

[10] $Corr(z_i, u) = 0$
[11] $Corr(z_i, ic) \neq 0$

4.1 Sample selection

4.1.1 Sample selection: employment

In most European countries women tend to retire earlier than the official retirement age of (usually) 65. Therefore, for the purpose of our analysis we only include female respondents in the age between 50 and 60 and male respondents in the age between 50 and 65 in our sample. We consider all individuals reported to provide informal care to a parent, spouse, family, friend or other acquaintance. Survey records with item-non response are dropped from the sample.

4.1.2 Sample selection: mental health

In our mental health sample we included individuals between the age of 50 and 75; this upper limit is due to the share of caregivers that tends to decline after the age of 75 (Attias-Donfut et al., 2005). Again we include all individuals which reported to provide informal care to a parent, family, friend or other acquaintance and incomplete survey records are dropped from the sample.

4.2 Informal care

Respondents were asked the next two questions:

I. *"Is there someone living in this household whom you have helped regularly during the last twelve months with personal care, such as washing, getting out of bed, or dressing?"*

II. *"In the last twelve months, have you personally given any kind of help … to a family member from outside the household, a friend or neighbour?"*

They could choose from the next three types of informal care:

1. "*Personal care*, i.e. dressing, including putting on shoes and socks bathing or showering eating, e.g., cutting up your food getting in or out of bed using the toilet, including getting up or down.
2. *Practical household help*, e.g., with home repairs, gardening, transportation, shopping, household chores.
3. *Help with paperwork*, such as filling out forms, settling financial or legal matters."[12]

These are three different types of caregiving which might have a different effect on our outcome variable. Therefore, we use several subtypes of binary caregiving variables:

[12] SHARE release guide 2.4.1

Type of informal care giving	Definition
CARE	Equals 1 if individuals reported to be providing at least one type of informal care to anyone (both co-residential and extra-residential care).
PARCARE	Equals 1 if individuals reported to be providing extra-residential *personal* care to a parent.
ICARE	Equals 1 if individuals reported to be providing *personal* care to a parent, family, friend or other acquaintance (both co-residential and extra-residential care).
COCARE	Equals 1 if individuals reported to be providing co-residential *personal* care to a parent, family, friend or other acquaintance.
EXCARE	Equals 1 if individuals reported to be providing extra-residential *personal* care to a parent, family, friend or other acquaintance.
PRAC	Equals 1 if individuals reported to be providing help with practical activities to a parent, family, friend or other acquaintance (extra-residential).
PAPER	Equals 1 if individuals reported to be providing help with paperwork to a parent, family, friend or other acquaintance (extra-residential).

Total number of individuals per type of care giving:

N	CARE	PARCARE	ICARE	COCARE	EXCARE	PRAC	PAPER	Total sample
Employment sample	5,602	740	1,606	490	1,182	4,212	2,244	12,062
Mental health sample	10,558	1,071	3,218	1,310	2,089	7,799	3,378	26,437

4.3 Dependent variables

4.3.1 Employment

Respondents in the survey were asked about their current job situation; for those who reported to be (self)employed (including working in a family business), a binary variable *employment* (EMP) takes value 1, and zero if otherwise. In this study we only consider the effect of care giving on the extensive margin.

4.3.2 Mental health

Individuals' mental health is assessed by the self-report 12-item EURO-D scale. The 12-items are: depressed last month, pessimism, wished to be death, felt guilty, sleep, interest, irritability, appetite, fatigue, concentration, enjoyment and tearfulness. This scale was developed by the EURODEP Consortium to make a cross-country comparison possible for European countries.

Prince et al (1998) found that reporting four or more symptoms on the EURO-D scale is the optimal cut-off point in predicting GMS (clinical) depression (Prince et al., 1999). Therefore, we can use this as a threshold – i.e. dichotomising the EURO-D scale – in our study to examine whether caregivers are more likely to report high depression levels. We also use the whole EURO-D scale itself to examine how informal care giving affects the total number of depressive symptoms. A third measure to assess mental health is obtained by a binary variable equalling 1 if an individual reported to be depressed the last previous month and 0 if otherwise.

4.4 Instruments

4.4.1 Selection into caregiving: employment

Solving the endogeneity problem requires instruments which are highly correlated with the caring decision but not with the employment decision. Parental health status is very likely to highly impact on the caring decision, but not on the employment decision. Therefore, a dummy for parents with a poor health status (as perceived by the respondent) is used as an instrument. The SHARE data also shows that single-living parents are more likely to receive informal care compared to those who live with others (Attias-Donfut et al., 2005). Therefore, we use a dummy for single-living parents to instrument the informal care decision.

The number of brothers and sisters alive is also used by quite some studies as an instrument (Bolin et al., 2008, Crespo, 2007, Ettner, 1995,1996, Johnson & Lo Sasso, 2006, Latif, 2006). Having siblings or not may influence the decision to become a caregiver. Siblings may act in a strategic way or negotiate about who will become the caregiver, as a result it is quite plausible that the least healthiest sibling becomes the caregiver or the one who is already less likely to be in a paid job (Coe and Van Houtven, 2009).

4.4.2 Selection into caregiving: mental health

Following part of the literature the number of siblings alive, the number of children and a dummy for parents age 75 and above are used here to instrument informal care giving (Ettner 1995, Bolin et al., 2008, Coe and Van Houtven, 2009, Van Houtven et al., 2010). For the same reason as mentioned in

the previous section we use the number of siblings alive as an instrument. We use parental age as individuals at the age of 75 and above are more likely to receive informal care (Attias-Donfut et al., 2005).

4.5 Other explanatory regressors

4.5.1 Explanatory variables: employment

Other variables which are likely to affect labour supply decisions and therefore should be controlled for are socio-economic and demographic variables like gender, age, age-squared, marital status, years of education, number of children, number of grandchildren, home-ownership, self reported health, number of chronic health conditions, number of ADLs, living in a rural area, household size, wave dummy, and country dummies.

As the attachment of males and females to the labour force is not the same, we employ the analyses for males and females separately. To control for education the total number of years of education is included. We include marital status as we expect this to affect the employment decision if there is already another 'breadwinner' in the same household. Health status is established in the literature to affect the employment decision and therefore should be controlled for. We use self-reported health status as a proxy for health status, however, as this variable could be measured with error or may be assessed differently by different age groups (Crossley and Kennedy, 2002, Mc Fadden et al., 2008),[13] we also use objective measures of health by including the total number of chronic conditions and total number of ADLs.

Individuals in their mid-lives are likely to be both looking after grandchildren and (still) looking after their children, which might affect the employment decision. Therefore, we include a variable with the total number of grandchildren and total number of children.

As we do not observe wages for non-workers, we use home-ownership as a proxy for household income (instead of household income) and with country dummies we control for unobserved country-specific heterogeneity that may affect employment.

4.5.2 Explanatory variables: mental health

Analysing the effect on mental health we also include socio-economic and demographic variables like gender, age, age-squared, marital status, years of education, number of children, household

[13] Yet, we still use self-reported health as an explanatory variable as it has been shown to predict objective health measures (Van Doorslaer and Jones, 2003).

income, household size, dummies for non-mental chronic health conditions, a wave dummy and country dummies.

We control for gender as the prevalence of depression (or another mental illness) is more pronounced among women along the life course than it is among men. Besides that women seem to be more attached to caregiving compared to men (Hirst, 2003). For these reasons the analyses will be carried out for males and females separately.

To control for an individual's socio-economic status the total number of years of education is included. We also use household income equivalence (PPP-adjusted) to control for socio-economic status and we expect a negative association with the probability of being depressed. Marital status seems to be an important factor and is accounted for (Pinquart and Sörenson, 2003).

Physical health is very likely to affect mental health. As physical health may be endogenous to mental health we include dummies of chronic diseases which are not likely to be affected by depression: diabetes, chronic lung disease, asthma, arthritis, osteoporosis and cataracts.

To control for seasonal effects on the probability of being depressed we include a dummy for interviews that have been taken during the winter season.[14] Finally, with country dummies we control for unobserved country-specific heterogeneity that may affect an individual's mental health.

4.6 Descriptive statistics[15]

4.6.1 Employment

Survey records with item non-response are dropped from the sample. Our final sample consists of 12,062 observations in both waves, of which approximately 57% is represented by men and 43% by women.

About 46% of all individuals reported to be providing at least one type of informal caregiving (CARE) and 59% of all individuals reported to be working. Of all employed individuals 48.2% reported to be a caregiver, of the non employed we find a smaller share of respondents caregiving, i.e. 43.8%. However, when we look at respondents providing personal care (ICARE) we find that 12.4% of the employed individuals and a larger share of the non-employed, 14.7%, reported to be a caregiver. We

[14] Using longitudinal population-based data Harmatz et al (2000) found strong seasonal effects on depression, with highest Beck Depression Inventory (BDI) scores in the winter (Harmatz et al., 2000).
[15] The following descriptive statistics are based on data from both waves (i.e. the pooled dataset) and use CARE as caregiver variable (unless mentioned otherwise).

find quite some difference in the employment status for males and females. Almost 63% males reported to be working, for females this was only 55%.

About 88% of the female respondents who were not employed in the first wave, were also not employed in the second wave and of their male counterparts this was about 91%. Of the employed females in the first wave 88.1% also reported to be working in the second wave and of their male counterparts this was almost the same share, 88.5%. About 72% of the female caregivers reported to be caregiver in both waves and only 66% of their male counterparts. 65.3% of the female non-caregivers were not providing care in both waves, for males this share was higher 69.1%.

Caregivers are more educated compared to non-caregivers; on average they completed 12 years of education, while their counterparts completed one year less. They are also more likely to have at least one living parent, a parent with a poor health status and a single-living parent. In general caregivers providing personal care (ICARE) are more likely to be female (59.9%). An interesting finding is that about 44% of the caregivers reported a very good or excellent health status, while for non-caregivers this was only 39%. On average the individuals reported to have one chronic condition and about 95% reported to have zero limitations in ADLs.

The individuals have an average age of 56 and about 77% of them reported to be living with a spouse or partner. On average they reported to have two children, one grandchild and two household members. About 74% of the individuals owned a house, almost 92% was born in the country of interview and almost 24% reported to live in a rural area.

4.6.2 Mental health

In our analysis on mental health the final sample exists of 26,447 observations, representing about 47% men and 53% women. Survey records with item-non response are not included in our analysis.

Almost 40% of all individuals reported to be providing at least one type of informal care (CARE). A larger share of the caregivers reported to be sad or depressed last month compared to non-caregivers (39.0% and 33.7% respectively). We find quite some difference between male and female caregivers; almost twice as much female caregivers reported to be depressed or sad in the last month compared to their male counterparts (48.1% and 28.4% respectively). We also find a mental health gap between female and male non-caregivers (42.1% and 24.4% respectively). However, the mental health gap between males and females becomes much smaller or disappears when we take

the mean (per sample) of being depressed into account.[16] On average individuals reported 2 symptoms on the EURO-D scale. Almost the same share of caregivers and non-caregivers reported at least 4 or more symptoms on the EURO-D scale, 22.4% and 22.5% respectively.

Almost 60% of the female caregivers reported to be caregiver in both waves and the same applies to about 55% of their male counterparts. Slightly more than 55% of all individuals that reported to be depressed last month in the first wave, also reported to be depressed in the second wave.

Caregivers are more educated compared to non-caregivers; on average they completed 11 years of education, while their counterparts completed 10 years. They are also more likely to have a parent aged 75 and above (40.0% and 25.5% respectively). In general caregivers are more likely to be female (54%). Non-caregivers are more likely to be diabetic, to have a chronic lung disease, arthritis, osteoporosis and/or cataract.

The individuals have an average age of 61 and about 81% of them reported to be living with a spouse or partner. On average they reported to have two children, three siblings alive, two household members and almost 25% reported to be living in a rural area. About one fifth of the interviews were taken in the winter season (20.86%).

5. Results[17]

5.1 Employment

As males and females have a different attachment to informal caregiving and to the labour force we employed the analyses for males and females separately. Performing a t-test and Wilcoxon-Mann-Whitney test we find indeed that there is a significant difference in the employment and caregiving status between males and females and therefore we cannot pool the samples. We also performed a Breusch-Pagan test and rejected the null hypothesis of homoskedasticity; therefore, all analyses are employed with standard errors robust to heteroskedasticity.[18]

5.1.1 OLS results

Female sample

[16] The reason we correct for mean differences is that females are already more likely to be depressed along the life course compared to men.
[17] All results are under the ceteris paribus condition (i.e. holding all other this equal).
[18] F(1, 5933) = 6.20 with a P-value of 0.0128

Table 1 displays the main results per caregiver variable on employment.[19] The OLS results suggest a significant negative effect of 3pp of providing personal care to anyone (ICARE) on the probability of being employed. Helping with practical activities shows a negative effect of 2pp, but it is only significant at a 10% significance level. The magnitude of the effect becomes larger when we look at providing co-residential personal care, we find a significant negative effect of 7pp.

Furthermore, the OLS results indicate a significant non-linear relationship between employment and age.[20] Being married or living with a registered partner compared to living as a single decreases the probability of employment by 4pp. An extra year of education has a positive effect of 2pp on the employment probability and reporting a very good or excellent health status increases the employment probability with 8pp. An increase in the number of chronic conditions and the number of ADLs by one decreases the probability of employment by 4pp and 10pp respectively. Having children and living with others in the same household has a negative effect on employment of 1pp and 2pp, respectively and for home owners the employment probability increases by 4pp. All country dummies are statistically significant, except for Austria, and they are jointly significant (F(10, 5202) = 35.50). Age, having grandchildren, being born in country of interview, living in a rural area and the wave dummy have no significant effect on the employment probability.

Male sample

The OLS results do not suggest a significant effect of any of the caregiving subtypes on employment. We find a significant non-linear relationship between age and employment. Like we found for females, an extra year of education has a positive effect of 1pp on the employment probability and reporting a very good or excellent health status increases the employment probability with 8pp. An increase in the number of chronic conditions and the number of ADLs by one decreases the probability of employment by 4pp and 8pp, respectively. Having grandchildren decreases the employment probability with 1pp, while having children increases the employment probability with 1pp. Like in the female sample the results suggest that owning a house increases the probability of being employed with 4pp. Living in a rural area and living with others in the same household also increase the employment probability by 3pp and 1pp respectively. Being born in the country of interview and the wave dummy have a negative effect on the employment probability. Most of the country dummies are statistically significant, except for Denmark and Spain, and they are also jointly significant (F(10, 6808) = 25.35)). Only being married or living with a registered partner (compared to living as a single) has no significant effect on the employment probability.

[19] The full output tables for CARE and ICARE are displayed in the Appendix (Table A.5a and A.5b).
[20] All these results are based on the analysis of providing personal care (ICARE) on employment.

Table 1

EMP VARIABLES	F OLS	F FE	F IV	F IVFE	M OLS	M FE	M IV	M IVFE
CARE	-0.01	-0.05*	0.05	-0.02	0.00	0.00	0.02	0.21
	(0.013)	(0.024)	(0.092)	(0.324)	(0.010)	(0.019)	(0.098)	(0.271)
PARCARE	-0.00	-0.00	0.04	-0.06	0.02	0.02	-0.04	1.03
	(0.021)	(0.031)	(0.111)	(0.224)	(0.026)	(0.038)	(0.212)	(1.205)
ICARE	-0.03*	-0.06*	0.04	-0.09	-0.00	0.02	-0.20	0.89
	(0.016)	(0.026)	(0.172)	(0.285)	(0.017)	(0.032)	(0.327)	(0.952)
COCARE	-0.07*	-0.08	-0.52	-1.11	-0.04	0.01	-18.04	-0.28
	(0.030)	(0.058)	(0.703)	(2.061)	(0.027)	(0.050)	(99.250)	(0.776)
EXCARE	-0.03	-0.05+	0.06	-0.05	0.02	0.01	-0.20	0.82
	(0.017)	(0.028)	(0.151)	(0.294)	(0.020)	(0.035)	(0.308)	(0.855)
PRAC	-0.02+	-0.04+	0.08	0.13	-0.01	-0.01	0.00	-0.43
	(0.013)	(0.021)	(0.104)	(0.626)	(0.011)	(0.022)	(0.114)	(0.816)
PAPER	0.01	-0.04	0.06	-0.18	0.01	0.02	0.07	0.13
	(0.016)	(0.029)	(0.111)	(0.308)	(0.012)	(0.023)	(0.101)	(0.271)
Observations	5,228	5,228	5,228	1,518	6,834	6,834	6,834	1,800
Number of pid		4,469		759		5,934		900

Test on endogeneity	CARE	PARCARE	ICARE	COCARE	EXCARE	PRAC	PAPER
Females							
Wu-Hausman F test (F (1,5200)) P-value	0.44667	0.69120	0.66204	0.50026	0.56669	0.32358	0.64075
Males							
Wu-Hausman F test (F (1,6807)) P-value	0.83243	0.80206	0.53808	0.00007	0.46486	0.92241	0.60458

Robust standard errors in parentheses; *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

5.1.2 FE results

Controlling for unobserved time-invariant individual heterogeneity the results indicate for females with caring responsibilities in general (CARE) a significant negative effect on employment of 5pp. The FE results also suggest a significant negative effect of 6pp of providing personal care (ICARE) on

employment.[21] The other types of caregiving have no significant effect on employment. We also find that the other variables become highly insignificant. In the male sample the effect of caregiving on employment remains insignificant.

5.1.3 IV results

5.1.3.1 First-stage results, validity tests on instruments and test on endogeneity

We employed a 2SLS method to deal with potential endogeneity of the caregiving variable due to simultaneous decision-making and time-variant unobserved heterogeneity. If instruments are only weakly correlated, the IV estimates could be biased or inconsistent, and would in that case not show a causal effect of our outcome variable through the caregiver variable (Wooldridge, 2009, p. 83). Therefore, we test for the (potential) weakness of instruments using 12.83 as a critical value of the first-stage F-statistic (Stock, Wright and Yogo 2002).[22]

Female sample

We use single-living parent(s), parent(s) in poor health and the number of siblings alive as instruments. The first-stage results show that a single-living parent and parental poor health have a significant positive effect on the caregiving decision for most of the caregiver subtypes in the female sample (see Appendix Table A.4c).[23] The "number of siblings alive" variable has a negative sign and is only significant when we look at providing any type of care (CARE), providing personal care (ICARE) and help with paperwork (PAPER). Even though the correlations between the caregiver variables and instruments are not very high, the Cragg-Donald Wald and Kleibergen-Paap rk Wald F statistic do not indicate weak instruments for most of the caregiver variables in the female sample. They only seem to be weak for providing co-residential care (COCARE) (see Appendix Table A.4a). Moreover, we do not find indication of correlation of the instruments with the error terms.[24]

Performing a Sargan test on overidentifying restrictions we do not reject the null hypothesis, which means we can properly use our instruments to identify the caregiving decision.[25] Moreover, a Wu-Hausman F-test does not indicate endogeneity of caregiving. We argue that our instruments can be

[21] The coefficients of the FE estimation are only jointly significant on a 10% significance level: F(14,4468)=1.68 with P-value = 0.0534.
[22] This critical value follows from using three instrumental variables on a 2SLS bias of 5%.
[23] In the female sample they are not significant for COCARE.
[24] The assumption that the IV is not correlated with the error term cannot be tested in full (Schmidheiny, 2012).
[25] Also the Kleibergen-Paap rk LM statistic (underidentification test) and Hansen J statistic (overidentification test) suggest valid instruments.

properly used for most of the caregiving types, except for co-residential care. For this latter one, the results should be interpreted as indicative only (Heitmueller, 2007).

Male sample

The first-stage results suggest that poor parental health has a highly significant positive effect on the caregiving decision for almost all caregiving subtypes (except for COCARE). "Single living parent" has a significant positive effect on providing any type of care (CARE), personal parental care (PARCARE), help with practical activities (PRAC) and help with paperwork (PAPER). "The number of siblings" has a significant negative effect on personal parental care (PARCARE), extra-residential personal care (EXCARE) and help with paperwork (PAPER). Furthermore, we find indication of weak instruments for three types of caregiving i.e ICARE, COCARE and EXCARE (see Appendix Table A.4d). The Hansen J statistic test indicates correlation of the instruments with the error terms for almost all of the caregiver variables.[26] Suggesting that the instruments are rather weak in the male sample and we should reject the instruments.

Performing a Sargan test on overidentifying restricitions we reject the null hypothesis, suggesting our instruments are not valid and therefore cannot be used to identify the caregiving decision. Even though the Wu-Hausman F-test does not indicate endogeneity of caregiving (for most of the caregiving subtypes), as our instruments do not seem to be valid and seem to be correlated with the error terms, the instruments cannot be properly used to identify the caregiving decision. Suggesting we cannot use IV estimation to examine the causal effect of caregiving on employment in the male sample.

5.1.3.2 2SLS results

As we cannot use the instruments in the male sample, we will only discuss the 2SLS results for females. The 2SLS results show no significant effect of any caregiving type on employment, the sign becomes positive and we obtain large standard errors. The large standard errors compared to the OLS results might be the result of less efficient IV coefficients because of exogenous caregiver variables or due to the weak correlation between the caregiving variable and the instruments (Wooldridge, 2009, p. 527). A standard Hausman test on the difference between estimated OLS and IV coefficients indicates that OLS estimation is preferred over IV estimation. Suggesting that OLS coefficients are more consistent and efficient compared to the IV coefficients.

[26] The assumption that the IV is not correlated with the error term cannot be tested in full (Schmidheiny, 2012).

Overall, the magnitude of the effects of the other explanatory variables are almost equal to the estimated effects with OLS.

5.1.4 Additional specification tests

A Hausman test on the difference between OLS and IV estimation indicates that OLS is preferred over IV and the Langrangian Multiplier test suggest that RE estimation is preferred over OLS. We also performed a Hausman test on the significant difference between Random Effects (RE) and Fixed Effects (FE) estimation. We rejected the null hypothesis that u_i (errors) are not correlated with the regressors. FE estimation yields consistent estimates, but may not be the most efficient estimation. Moreover, FE estimated coefficients may become imprecise and/or insignificant (due to inefficiency) when variables do not change over time for each individual and FE estimation cannot be used to examine changes in the dependent variable caused by time-invariant variables (like gender, country dummies) (Wooldridge, 2002).Therefore, to decide between OLS and FE estimation, we use the F test that all u_i=0, which indicates that FE is preferred over OLS.

Performing a standard Hausman test we concluded that pooled OLS estimation is preferred over IV estimation. Next, we found that RE estimation is preferred over OLS regression and that FE estimation is also preferred over OLS. A Hausman test on the difference between FE and RE estimation, indicates that FE is preferred over RE estimation. Even though we did not obtain significant IV estimates, we argue that the FE estimates indicate causal inference of the effect of caregiving on employment, as we did not find indication of endogeneity of (most of) the caregiving variables. Overall, the FE results indicate an underestimation of the effect of caregiving on the employment probability when we carry out pooled OLS regression in the female sample.[27]

5.2 Mental health

As the prevalence of depression is more pronounced among women along the life course than it is among men, we employ the analyses for males and females separately (Hirst, 2003). Women also seem to be more attached to caregiving compared to men. Again we run a t-test and a Wilcoxon-Mann-Whitney test and find that there is a significant difference in the probability of being depressed and caregiving status between males and females and therefore we cannot pool the samples. We also performed a Breusch-Pagan test and rejected the null hypothesis of homoskedasticity; therefore, all the analyses are employed with standard errors robust to heteroskedasticity.

[27] Under the ceteris paribus condition.

5.2.1 OLS results

5.2.1.1 Depressed last month

Female sample

Table 2 shows the results of caregiving on the probability of being depressed in the last previous month. Overall, the OLS results suggest a significant positive effect of caregiving on the probability of being depressed i.e. caregiving increases the probability of being depressed.[28]

Providing any type of care to anyone (CARE) has a positive effect of 7pp on the probability of being depressed. Providing extra-residential personal care to a parent (PARCARE) increases the probability of being depressed with 12pp. Co-residential (COCARE) and extra-residential (EXCARE) personal caregiving also increase the probability of being depressed with 10pp and 12pp respectively. Personal caregiving (ICARE) has a positive effect of 12pp on the probability of being depressed. Help with practical activities (PRAC) and help with paperwork (PAPER) increase the probability of being depressed with 6pp and 5pp respectively.

The OLS results suggest that the probability of being depressed decreases with age and we find a winter seasonal effect of 4pp on the probability of being depressed compared to the other seasons. Being married or living with a registered partner compared to living as a single decreases the probability of being depressed with 11pp. An extra year of education decreases the probability of being depressed, but the effect has a small magnitude and being employed increases the probability of depression with 5pp. Having diabetes or a chronic lung disease increases the probability of being depressed with 7pp and 8pp respectively. Both asthma and arthritis have a positive effect of 6pp and 13pp respectively on the probability of being depressed. Having osteoporosis or cataracts increase the probability of being depressed with 9pp and 10pp respectively. Most of the country dummies have a significant effect on the probability of being depressed, except for the Netherlands, Belgium, Austria and Greece, and they are jointly significant (F(10, 14038) = 20.63 with a P-value of 0.0000). Household income, living in a rural area and household size have no significant effect on the probability of being depressed.[29]

Male sample

[28] Under the ceteris paribus condition.

[29] As the significance, magnitude and sign of the explanatory variables are (almost) not driven by caregiving subtype we will only describe and display the results for providing any type of care to anyone (CARE) (Table A.7a-c).

Providing any type of care to anyone (CARE) has a positive effect of 4pp on the probability of being depressed. Co-residential (COCARE) and extra-residential (EXCARE) personal caregiving both increase the probability of being depressed with 8pp. Personal caregiving (ICARE) also has a positive effect of 8pp on the probability of being depressed. Help with practical activities (PRAC) and help with paperwork (PAPER) increase the probability of being depressed with 4pp and 5pp respectively.

Furthermore, the OLS results suggest an inverse u-shaped relationship between age and the probability of depression. Compared to the female sample we find a smaller winter seasonal effect of 2pp on the probability of being depressed.[30] Being married or living with a registered partner compared to living as a single decreases the probability of being depressed with 12pp. Having diabetes or a chronic lung disease increase the probability of being depressed with 6pp and 15pp respectively. Both asthma and arthritis have a positive effect of 7pp on the probability of being depressed. Having osteoporosis or cataracts increase the probability of being depressed with 12pp and 5pp respectively. Being employed decreases the probability of depression with 7pp. Living in a rural area decreases the probability of depression with 2pp and living with other household members increases the probability of depression with 1pp. Only the country dummies for France, Germany, Switzerland and Italy are statistically significant, but they are all jointly significant (F(10, 12343) = 8.49 with a P-value of 0.0000). Total number of years of education, household income and a wave dummy have no significant effect on the probability of being depressed.[31]

Table 2

Depressed LM	**F**	**F**	**F**	**F**	**M**	**M**	**M**	**M**
VARIABLES	OLS	FE	IV	IVFE	OLS	FE	IV	IVFE
CARE	0.07***	0.10*	-0.01	-0.04	0.04***	-0.00	-0.13	-1.25
	(0.009)	(0.047)	(0.058)	(0.380)	(0.008)	(0.039)	(0.092)	(2.513)
PARCARE	0.12***	0.11	0.03	0.31	0.09**	0.00	-0.30	-1.14
	(0.018)	(0.069)	(0.087)	(0.581)	(0.029)	(0.072)	(0.230)	(1.113)
ICARE	0.12***	0.13**	-0.04	-0.16	0.08***	-0.03	-0.69*	-0.92
	(0.012)	(0.052)	(0.132)	(0.389)	(0.015)	(0.051)	(0.290)	(0.845)
COCARE	0.10***	0.14+	-1.23	-1.03	0.08***	-0.05	-1.83*	-1.16
	(0.018)	(0.076)	(1.211)	(1.080)	(0.021)	(0.084)	(0.814)	(2.181)
EXCARE	0.12***	0.10+	-0.02	0.38	0.08***	-0.00	-0.61+	-0.88
	(0.014)	(0.059)	(0.128)	(0.606)	(0.020)	(0.056)	(0.356)	(0.942)
PRAC	0.06***	0.04	-0.00	0.44	0.04***	0.03	-0.12	0.63
	(0.009)	(0.048)	(0.066)	(0.500)	(0.009)	(0.040)	(0.110)	(0.737)

[30] Only significant on a 10% significance level.

[31] As the significance, magnitude and sign of the explanatory variables are (almost) not driven by caregiving subtype we will only describe the results for providing any type of care to anyone (CARE).

PAPER	0.05***	0.01	0.04	0.66	0.05***	-0.02	-0.12	-0.70
	(0.013)	(0.056)	(0.095)	(0.717)	(0.012)	(0.045)	(0.114)	(0.682)
Observations	14,066	14,066	14,066	1,056	12,371	12,371	12,371	940
Number of pid		13,538		528		11,901		470

Test on endogeneity	CARE	PARCARE	ICARE	COCARE	EXCARE	PRAC	PAPER
Females							
Wu-Hausman F test (F ()) P-value	0.16163	0.31048	0.24141	0.18243	0.29500	0.35458	0.87572
Males							
Wu-Hausman F test (F ()) P-value	0.05332	0.07963	0.00278	0.00091	0.03967	0.13421	0.14312

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1 and robust standard errors in parentheses

5.2.1.2 High depression level

Table 3 shows the results of caregiving on the probability of a high depression level.[32] Overall, the OLS results suggest a significant positive effect of caregiving on the probability of clinical depression.

Female sample

Providing any type of care to anyone (CARE) has a positive effect of 3pp on the probability of a high depression level. Providing extra-residential personal care (PARCARE) to a parent increases the probability of a high depression level with 9pp. Co-residential (COCARE) and extra-residential (EXCARE) personal caregiving also increase the probability of a high depression level with 10pp and 5pp respectively. Providing personal care (ICARE) has a positive effect of 7pp on the probability of a high depression level. Help with practical activities (PRAC) has no significant effect on a high depression level and the effect of help with paperwork (PAPER) of 2pp on a high depression level is only significant on a 10% significance level.

The OLS results show a significant inverse u-shape relationship between age and the probability of a high depression level. The winter seasonal effect of 2pp is only significant on a 10% significance level. Being married or living with a registered partner compared to living as a single and years of education decrease the probability of a high depression level with 8pp and 1pp respectively. Being employed increases the probability of a high depression level with 5pp. Both having diabetes or a

[32] High depression level is denoted by reporting more than three depressive symptoms on the EUROD 12-item scale.

chronic lung disease increase the probability of a high depression level with 9pp. Asthma and arthritis also have a positive effect of 8pp and 15pp respectively on the probability of a high depression level. Having osteoporosis or cataracts increase the probability of a high depression level with 12pp and 9pp respectively. Living in a rural area has a positive effect of 2pp on a high depression probability. Most of the country dummies have a significant effect on the probability of a high depression level, except for the Netherlands (only significant on a 10% significance level), Germany and Austria, and they are jointly significant (F(10, 14038) = 15.32 with a P-value of 0.0000). Household income, a wave dummy and household size have no significant effect on the probability of a high depression level.

Male sample

Providing personal care (ICARE) has a positive effect of 4pp on the probability of a high depression level. Co-residential (COCARE) and extra-residential (EXCARE) personal caregiving also increase the probability of a high depression level with 4pp. The other subtypes of care have no significant effect on the probability of a high depression level.

The OLS results show a significant inverse u-shape relationship between age and the probability of a high depression level. Being married or living with a registered partner compared to living as a single and the total number of years of education decrease the probability of a high depression level with 9pp and 1pp respectively. Being employed increases the probability of a high depression level with 8pp. Having diabetes or a chronic lung disease increase the probability of a high depression level with 9pp and 15pp respectively. Both asthma and arthritis have a positive effect of 8pp on the probability of a high depression level. Having osteoporosis or cataracts increase the probability of being highly depressed with 11pp and 6pp respectively. Living in a rural area has a positive effect of 2pp on the high depression probability and living with other household members increases the probability of a high depression level with 1pp (only significant on a 10% significance level). The country dummies are only significant for the Netherlands, Belgium (on a 10% significance level), Austria and Italy, and they are jointly significant (F(10, 12343) = 8.02 with a P-value of 0.0000). The winter season dummy, household income and a wave dummy have no significant effect on the probability of a high depression level.

Table 3

Depressed3	**F**	**F**	**F**	**F**	**M**	**M**	**M**	**M**
VARIABLES	OLS	FE	IV	IVFE	OLS	FE	IV	IVFE
CARE	0.03***	0.10**	0.05	0.04	-0.00	-0.02	-0.09	-0.33

	(0.008)	(0.038)	(0.053)	(0.283)	(0.006)	(0.030)	(0.071)	(1.113)
PARCARE	0.09***	0.08	0.09	0.04	0.01	-0.04	-0.22	-0.28
	(0.017)	(0.053)	(0.079)	(0.454)	(0.021)	(0.061)	(0.177)	(0.645)
ICARE	0.07***	0.09*	0.10	-0.11	0.04**	-0.03	-0.59*	-0.23
	(0.011)	(0.041)	(0.119)	(0.306)	(0.012)	(0.046)	(0.235)	(0.492)
COCARE	0.10***	0.22**	-0.62	-0.40	0.04*	-0.03	-1.66*	-0.34
	(0.017)	(0.071)	(0.984)	(0.741)	(0.018)	(0.078)	(0.697)	(1.428)
EXCARE	0.05***	0.02	0.11	0.01	0.04*	-0.03	-0.50+	-0.21
	(0.012)	(0.045)	(0.116)	(0.470)	(0.016)	(0.056)	(0.279)	(0.544)
PRAC	0.01	0.05	0.06	0.28	-0.01	-0.05	-0.08	0.14
	(0.008)	(0.040)	(0.060)	(0.398)	(0.007)	(0.031)	(0.085)	(0.457)
PAPER	0.02+	0.09+	0.10	0.40	0.01	-0.03	-0.08	-0.19
	(0.012)	(0.047)	(0.086)	(0.562)	(0.009)	(0.037)	(0.087)	(0.442)
Observations	14,066	14,066	14,066	1,056	12,371	12,371	12,371	940
Number of pid		13,538		528		11,901		470

Test on endogeneity	CARE	PARCARE	PARCOCARE	ICARE	COCARE	EXCARE	PRAC	PAPER
Females								
Wu-Hausman F test (F ()) P-value	0.72900	0.93495	0.29157	0.84345	0.41630	0.61997	0.41587	0.37388
Males								
Wu-Hausman F test (F ()) P-value	0.19872	0.19103	0.56865	0.00193	0.00018	0.04000	0.41700	0.32515

Robust standard errors in parentheses; *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

5.2.1.3 EUROD 12-item scale

Table 4 displays the results of the effect of caregiving on the total number of depressive symptoms.

Female sample

Providing any type of care to anyone (CARE) has a positive effect of 0.19 on the total number of depressive symptoms. Providing extra-residential personal care (PARCARE) to a parent increases the number of depressive symptoms with 0.49. Co-residential (COCARE) and extra-residential (EXCARE) personal caregiving also increase the number of depressive symptoms with 0.65 and 0.32 respectively. Providing personal care (ICARE) has a positive effect of 0.47 on the total number of depressive symptoms. Help with practical activities (PRAC) increases the number of depressive

symptoms with 0.07 (only significant on a 10% significance level) and help with paperwork (PAPER) increases the number of depressive symptoms with 0.11.

The OLS results show a significant inverse u-shape relationship between age and the total number of depressive symptoms. The winter seasonal effect increases the number of depressive symptoms with 0.13. Being married or living with a registered partner compared to living as a single and years of education decrease the number of depressive symptoms with 0.50 and 0.05 respectively. Also employment decreases the number of depressive symptoms with 0.31. Both having diabetes or a chronic lung disease increase the number of depressive symptoms with 0.53 and 0.64 respectively. Asthma and arthritis increase the number of depressive symptoms with 0.47 and 0.84 respectively. Having osteoporosis or cataracts increase the number of depressive symptoms with 0.68 and 0.48 respectively. Living in a rural area decreases the number of depressive symptoms with 0.10. Most of the country dummies have a significant effect on the total number of depressive symptoms, except for Austria and Greece (only on a 10% significance level) , and they are jointly significant (F(10, 14038) = 24.08). Household income, household size and a wave dummy have no significant effect on the total number of depressive symptoms.

Male sample

Providing personal care (ICARE) has a positive effect of 0.33 on the total number of depressive symptoms. Co-residential (COCARE) and extra-residential (EXCARE) personal caregiving also increase the number of depressive symptoms with 0.41 and 0.26 respectively. The other caregiving subtypes have no significant effect on the total number of depressive symptoms (on a 5% significance level).

The OLS results show a significant inverse u-shape relationship between age and the total number of depressive symptoms. Being married or living with a registered partner compared to living as a single and years of education decrease the number of depressive symptoms with 0.58 and 0.04 respectively. Also employment decreases the number of depressive symptoms with 0.49. Both having diabetes or a chronic lung disease increase the number of depressive symptoms with 0.52 and 0.89 respectively. Asthma and arthritis increase the number of depressive symptoms with 0.56 and 0.55 respectively. Having osteoporosis or cataracts increase the number of depressive symptoms with 0.67 and 0.43 respectively. Living in a rural area decreases the number of depressive symptoms with 0.12 and living with other household members increases the total number of depressive symptoms with 0.04. The country dummies are significant for the Netherlands, Belgium, France, Italy, Spain and Austria (on a 10% significance level), and they are jointly significant (F(10, 12343) = 14.17). The winter season, household income and a wave dummy have no significant effect on the total number of depressive symptoms.

Table 4

EUROD	**F**	**F**	**F**	**F**	**M**	**M**	**M**	**M**
VARIABLES	OLS	FE	IV	IVFE	OLS	FE	IV	IVFE
CARE	0.19***	0.42*	0.20	0.41	0.05	-0.13	-0.99*	-6.63
	(0.037)	(0.174)	(0.262)	(1.673)	(0.034)	(0.147)	(0.389)	(11.748)
PARCARE	0.49***	0.29	0.52	0.68	0.22+	-0.07	-2.48*	-4.25
	(0.081)	(0.246)	(0.389)	(2.518)	(0.114)	(0.307)	(0.967)	(4.238)
ICARE	0.47***	0.34+	0.39	-0.87	0.33***	-0.13	-4.55**	-3.68
	(0.052)	(0.198)	(0.589)	(1.881)	(0.065)	(0.216)	(1.386)	(3.411)
COCARE	0.65***	0.86*	-7.62	-3.63	0.41***	0.25	-10.46*	-8.37
	(0.090)	(0.350)	(6.322)	(4.484)	(0.098)	(0.328)	(4.067)	(10.922)
EXCARE	0.32***	0.05	0.53	0.46	0.26**	-0.32	-4.62**	-2.91
	(0.058)	(0.213)	(0.573)	(2.644)	(0.081)	(0.291)	(1.636)	(3.279)
PRAC	0.07+	0.27	0.29	2.53	-0.02	-0.27+	-0.98*	1.53
	(0.039)	(0.176)	(0.295)	(1.991)	(0.035)	(0.158)	(0.460)	(2.515)
PAPER	0.11*	0.13	0.49	3.62	0.05	-0.23	-1.06*	-4.13
	(0.054)	(0.208)	(0.425)	(2.871)	(0.045)	(0.200)	(0.474)	(3.020)
Observations	14,066	14,066	14,066	1,056	12,371	12,371	12,371	940
Number of pid		13,538		528		11,901		470

Test on endogeneity	CARE	PARCARE	ICARE	COCARE	EXCARE	PRAC	PAPER
Females							
Wu-Hausman F test (F ()) P-value	0.95277	0.92930	0.89780	0.05912	0.71682	0.44495	0.35274
Males							
Wu-Hausman F test (F ()) P-value	0.00516	0.00379	0.00000	0.00000	0.00041	0.03154	0.01673

Robust standard errors in parentheses; *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

5.2.2 FE results

Female sample

Controlling for unobserved time-invariant individual heterogeneity suggests a significant positive effect of 10pp of caring responsibilities in general (CARE) on the probability of being depressed last month. The FE results also suggest a significant negative effect of 13pp of providing personal care (ICARE) on the probability of being depressed last month.

Furthermore, we find a significant positive effect of caring responsibilities in general (CARE) of 10pp on the probability of a high depression level and a significant positive effect of 9pp of providing personal care (ICARE). Co-residential care (COCARE) has a large effect on the probability a high depression level i.e. 22pp.

Caring responsibilities in general (CARE) increase the number of depressive symptoms by 0.42 and co-residential care increases the number of depressive symptoms with 0.86.

We do not find significant effects of the other subtypes of caregiving on any of the mental health indicators. Like in our analysis on employment, we obtain highly insignificant coefficients of the other explanatory variables.

Male sample

In the male sample we do not obtain significant FE results.

We cannot reject the null hypothesis of joint significance of all variables (F-test), which indicates that FE estimation does not fit our data well. Moreover, we tested if time fixed effects are needed with a joint F-test and we did not reject the null hypothesis that all wave dummies are equal to zero. Suggesting that time fixed effects are not needed.

5.2.3.1 First-stage results, validity tests on instruments and test on endogeneity

Female sample

We use the number of children, the number of siblings alive and a dummy for parents aged 75+ as instruments. The first-stage results show that the dummy for parent(s) aged 75+ has a highly significant positive effect on the caregiving decision (except on COCARE). Having children has a significant negative effect on all care variables, except on PARCARE and COCARE; having siblings only seems to have a negative effect on providing extra-residential care to a parent or provide help with paperwork (PARCARE and PAPER) (see Appendix Table A.6c). Like in our analysis on employment we do not find highly correlated instruments with the caregiver variables. Yet, the Cragg-Donald Wald and Kleibergen-Paap rk Wald F statistic do not indicate weak instruments for most of the caregiver variables in the female sample. The results only show indication of weak instruments for the COCARE variable (see Appendix Table A.6a). We also find no indication of correlation of the instruments with the error terms.

Performing a Sargan test on overidentifying restrictions we do not reject the null hypothesis, which indicates we can properly use our instruments to identify the caregiving decision.[33] Moreover, a Wu-Hausman F-test does not indicate endogeneity of caregiving. We argue that our instruments can be properly used for most of the caregiving types, except for COCARE.

Male sample

The first-stage results show that the dummy for parent(s) aged 75+ has a highly significant positive effect on the caregiving decision (except for COCARE). Having children and siblings both seem to have a negative effect on the caregiving decision, but not for all caregiving types (see Appendix Table A.6d). In the male sample we find indication of weak instruments for the co-residential caregiver variable (COCARE), but also for personal caregiving (ICARE) and extra-residential personal caregiving (EXCARE) (see Appendix table D.2). The Hansen J statistic test indicates correlation of the instruments with the error terms for almost all of the caregiver variables. Suggesting that the instruments are rather weak in the male sample and that we should reject the instruments.

Performing a Sargan test on overidentifying restrictions we reject the null hypothesis for quite some caregiving subtypes, which means we cannot properly use our instruments to identify the caregiving decision for these subtypes in the male sample. Moreover, a Wu-Hausman F-test indicates endogeneity of caregiving when we analyse the effect on the number of depressive symptoms (EUROD-scale). When we analyse the other two mental health indicators we only find indication of endogeneity for ICARE, COCARE and EXCARE. Overall, we argue that our instruments cannot be properly used to instrument caregiving in the male sample. Like in the analyses on employment this means we cannot use IV estimation to examine the causal effect of several caregiving subtypes on employment in the male sample.

5.2.3.2 2SLS results

The 2SLS results show no significant effect of any caregiving type on mental health and we obtain large standard errors in both samples.

Overall, the magnitude of the effects of the other explanatory variables are very similar to the estimated effects with OLS (see Appendix Table A.7a-c).

5.2.4 Additional specification tests

[33] Also the Kleibergen-Paap rk LM statistic (underidentification test) and Hansen J statistic (overidentification test) suggest valid instruments.

A Hausman test on the difference between OLS and IV estimation indicates that OLS is preferred over IV. We also performed a Hausman test on the significant difference between Random Effects (RE) and Fixed Effects (FE) estimation. We reject the null hypothesis that the errors are not correlated with the regressors, when we use depressed last month and a high level of depression as mental health indicators. To decide between OLS and FE estimation, we use the F test that all u_i=0, and we reject the null hypothesis suggesting that FE is preferred over OLS. However, the joint significance of all variables (F-test) is not statisitically significant, which indicates the inappropriateness of FE estimation. Also when we test the joint significance of all wave dummies we conclude that no time fixed effects are needed.

When we use the EUROD-scale and perform the Hausman test on the significant difference between RE and FE estimation, the results suggest that RE is preferred. And also the Breusch and Pagan Lagrangian multiplier test for random effects does not reject the null hypothesis of random effects; indicating significant differences across individuals in both samples.

We argue that the RE estimation is the favoured analysis when we use EUROD as a mental health indicator, clearly the results suggest there are significant differences between individuals affecting the number of depressive symptoms.

5.3 RE results

Table 5 shows the Random Effects results using the EUROD 12-item scale as a mental health indicator. Overall, the significance, sign and magnitude of the effects are very similar to the OLS results displayed in table 4.[34]

Table 5

EUROD	N	Number of pid	CARE	PARCARE	ICARE	COCARE	EXCARE	PRAC	PAPER
			RE	RE	RE	RE	RE	RE	RE
Female sample	14,066	13,538	0.20***	0.48***	0.47***	0.66***	0.31***	0.08+	0.10+
			(0.037)	(0.080)	(0.052)	(0.090)	(0.058)	(0.039)	(0.054)
Male sample	12,371	11,901	0.05	0.19+	0.30***	0.40***	0.23**	-0.03	0.04
			(0.033)	(0.112)	(0.064)	(0.097)	(0.080)	(0.035)	(0.045)

[34] The full output tables are displayed in Appendix A7.e and A7.f.

6. Discussion

In this study we examined the causal effect of caregiving on caregivers' employment and mental health status.

6.1 Discussion: Employment

We obtained FE results showing a non-negligible significant negative effect of 5pp of caring responsibilities on employment for females. We also find that providing personal care decreases the employment probability by 6pp. The magnitude of the effect is comparable to Heitmueller and Michaud (2010). Differently from Bolin et al (2008), for males we do not find a significantly lower probability of employment.[35]

FE estimates show causal effects (only) under the strict exogeneity assumption. This means that a violation of this assumption may result in non-causal effects on the outcome of interest. In the female sample our results suggest exogeneity of the caregiving variable and therefore we argue that the obtained results seem to show a significant causal effect of caregiving on employment.[36] For policy makers it is important to know whether individuals are quitting their job because of caregiving per se or that individuals who are already less likely to be employed are becoming caregivers. As these latter individuals will not necessarily be employed when long term care will be provided by formal care (Heitmueller, 2007).[37] Furthermore, flexible work conditions for caregivers may be needed (and should be encouraged), to keep them in labour force. If individuals quit their jobs in order to provide informal care to family, relatives or friends, this could also have major consequences for the social security system. When individuals quit working due to caregiving this may not only result in less tax income, but may also induce more reliance on social security benefits. To date not many studies have examined the effect of informal caregiving on social security benefits.

We have not been able to examine causal effects in an IV framework for males, suggesting that different IVs may be required to instrument caregiving in the male sample. We used several subtypes of caregiving to examine whether there are differences in the effect on employment. The results do not show large significant differences in magnitude between the different subtypes of caregiving.

[35] Bolin et al (2008) found a negative effect for males on a 10% significance level.
[36] A side effect of FE estimation is that is not able to estimate the causal effects of time constant regressors (as these are dropped from the analysis).
[37] Note providing more formal care services may only "work" if informal and formal care are substitutes. See for studies in this area for instance Bolin et al (2008b) and Van Houtven and Norton (2004).

A limitation of our data is that we used a relatively short panel, consequently we are not able to examine long term effects of caregiving on the employment probability. Another drawback is that we have not been able to capture initiating and continuing caregiving. The duration of the caregiving episode may have an important impact on employment, as longer caregiving spells may induce (even) larger opportunity costs (Coe and Van Houtven, 2010).

We tried to control for intensity of care by assuming that personal caregiving is a more intensive type of caregiving which can be expected to place a larger burden on the caregiver. Many of the other studies accounted for intensity by using the total number of hours of caregiving, which is a more precise measure of intensity and more appropriate in distinguishing between "intensive" caregivers and their counterparts.

An interesting topic for future research may be examining the effect of dementia caregiving on employment. The probability of dementia increases with age, hence with societies ageing an increase of individuals with dementia can be expected. Caregiving to parents with dementia seems to be very intensive and dementia caregivers should be distinguished from "normal" caregivers. In the context of potential opportunity costs in terms of reduced employment this has not been examined yet (to our knowledge).

6.2 Discussion: Mental health

RE estimated coefficients should only be used after ensuring that RE is consistent with respect to FE estimators (Antonakis et al., 2010). Comparing FE with RE results – using a Hausman test – we find indication that RE estimation should be used. We obtained significant positive effects of all care types on the total number of depressive symptoms in the female sample.[38] Ranging from 0.20 (CARE) to 0.48 (PARCARE). As we do not find indication of endogeneity of the care variable we argue that these effects are causal effects of caregiving on the number of depressive symptoms. The effect for COCARE is significant and shows the largest magnitude, but we should interpret the effect with caution, as our instruments did not perform well for this care variable. Moreover, we marginally accept the exogeneity assumption according to the Wu-Hausman F test (Table 4).

Even though the OLS results do show significant positive correlations, the causality of the effect on depression last month and a high level of depression remains inconclusive as we have not been able to account for unobserved time-invariant heterogeneity in the female sample.[39] Also for males we

[38] Help with practical activities and help with paperwork were only significant on a 10% significance level.
[39] We concluded that OLS estimation is preferred over IV estimation, but we have not been able to conclude that FE estimation is preferred over OLS as FE estimation was not appropriate to fit our data in the female sample.

cannot interpret the results as causal effects as we find indication of endogeneity of the all care subtypes in the male sample (using EUROD 12-item scale as a mental health indicator). However, the instruments were rather weak for ICARE, COCARE and EXCARE.

Mental health may be affected by a number of physical, social, environmental and psychological factors. All these factors may differ between individuals, consequently the self-reported depression/depressive symptoms may be measured with bias. Another potential bias may be that elderly might be not able to report a high level of depression as such (Hasin and link, 1988).

For policy makers it is important to know whether individuals are becoming (more) depressed because of caregiving per se or that individuals who are already in a "bad" mental health status are becoming caregivers. For these latter individuals providing more formal care may not improve their mental health status. Therefore, to disentangle the causal effect of caregiving on mental health we should control for these factors including pre mental health conditions (which we did not control for).

Like in our analyses on employment we have not been able to examine the long term effect of caregiving on mental health. Results in a previous study suggest that it takes former female caregivers about 5 years to reach the same level of distress as their counterparts (Hirst, 2005). Making it interesting to examine how caregiving affects mental health on the long run and what can be done to improve caregivers mental health in a shorter period of time. Another limitation of this study is that we did not have information on when caregiving has started and ended. Individuals are at an increased risk of mental health problems the first year they start and the year after they cease intensive caregiving (Hirst, 2005).

Even though the duration of a caregiving episode cannot (always) been predicted ex ante, more formal help at the end of an caregiving episode may reduce caregiver's opportunity costs (as more time is spent on caregiving at the end). Interesting for future research is to put more emphasis on the potential positive effects of caregiving on mental health, for instance in terms of good feelings, overall well-being and self-esteem.

7. Conclusion

In this study we examined the causal effect of caregiving on employment and mental health. In the context of ageing societies governments are facing challenges in keeping the public health care system sustainable. At the same time governments are encouraged to increase female labour force participation. Therefore, opportunity costs on the extensive margin induced by caregiving per se,

could have major implications for (female) labour force participation. On this, addressing the potential endogeneity of caregiving seems very important for policy purposes. When individuals who become caregivers are already less likely to be employed, increasing the availability of formal care may not increase (female) labour force participation.

Our study indicate that informal caregiving may induce non-negligible opportunity costs both in terms of reduced employment and increased mental health problems for females. Providing personal care may decrease the employment probability by 6pp and the effect of different subtypes of caregiving on the number of depressive symptoms ranges from (CARE) 0.20 to 0.48 (PARCARE). We also find that the magnitude of the effect becomes larger when personal care is provided to a parent (0.48) compared to providing personal care to anyone (0.31).

Therefore, our results suggest that policies on increasing female labour force participation should be taking into account the provision of eldercare and organise flexible work conditions for caregivers. Furthermore, caregivers may be in need of support when they are highly involved in caregiving. They may need help with taking care of someone in their own homes, or need emotional support during their caregiving episode.

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Appendix

Figure I. Long term care expenditures (OECD 2009)

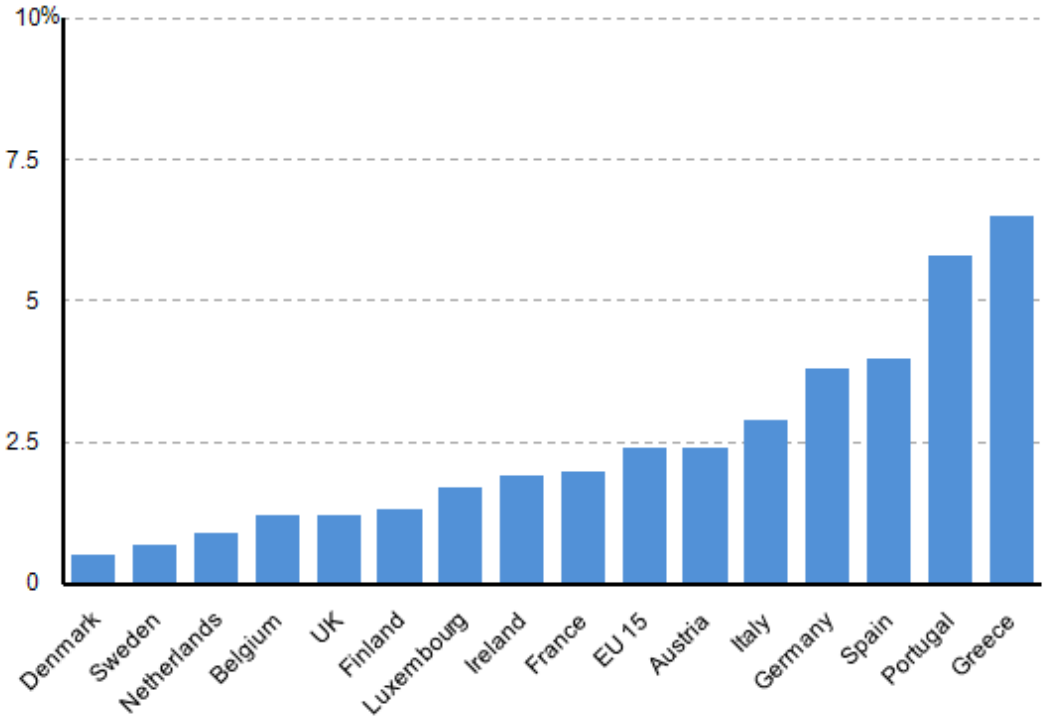

Figure II. Distribution EUROD 12-item scale

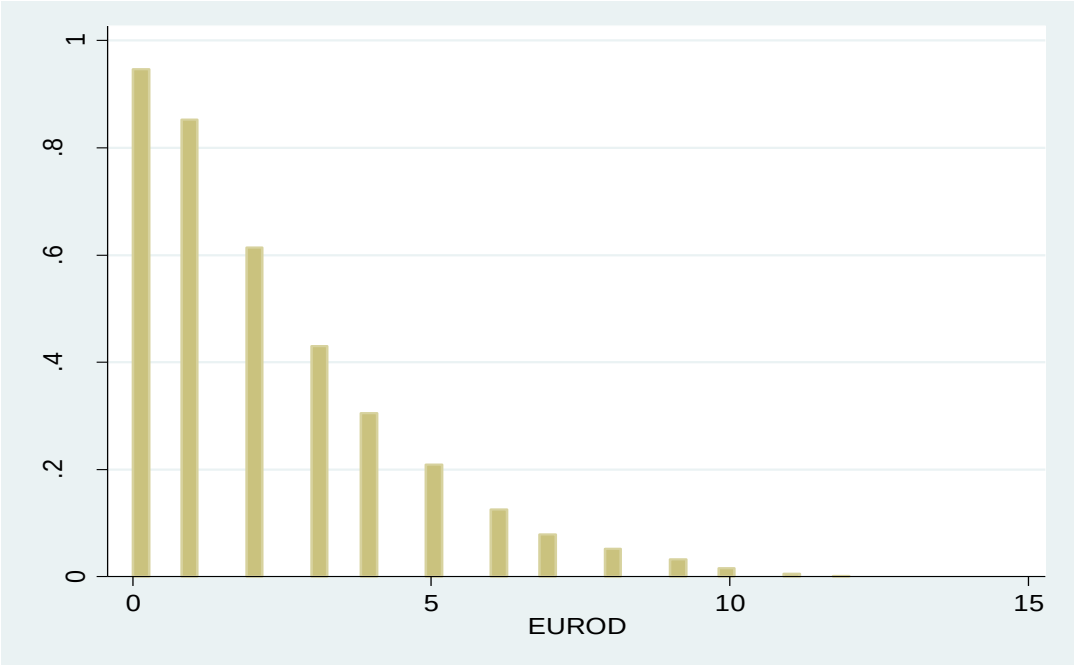

Figure III. Fit negative binomial probability

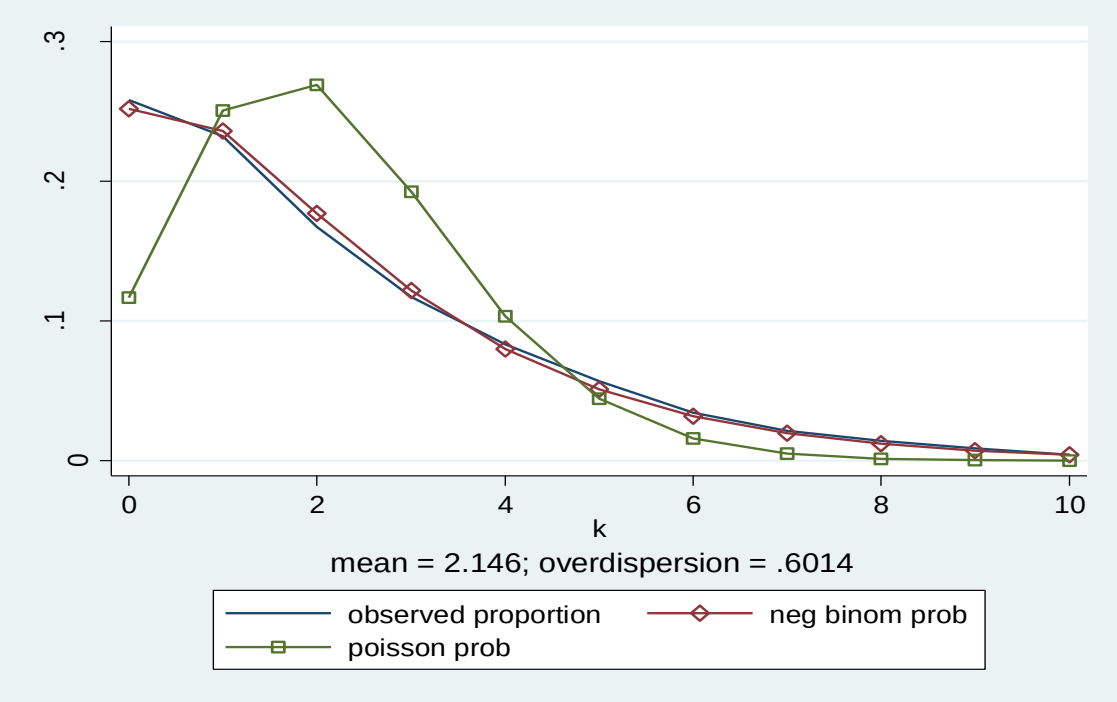

Table A.1 Definitions

Author(s)	Informal care giving	Outcome variable(s)
Boaz and Muller (1992)	Hours of unpaid caregiving to elderly parents needing help with ADLs or IADLs.[40]	Hours of paid work: full time and part time.
Bolin et al (2008)	Hours of informal care to elderly parents (/inlaws) needing help with personal care, practical care and/or paperwork.	Paid employment (1,0), hours of work and wages.
Carmichael and Charles (1998)	Informal care (1,0), hours of informal care to at least one dependent relative e.g. parent or handicapped child.	Paid employment (1,0), hours of work and log of gross hourly wage rate and log of predicted gross hourly wage rate.
Carmichael and Charles (2003)	Caring less or more than 10 hours per week, (main) co-residential care and (main) extra-residential care to a dependent.	Paid employment (1,0), log of gross hourly wage rate.
Casado-Marín et al (2009)	Becoming a caregiver for a dependent inside or outside the household and hours of informal caregiving (if caregiving=1).	Employment (1,0), full time employment (if employment=1) and income.
Casado-Marín et al (2011)	Caring for a dependent (1,0), caring for a dependent inside or outside the household	No employment (1,0), part time employment (1,0) if working between 15-30

[40] ADLs: "bathing, dressing, getting around inside the house, getting in and out of bed, getting to the toilet, continence, and eating."

IADLs: "housework, laundry, meal preparation, shopping for groceries, getting around outside the house, managing money, using the phone, and taking oral medicine." (Boaz and Muller 1992)

	(1,0).[41]	hours/wk and full time employment (1,0) if working 30 or more hours/wk.
Ciani (2012)	Looking after at least one person (non-children).	Employment (1,0) if at least working one hour.
Crespo (2007)	Informal care giving to elderly parents needing help with personal care, practical care and/or paperwork.	Employment (1,0) if working a positive number of hours or working part time, full time or self-employed/own business.
Crespo and Mira (2010)	See Crespo (2007).	Employment (1,0) if employed or self-employed/own business.
Ettner (1995)	Providing care up to nine hours or more than 9 hours/wk to an extra-residing parent and co-residence with a disabled parent.	Hours of work, labour force participation (1,0) if hours of work>1.
Ettner (1996)	Providing care to an extra-residing parent and co-residence with a disabled parent.	Hours of work.
Heitmueller (2007)	Informal care, co-residential care provided to a sick, disabled or an elderly person, and extra-residential care to a sick, disabled or elderly person.	Paid employment (1,0) or absent from a job.
Heitmueller and Michaud (2006)	See Heitmueller (2007).	See Heitmueller (2007).

[41] Other subtypes of caregiving are: starting caregiving, continuing caregiving, stopping caregiving, caregiving for less than 14 hours/wk, caregiving for between 14-28 hours/wk, caregiving for more than 28 hours/wk.

Heitmueller and Inglis (2007)	Informal care (1,0) if providing co-residential care to a sick, disabled or elderly person and/or extra-residential care to a sick, disabled or elderly person.	Log hourly wage.
Houtven et al (2010)	Informal care (1,0) if providing care to a parent or in-law needing help with personal activities and/or help with other things.	Paid employment or self-employment, hours of work and wages.
Johnson and Lo Sasso (2006)	Hours of care provided to parents needing help with personal activities and/or help with other things.	Hours of paid work.
Kotsadam (2010)	Informal care to and elderly or disabled parent (1,0) and provided hours of care per week.	Paid (self-)employment (and apprenticeship) (1,0) and log of hours of work.
Leigh (2011)	Informal care provided to a disabled spouse/relative or to parents/in-laws for at least 10 hours per week. Carer (1,0) if received Carer Allowance or Carer Payment.[42]	Currently employed, employed in the previous financial year, number of weeks worked per year, worked hours per week, log hourly wage.
Viitanen (2005)	Informal care to and elderly or disabled parent (1,0).	Paid employment (1,0).

[42] "Carer Allowance helps carers who are looking after a child or an adult with a severe disability or medical condition who needs a lot of additional attention", while "Carer Payment is an income support payment for carers who, because of the demands of their caring role, are unable to support themselves through full participation in the work force" (Leigh 2010).

Wolf and Soldo (1994)	Informal care giving to a disabled or chronically ill parent in the same household or care provided to a seriously ill or disabled parent living outside the household.	Usually worked hours.

Table A.2 Review literature employment

Author(s) (year of publication)	Type of data (country; dataset)	Method I:	Method II:	Main results	Other findings/suggestions
Boaz and Muller (1992)	Cross-sectional (United States; NLTCS&NICS; 1982)	- Estimation of a simultaneous equation model; assumption: informal care is endogenous to paid work and vice versa. - Use two-stage procedure to deal with correlated error terms.		- Unpaid help slightly affects full time work (-0.3%). - Full-time employment reduces informal caregiving by 20 hours per week. - No significant effect is found for part-time work in both directions.	- Care recipient's characteristics are very important in the number of hours devoted to unpaid help. - Co-residential carers provide many more hours compared to extra-residential carers.
Bolin et al (2008)	Cross-sectional (11 European countries; SHARE; first wave)	- IV-approach *Instruments*: - health status parents - age parents - parents live more than 100km away		- Full sample: significant negative effect on employment of 3.7%. In the female sample the results suggest a significant negative effect of 2.8%, for males this was 3.2% (both at a 10% sign. level).	- No significant effect on wages (full sample). - The effect was found to be stronger in Central Europe than in Southern Europe. Wage rates were less affected in Central Europe.

		- number of brothers and sisters		- Also significant negative effect on hours worked: 2.6% (only for full sample).	- Null hypothesis of informal caregiving being exogenous could not be rejected.
Carmichael and Charles (1998)	Cross-sectional (United Kingdom; GHS; 1985)			- Significant negative effect of approximately 10% on wages if providing informal care for at least 20 h/wk.	- Providing less than 20 h/wk has a significant *positive* effect of almost 27% on labour supply. Providing more than 20 h/wk has a significant positive effect of about 18% on labour supply.
Carmichael and Charles (2003)	Cross-sectional (United Kingdom; GHS; 1990)			- In the male sample the results suggest a significant negative effect of ca. 13% if providing at least 10 h week of informal care on the employment probability. In the female sample the negative effect was larger, 27%.	- Effect is attributable to the negative indirect earnings effect.[43] - They suggest it would be useful to estimate a general time-allocation model to allow for endogeneity.
Casado-Marín et al	Panel data (14 European countries,	-	- Use of the standard ATET estimator of	- Women who are not working prior to	- Also a significant negative effect on labour

[43] Carers earn less → therefore they are also less likely to be working (earnings and employment are positively correlated).

(2009)	ECHP, 8 waves)		expression which includes pre-treatment outcomes within the vector X (includes unobserved factors) of conditioning variables.	becoming a caregiver are significantly less likely to enter labour force (2.4% in SC and 3.5% in CC). For women who were working prior to becoming a caregiver the effect is also negative: 1.6% in SC en 1.9% in CC.	income which tends to be offset by an increase in social transfers in the SC and SCC (total effect is null).
Casado-Marín et al (2011)	Panel data (Spain, ECHP, 8 waves)	- Sensitivity analysis: two simultaneous equations with dynamics (time variant individual unobserved heterogeneity)	- Individual fixed effects; parametric relationship between the observable variables and the unobserved individual fixed effect (time-invariant individual fixed effects)	- Results suggest opportunity costs for women providing co-residential care, and/or provide care for more than one year, and/or provide care more than 28 h/wk.	- Effects on part-time work are non-negligible. - Co-residential care reduces probability of full-time employment by 2.7%. - Women seem to transit from employment to non-employment. - Exogeneity assumption cannot be rejected.
Ciani (2012)	Panel data (13 European countries, ECHP, 8 waves)	-IV-approach *Instruments:* - presence of disabled	- Linear fixed effects estimation	- Finds significant but small negative effect, on average, of co-residential parental	- Exogeneity assumption of IC cannot be rejected with respect to time variant individual

		person in the same HH - presence of person with poor health in the same HH	caregiving to labour supply. - Difference between baseline and IV-estimates not robust once controlled for unobserved individual heterogeneity.	unobserved heterogeneity.
Crespo (2007)	Cross-sectional (Europe, SHARE, first wave,	IV-approach Instruments: - dummy brother - dummy sister - both parents alive - age parent - health parent	- For both groups of countries negative effect on the probability of employment: 6pp in NC and 4pp in SC. - Under endogeneity substantially stronger negative effect: 28pp in NC and 32pp in SC.	- Suggests underestimation of the effect under the exogeneity assumption.
Crespo and Mira (2010)	Cross-section and panel data (European countries; SHARE,mfirst 2 waves)	- Instrumental variables treatment effects framework, which emphasises heterogeneity of treatment effects and	- In Northern and Central countries the aggregate loss of employment due to daily informal care giving seems negligible	- Local average treatment effect of daily care on labour supply, identified by variation in parental health, is a parameter of

		also shows which causal parameters can be identified by the IV estimates.	(close to zero). - Clear and robust north-south gradient in the negative effect of poor parental health on the probability of daily caregiving.	interest.
Ettner (1995)	Cross-sectional (pooled data) (US; SIPP; 1986-1988;)	- IV-approach Instruments: - parental education - the number of brothers and sisters - predicted probabilities form the multinomial logit regression	Co-residence with disabled parent has significant negative impact on female labour supply (reduction of 130 hours of work in an 18-week period). - The IV estimates suggest a larger effect.	
Ettner (1996)	Cross-sectional (US; NSFH; 1987)	- IV-approach Instruments: - age parents - health status parents - parents married - number of brothers	- Only significant effect of extra-residential parental caregiving on female labour supply.	- No significant effect was found for males.

		and sisters - parent's SES - parents' health and age missing - parents SES missing			
Heitmueller (2007)	Cross-sectional and panel data (England; BHPS; 2002)	IV-approach: 2SLS Instruments - number of sick or disabled people in the same HH. - age of three closest friends	- quasi fixed effects method used.	- Co-residential care giving significantly reduces the employment probability (up to 15pp). - Extra-residential care does not have a significant effect on employment.	- Durbin-Wu-Hausman test and Smith-Blundell indicate endogeneity of care variable. This does not apply to the co-residence care variable. - Overestimation of the effect if not controlled for fixed unobserved heterogeneity.
Heitmueller and Inglis (2007)	Cross-sectional findings and also exploit longitudinal dimension (UK; BHPS; 1993 and 2002)	-	-	Wage penalty caregivers (especially for women i.e. wage gap of 13 log pp). Wage penalty varies along the pay distribution and by gender.	
Heitmueller and	Panel data (England;	-	Multivariate dynamic panel data methods to	-Evidence for causal link from informal care to	

Michaud (2006)	BHPS; 1991-2003)		account for state dependence, feedback effects and correlated unobserved heterogeneity.	employment. - Employment rates reduced by up to 6 pp (only found for co-residential carers)	
Houtven et al (2010)	Panel data (US; HRS; 9 waves, 1992-2008)	- IV-approach Instruments: - Parent or in-law has ADL needs - Parent or in-law cannot be left alone - Parent or in-law died - Parent or in-law became widowed	- LPM with Fixed effects	- Caregivers are about 2 pp less likely to be in labour force (magnitudes of the effect are quite similar for both males and females).	- Wage penalties exist for females. - Wage premiums exist for males. - No evidence found on the endogeneity of informal care on work.
Johnson and Lo Sasso (2006)	Panel data (US; HRS; 1996&1998)	- Simultaneous estimation of a model of assistance to a parent including instruments: - age and health status parents. - number of brothers	- Take advantage of the random effects model.	- Findings suggest that providing elder care strongly reduces female labour supply at midlife (159 hours of work per year). - Results suggest an underestimation of the effect if not controlling	

		and sisters care giver - parental marital status - financial situation parents - indicator z for when the mother is alive.		for unobserved heterogeneity (reduction of 367 hours of work per year in total) .	
Kotsadam (2010)	Panel data (European countries, ECHP, 1994-2001)	-	- Compares coefficients from the random effects logit model to the logit fixed effects model (using Hausman tests) - Linear fixed effects model.	- Finds significant negative association between informal care giving to elderly and labour supply in SC: 7pp and in CC: 3pp.	- Difference between SC and CC is not significant.
Leigh (2011)	Panel data (Australia; HILDA; 2001-2007)		- Individual fixed effects model (OLS).	- The negative effect seems quite smaller in the panel (5.4pp) compared to the cross-section (20pp).	- Suggests that large estimated effects with cross-sectional data is likely to be driven by unobserved individual heterogeneity (one-fourth to one-sixth).
Viitanen (2005)	Panel data (13 European countries;	-	-	- Informal care giving has only a significant negative impact on the	- Indication of unobserved heterogeneity driving the

	ECHP; 1994-2001)		probability of employment in Germany: 0.3pp.	results (45-86%).
Wolf and Soldo (1994)	Cross-sectional (US, NSFH, 1987-1988)	-IV-approach (simultaneous equation model) *Instruments* - Old/sick parent - Healthy parent - Interaction term of the above two. - number of living brothers, sisters, and siblings-in-law.	- Results show no indication of reduced probability of being employed, or reduced hours of work due to parental care giving.	

Table A.3a Descriptive statistics: Employment

Variable		Females (% if binary)	Males (% if binary)
Dependent			
EMP	1 if in (self)employment, 0 otherwise	55.2	63.1
Independent			
CARE	1 if any type of informal care, 0 otherwise	48.9	44.6
PARCARE	1 if extra-residential personal care to a parent/parents, 0 otherwise	9.4	3.6
ICARE	1 if co-residential and/or extra-residential personal care to anyone, 0 otherwise	18.4	9.4
COCARE	1 if co-residential personal care to anyone, 0 otherwise	4.7	3.5
EXCARE	1 if extra-residential personal care to anyone, 0 otherwise	14.5	6.2
PRAC	1 if helping anyone with practical activities, 0 otherwise	37.2	33.2
PAPER	1 if helping anyone with paperwork, 0 otherwise	18.4	18.8
single	1 if single living parent, 0 otherwise	42.5	37.9
poorhealth	1 if parent is in poor health (as perceived by respondent), 0 otherwise	23.1	19.1
siblalive	Number of siblings alive	2.8 (2.06)	2.8 (2.09)
female	1 if female, 0 if otherwise	43.3	56.7

age	Age in years	54.8 (2.81)	57.1 (4.23)
agesq	Age^2	3006.5 (308.69)	3275.1 (485.59)
marit1	1 if married, 0 otherwise	71.1	81.6
yearseduc	Number of years of education	11.2 (4.08)	11.7 (4.23)
verygood	1 if reported very good/excellent health, 0 otherwise	39.0	43.8
nchronic	Number of chronic conditions	1.2 (1.25)	1.1 (1.18)
adl	Number of ADLs	0.1 (0.45)	0.1 (0.46)
grchildren	Number of grandchildren	1.2 (1.95)	1.1 (1.98)
children	Number of children	2.0 (1.25)	2.1 (1.33)
owner	1 if owning a house, 0 otherwise	72.1	75.8
rural	1 if living in a rural area, 0 otherwise	23.0	24.4
hhsize	Number of household members	2.4 (1.10)	2.5 (1.14)
native	1 if born in country of interview, 0 otherwise	91.9	91.8
dwave	1 if wave=1, 0 otherwise	59.7	62.3
Denmark	1 if country of interview is Denmark, 0 otherwise	7.8	9.8
Sweden	1 if country of interview is Sweden, 0 otherwise	11.1	10.6
Netherlands	1 if country of interview is the Netherlands, 0 otherwise	13.1	11.9
Austria	1 if country of interview is Austria, 0 otherwise	4.2	4.8

Belgium	1 if country of interview is Belgium, 0 otherwise	11.9	12.5
Germany	1 if country of interview is Germany, 0 otherwise	8.8	9.5
France	1 if country of interview is France, 0 otherwise	9.0	9.0
Switzerland	1 if country of interview is Switzerland, 0 otherwise	4.8	5.1
Spain	1 if country of interview is Spain, 0 otherwise	9.0	6.8
Italy	1 if country of interview is Italy, 0 otherwise	9.8	8.5
Greece	1 if country of interview is Greece, 0 otherwise	10.5	11.4

Standard deviation in parentheses

Table A.3b Descriptive statistics: Mental health

Variable		Females (% if binary)	Males (% if binary)
Dependent			
Depressed	1 if depressed/sad last month, 0 otherwise	44.5	26.0
Depressed3	1 if more than 3 symptoms on EUROD 12-item scale, 0 otherwise	29.5	14.5
EUROD	Number of depressive symptoms on EUROD 12-item scale	2.6 (2.29)	1.7 (1.89)
Independent			
CARE	1 if any type of informal care, 0 otherwise	40.8	39.0
PARCARE	1 if extra-residential personal care to a parent/parents, 0 otherwise	5.7	2.2
ICARE	1 if co-residential and/or extra-residential personal care to anyone, 0 otherwise	15.4	8.5
COCARE	1 if co-residential personal care to anyone, 0 otherwise	5.7	4.1
EXCARE	1 if extra-residential personal care to anyone, 0 otherwise	10.7	4.7
PRAC	1 if helping anyone with practical activities, 0 otherwise	30.8	28.7
PAPER	1 if helping anyone with paperwork, 0 otherwise	11.9	13.8
siblalive	Number of siblings alive	2.7 (2.05)	2.7 (2.06)

children	Number of children	2.2 (1.37)	2.2 (1.35)
age75	1 if parent is aged 75 or above, 0 otherwise	31.5	31.0
female	1 if female, 0 if otherwise	53.2	46.8
age	Age in years	60.9 (7.03)	61.2 (6.98)
agesq	Age^2	3757.9 (870.77)	3799.67 (866.52)
winter	1 if month of interview was December, January, February or March, 0 otherwise	20.2	21.6
marit1	1 if married, 0 otherwise	75.6	86.7
yearseduc	Number of years of education	10.0 (4.35)	10.8 (4.46)
diabetes	1 if reported to have diabetes, 0 otherwise	8.1	9.3
lungdis	1 if reported to have chronic lung disease, 0 otherwise	4.1	5.2
asthma	1 if reported to have asthma, 0 otherwise	4.9	3.9
arthritis	1 if reported to have arthritis, 0 otherwise	22.8	12.3
osteoporosis	1 if reported to have osteoporosis, 0 otherwise	10.8	1.4
cataracts	1 if reported to have cataracts, 0 otherwise	4.9	3.6
lfp	1 if in (self-)employment, 0 otherwise	30.4	42.9
hhincome-equippp	Household income equivalence, PPP adjusted (Germany as a base)	27842.06 (30483.93)	29550.67 (29921.78)

rural	1 if living in a rural area, 0 otherwise	24.2	25.5
hhsize	Number of household members	2.2 (0.97)	2.4 (1.02)
dwave	1 if wave=1, 0 otherwise	72.7	71.7
Denmark	1 if country of interview is Denmark, 0 otherwise	8.2	8.4
Sweden	1 if country of interview is Sweden, 0 otherwise	10.2	10.2
Netherlands	1 if country of interview is the Netherlands, 0 otherwise	11.5	11.4
Austria	1 if country of interview is Austria, 0 otherwise	4.9	4.4
Belgium	1 if country of interview is Belgium, 0 otherwise	11.0	11.2
Germany	1 if country of interview is Germany, 0 otherwise	10.1	10.6
France	1 if country of interview is France, 0 otherwise	10.1	9.8
Switzerland	1 if country of interview is Switzerland, 0 otherwise	4.5	4.6
Spain	1 if country of interview is Spain, 0 otherwise	8.8	8.4
Italy	1 if country of interview is Italy, 0 otherwise	11.0	10.7
Greece	1 if country of interview is Greece, 0 otherwise	9.6	10.4

Standard deviation in parentheses

Table A.4a Stock Yogo weak ID test

Stock Yogo weak ID test critical values:	
5% maximal IV relative bias	13.91
10% maximal IV relative bias	9.08
20% maximal IV relative bias	6.46
30% maximal IV relative bias	5.39
10% maximal IV size	22.30
15% maximal IV size	12.83
20% maximal IV size	9.54
25% maximal IV size	7.80

Table A.4b Validity of instruments employment (females)

	CARE	**PARCARE**	**ICARE**	**COCARE**	**EXCARE**	**PRAC**	**PAPER**
Correlations:							
Single	0.1281	0.1456	0.0630	-0.0262	0.0878	0.1256	0.1334
Poorhealth	0.0970	0.1617	0.0847	-0.0115	0.1018	0.0766	0.1002
Number of siblings alive	-0.0481	-0.0313	-0.0191	-0.0185	-0.0120	-0.0276	-0.0799
Kleibergen –Paap rk LM statistic	99.591	140.436	40.457	8.706	59.838	82.508	99.384
Chi-square (3) P-value	0.0000	0.0000	0.0000	0.0335	0.0000	0.0000	0.0000
Cragg-Donald Wald F statistic	33.325	64.940	14.929	3.211	23.461	28.155	37.135
Kleibergen-Paap rk Wald F statistic	34.091	49.483	13.650	2.867	20.333	27.858	34.193
Hansen J statistic	1.457	1.680	1.749	1.124	1.645	1.208	1.504
Chi-square (2) P-value	0.4826	0.4316	0.4171	0.5702	0.4394	0.5465	0.4713

Table A.4c Validity of instruments employment (males)

	CARE	PARCARE	ICARE	COCARE	EXCARE	PRAC	PAPER
Correlations:							
Single	0.0966	0.0938	0.0312	-0.0043	0.0392	0.0822	0.1262
Poorhealth	0.0809	0.1125	0.0520	-0.0026	0.0700	0.0772	0.0892
Number of siblings alive	-0.0334	-0.0438	-0.0178	0.0080	-0.0294	-0.0268	-0.0513
Kleibergen –Paap rk LM statistic	72.609	69.264	14.835	0.033	22.874	58.682	96.078
Chi-square (3) P-value	0.0000	0.0000	0.0020	0.9984	0.0000	0.0000	0.0000
Cragg-Donald Wald F statistic	24.557	34.932	6.130	0.011	10.163	20.415	36.557
Kleibergen-Paap rk Wald F statistic	24.622	23.819	4.966	0.011	7.726	19.857	32.773
Hansen J statistic	8.918	8.873	8.212	0.082	8.121	8.958	8.549
Chi-square (2) P-value	0.0116	0.0118	0.0165	0.9600	0.0172	0.0113	0.0139

All output Tables: Robust standard errors in parentheses; *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Table A.4e First stage results employment (females)

VARIABLES	CARE	PARCARE	ICARE	COCARE	EXCARE	PRAC	PAPER
age	0.15	0.04	0.02	-0.01	0.04	0.12	0.09
	(0.102)	(0.059)	(0.081)	(0.045)	(0.073)	(0.097)	(0.078)
agesq	-0.00	-0.00	-0.00	0.00	-0.00	-0.00	-0.00
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
marit1	-0.01	-0.00	0.01	-0.01	0.01	0.01	-0.01
	(0.018)	(0.010)	(0.014)	(0.009)	(0.013)	(0.017)	(0.014)
yearseduc	0.00*	0.00**	0.00+	-0.00*	0.00**	0.00	0.01***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
verygood	0.04**	0.01	-0.00	-0.01	0.00	0.04*	0.04**
	(0.015)	(0.009)	(0.012)	(0.006)	(0.011)	(0.015)	(0.012)
nchronic	0.02***	0.01	0.01**	0.00	0.01**	0.01*	0.01**
	(0.006)	(0.003)	(0.005)	(0.003)	(0.004)	(0.006)	(0.005)
adl	-0.02	-0.01*	-0.00	0.01	-0.01	-0.03*	-0.00
	(0.015)	(0.005)	(0.011)	(0.007)	(0.010)	(0.014)	(0.011)
grchildren	0.00	0.00	0.01*	0.01**	0.00	-0.00	-0.00
	(0.004)	(0.002)	(0.003)	(0.002)	(0.003)	(0.004)	(0.003)
children	-0.02*	-0.01	-0.02**	-0.01*	-0.01	-0.00	0.00
	(0.007)	(0.004)	(0.005)	(0.003)	(0.005)	(0.007)	(0.005)
owner	0.02	0.02+	-0.01	-0.01	-0.00	0.03+	0.02
	(0.017)	(0.009)	(0.013)	(0.007)	(0.012)	(0.016)	(0.013)
rural	0.00	0.01	0.01	0.01	-0.00	0.02	-0.02
	(0.017)	(0.010)	(0.014)	(0.008)	(0.012)	(0.017)	(0.013)
hhsize	0.02*	0.01+	0.03***	0.02***	0.01	-0.01	-0.00
	(0.009)	(0.005)	(0.007)	(0.005)	(0.006)	(0.008)	(0.006)
native	-0.15***	-0.07***	-0.08***	-0.01	-0.07***	-0.14***	-0.08***
	(0.025)	(0.010)	(0.017)	(0.010)	(0.015)	(0.023)	(0.018)
dwave	-0.01	0.00	-0.01	0.00	-0.00	-0.00	-0.00
	(0.014)	(0.009)	(0.012)	(0.006)	(0.011)	(0.014)	(0.012)
Denmark	0.25***	-0.02	-0.03	-0.01	-0.03	0.29***	0.07*
	(0.034)	(0.018)	(0.026)	(0.013)	(0.024)	(0.032)	(0.026)
Sweden	0.25***	-0.00	-0.04+	-0.03*	-0.02	0.29***	0.11***
	(0.030)	(0.018)	(0.023)	(0.012)	(0.022)	(0.029)	(0.024)
Netherlands	0.23***	0.04*	0.02	-0.01	0.02	0.25***	0.05*
	(0.029)	(0.018)	(0.024)	(0.012)	(0.022)	(0.027)	(0.021)
Austria	0.02	-0.01	-0.04	-0.02	-0.04	0.05	0.00
	(0.038)	(0.020)	(0.029)	(0.016)	(0.026)	(0.035)	(0.026)
Belgium	0.23***	0.01	-0.01	-0.00	-0.01	0.25***	0.09***
	(0.029)	(0.017)	(0.023)	(0.013)	(0.021)	(0.027)	(0.022)
France	0.09**	-0.01	-0.03	-0.01	-0.03	0.08**	0.07**
	(0.032)	(0.017)	(0.024)	(0.014)	(0.021)	(0.028)	(0.023)
Germany	0.16***	0.01	-0.01	-0.00	-0.01	0.18***	0.08**
	(0.032)	(0.019)	(0.026)	(0.015)	(0.023)	(0.031)	(0.025)
Switzerland	0.14***	0.03	-0.02	-0.01	-0.02	0.11**	0.11***
	(0.039)	(0.024)	(0.030)	(0.015)	(0.027)	(0.037)	(0.031)
Italy	0.06*	0.01	0.05*	0.01	0.05*	0.01	0.06**
	(0.031)	(0.018)	(0.026)	(0.016)	(0.024)	(0.027)	(0.022)
Spain	-0.03	-0.00	0.02	0.03	-0.01	-0.02	0.01
	(0.030)	(0.018)	(0.026)	(0.017)	(0.022)	(0.026)	(0.020)
single	0.10***	0.07***	0.04***	-0.01	0.05***	0.10***	0.08***
	(0.014)	(0.009)	(0.011)	(0.006)	(0.010)	(0.014)	(0.011)
poorhealth	0.08***	0.09***	0.06***	-0.00	0.07***	0.06**	0.06***
	(0.017)	(0.013)	(0.014)	(0.007)	(0.014)	(0.017)	(0.015)
siblalive	-0.01*	-0.00	-0.00	-0.00*	0.00	-0.00	-0.01***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)
Constant	-3.86	-1.02	-0.41	0.29	-1.17	-3.20	-2.30
	(2.797)	(1.615)	(2.210)	(1.231)	(2.005)	(2.672)	(2.137)

Observations	5,228	5,228	5,228	5,228	5,228	5,228	5,228
R-squared	0.08	0.05	0.03	0.03	0.03	0.09	0.06
F test	18.26	8.82	5.46	4.01	5.32	21.98	11.42

Table A.4f First stage results employment (males)

VARIABLES	CARE	PARCARE	PARCOCARE	ICARE	COCARE	EXCARE	PRAC	PAPER
age	-0.05	0.01	-0.00	0.01	-0.00	0.01	-0.05	-0.03
	(0.040)	(0.016)	(0.006)	(0.025)	(0.016)	(0.020)	(0.038)	(0.032)
agesq	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00	0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
marit1	0.02	0.01	-0.00	0.03*	-0.00	0.03***	-0.00	0.03+
	(0.018)	(0.007)	(0.003)	(0.011)	(0.007)	(0.008)	(0.017)	(0.014)
yearseduc	0.01***	0.00**	0.00	0.00**	-0.00	0.00***	0.00	0.01***
	(0.002)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
verygood	0.03*	0.01	0.00*	0.00	-0.00	-0.00	0.04**	0.02*
	(0.013)	(0.005)	(0.002)	(0.008)	(0.005)	(0.006)	(0.012)	(0.010)
nchronic	0.01	0.00	0.00	0.01+	0.00+	0.00	0.01+	0.01*
	(0.005)	(0.002)	(0.001)	(0.003)	(0.002)	(0.003)	(0.005)	(0.004)
adl	-0.01	-0.00	-0.00**	0.01	0.02*	-0.01	-0.03**	-0.00
	(0.013)	(0.003)	(0.000)	(0.009)	(0.008)	(0.004)	(0.011)	(0.010)
grchildren	0.00	-0.00	0.00	0.00	0.00+	0.00	-0.00	0.00
	(0.004)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
children	-0.00	-0.00	0.00	-0.01***	-0.01**	-0.01*	0.00	-0.00
	(0.006)	(0.002)	(0.001)	(0.003)	(0.002)	(0.002)	(0.005)	(0.004)
owner	0.02	-0.00	0.00	-0.01	-0.00	-0.01	0.03*	0.01
	(0.015)	(0.005)	(0.002)	(0.009)	(0.006)	(0.007)	(0.014)	(0.011)
rural	-0.01	-0.00	0.00	-0.00	0.00	-0.00	-0.01	-0.02
	(0.014)	(0.006)	(0.002)	(0.009)	(0.006)	(0.007)	(0.014)	(0.011)
hhsize	0.00	0.00	0.00	0.01*	0.02***	-0.00	-0.01	-0.00
	(0.007)	(0.003)	(0.001)	(0.004)	(0.003)	(0.003)	(0.006)	(0.005)
native	-0.11***	-0.03***	-0.00	-0.03*	0.00	-0.03**	-0.08***	-0.07***
	(0.022)	(0.006)	(0.002)	(0.012)	(0.008)	(0.009)	(0.021)	(0.016)
dwave	0.03*	0.00	0.00	0.01	0.00	0.01	0.02	0.01
	(0.013)	(0.005)	(0.002)	(0.008)	(0.005)	(0.006)	(0.012)	(0.010)
Denmark	0.28***	-0.01	0.00	-0.03*	-0.01	-0.02*	0.34***	0.05*
	(0.026)	(0.009)	(0.004)	(0.014)	(0.009)	(0.011)	(0.024)	(0.021)
Sweden	0.30***	-0.00	0.00	0.00	-0.01	0.01	0.33***	0.08***
	(0.025)	(0.009)	(0.003)	(0.015)	(0.009)	(0.012)	(0.023)	(0.020)
Netherlands	0.30***	0.02+	0.01*	0.03+	0.01	0.02+	0.27***	0.12***
	(0.025)	(0.010)	(0.004)	(0.015)	(0.010)	(0.012)	(0.023)	(0.021)
Austria	0.14***	-0.01	-0.00	-0.02	-0.01	-0.02	0.20***	-0.01
	(0.032)	(0.010)	(0.002)	(0.017)	(0.012)	(0.012)	(0.030)	(0.023)
Belgium	0.28***	0.03*	0.01	0.05**	0.00	0.05***	0.30***	0.08***
	(0.024)	(0.010)	(0.003)	(0.015)	(0.010)	(0.013)	(0.022)	(0.019)
France	0.13***	0.01	0.01	0.01	-0.01	0.01	0.13***	0.06**
	(0.026)	(0.010)	(0.004)	(0.016)	(0.010)	(0.013)	(0.023)	(0.021)
Germany	0.20***	-0.01	0.00	-0.00	-0.00	-0.00	0.26***	0.03
	(0.027)	(0.010)	(0.003)	(0.016)	(0.010)	(0.013)	(0.025)	(0.021)
Switzerland	0.12***	0.00	-0.00	-0.02	-0.02*	0.00	0.14***	0.04
	(0.032)	(0.012)	(0.002)	(0.017)	(0.010)	(0.015)	(0.028)	(0.025)
Italy	0.10***	0.02+	0.00	0.08***	0.01	0.06***	0.05*	0.05*
	(0.026)	(0.011)	(0.003)	(0.019)	(0.012)	(0.015)	(0.022)	(0.020)
Spain	-0.03	0.02	0.00	0.06**	0.02	0.04**	-0.04*	-0.03
	(0.025)	(0.011)	(0.004)	(0.019)	(0.013)	(0.015)	(0.019)	(0.018)
single	0.07***	0.02***	0.00+	0.01	-0.00	0.00	0.06***	0.08***
	(0.013)	(0.006)	(0.002)	(0.008)	(0.005)	(0.007)	(0.012)	(0.011)
poorhealth	0.07***	0.04***	0.00	0.03**	0.00	0.04***	0.06***	0.05***
	(0.016)	(0.008)	(0.003)	(0.011)	(0.006)	(0.009)	(0.016)	(0.014)
siblalive	-0.01+	-0.00***	-0.00**	-0.00	-0.00	-0.00*	-0.00	-0.01**
	(0.003)	(0.001)	(0.000)	(0.002)	(0.001)	(0.001)	(0.003)	(0.002)
Constant	1.56	-0.21	0.04	-0.22	0.08	-0.10	1.70	0.90
	(1.158)	(0.467)	(0.163)	(0.708)	(0.449)	(0.587)	(1.086)	(0.915)
Observations	6,834	6,834	6,834	6,834	6,834	6,834	6,834	6,834
R-squared	0.09	0.03	0.01	0.02	0.01	0.02	0.10	0.06
F test	27.77	5.38	1.13	5.43	3.04	5.30	34.30	17.78

Table A.5a Results employment (CARE)

EMP	F	F	F	F	M	M	M	M
VARIABLES	OLS	FE	IV	IVFE	OLS	FE	IV	IVFE
CARE	-0.01	-0.05*	0.05	-0.02	0.00	0.00	0.02	0.21
	(0.013)	(0.024)	(0.092)	(0.324)	(0.010)	(0.019)	(0.098)	(0.271)
age	0.15+	0.04	0.14	0.05	0.26***	0.30***	0.26***	0.27***
	(0.091)	(0.141)	(0.093)	(0.140)	(0.033)	(0.070)	(0.033)	(0.082)
agesq	-0.00*	-0.00	-0.00+	-0.00	-0.00***	-0.00***	-0.00***	-0.00**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
marit1	-0.04*	-0.02	-0.04*	-0.01	0.02	0.06	0.02	0.08
	(0.016)	(0.064)	(0.016)	(0.074)	(0.016)	(0.056)	(0.016)	(0.060)
yearseduc	0.02***	-0.00	0.02***	-0.00	0.01***	0.00	0.01***	0.00
	(0.002)	(0.004)	(0.002)	(0.005)	(0.001)	(0.004)	(0.002)	(0.004)
verygood	0.08***	0.02	0.07***	0.02	0.08***	-0.01	0.08***	0.00
	(0.014)	(0.024)	(0.015)	(0.026)	(0.011)	(0.020)	(0.011)	(0.022)
nchronic	-0.04***	0.01	-0.04***	0.01	-0.04***	0.00	-0.04***	0.01
	(0.006)	(0.016)	(0.006)	(0.016)	(0.005)	(0.013)	(0.005)	(0.013)
adl	-0.10***	-0.02	-0.10***	-0.02	-0.08***	-0.04	-0.08***	-0.05
	(0.013)	(0.021)	(0.013)	(0.023)	(0.010)	(0.031)	(0.010)	(0.031)
grchildren	-0.00	-0.00	-0.00	-0.00	-0.01**	-0.01	-0.01**	-0.02
	(0.004)	(0.011)	(0.004)	(0.011)	(0.003)	(0.011)	(0.003)	(0.014)
children	-0.01*	-0.02	-0.01+	-0.02	0.01*	0.01	0.01*	0.02
	(0.006)	(0.037)	(0.007)	(0.039)	(0.005)	(0.023)	(0.005)	(0.028)
owner	0.04**	-0.10	0.04**	-0.10	0.04***	0.04	0.04***	0.02
	(0.015)	(0.062)	(0.015)	(0.063)	(0.013)	(0.038)	(0.013)	(0.043)
rural	-0.02	0.20	-0.02	0.19	0.03*	-0.05	0.03*	-0.04
	(0.015)	(0.162)	(0.015)	(0.167)	(0.012)	(0.077)	(0.012)	(0.083)
hhsize	-0.02**	-0.03*	-0.02**	-0.03+	0.01*	-0.00	0.01*	-0.00
	(0.008)	(0.012)	(0.008)	(0.016)	(0.006)	(0.014)	(0.006)	(0.016)
native	-0.01		0.01		-0.09***		-0.08***	
	(0.024)		(0.028)		(0.020)		(0.023)	
dwave	-0.02	-0.06	-0.02	-0.05	-0.04***	0.16*	-0.04***	0.15*
	(0.013)	(0.074)	(0.013)	(0.100)	(0.010)	(0.065)	(0.010)	(0.069)
Denmark	0.30***		0.28***		0.01		0.01	
	(0.029)		(0.037)		(0.022)		(0.034)	
Sweden	0.40***		0.38***		0.12***		0.11**	
	(0.027)		(0.036)		(0.021)		(0.037)	
Netherlands	0.15***		0.13***		-0.05*		-0.05	
	(0.027)		(0.034)		(0.021)		(0.035)	
Austria	0.05		0.05		-0.11***		-0.12***	
	(0.036)		(0.036)		(0.026)		(0.030)	
Belgium	0.10***		0.08*		-0.13***		-0.14***	
	(0.028)		(0.035)		(0.021)		(0.034)	
France	0.27***		0.26***		-0.11***		-0.11***	
	(0.030)		(0.031)		(0.023)		(0.026)	
Germany	0.22***		0.20***		-0.07**		-0.08**	
	(0.030)		(0.033)		(0.023)		(0.030)	
Switzerland	0.30***		0.29***		0.09***		0.09**	
	(0.035)		(0.038)		(0.026)		(0.028)	
Italy	0.06*		0.05+		-0.12***		-0.13***	
	(0.028)		(0.028)		(0.023)		(0.025)	
Spain	0.08**		0.08**		-0.03		-0.02	
	(0.029)		(0.029)		(0.025)		(0.025)	
Constant	-3.09	0.50	-2.78		-5.55***	-9.07***	-5.58***	
	(2.507)	(4.186)	(2.550)		(0.954)	(2.374)	(0.958)	
Observations	5,228	5,228	5,228	1,518	6,834	6,834	6,834	1,800
R-squared	0.22	0.03	0.22	0.03	0.31	0.06	0.31	-0.07
F test	85.95	1.73	84.84	1.30	176.90	3.68	176.59	3.38
Number of pid		4,469		759		5,934		900

Table A.5b Results employment (ICARE)

EMP	F	F	F	F	M	M	M	M
VARIABLES	OLS	FE	IV	IVFE	OLS	FE	IV	IVFE
ICARE	-0.03*	-0.06*	0.04	-0.09	-0.00	0.02	-0.20	0.89
	(0.016)	(0.026)	(0.172)	(0.285)	(0.017)	(0.032)	(0.327)	(0.952)
age	0.15	0.05	0.15	0.05	0.26***	0.30***	0.26***	0.22+
	(0.091)	(0.140)	(0.092)	(0.142)	(0.033)	(0.071)	(0.034)	(0.127)
agesq	-0.00*	-0.00	-0.00+	-0.00	-0.00***	-0.00***	-0.00***	-0.00
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
marit1	-0.04*	-0.01	-0.04*	-0.01	0.02	0.06	0.03+	0.04
	(0.016)	(0.063)	(0.016)	(0.063)	(0.016)	(0.056)	(0.018)	(0.092)
yearseduc	0.02***	-0.00	0.02***	-0.00	0.01***	0.00	0.01***	0.00
	(0.002)	(0.004)	(0.002)	(0.004)	(0.001)	(0.004)	(0.002)	(0.005)
verygood	0.08***	0.02	0.08***	0.01	0.08***	-0.01	0.08***	-0.01
	(0.014)	(0.024)	(0.014)	(0.025)	(0.011)	(0.020)	(0.011)	(0.033)
nchronic	-0.04***	0.01	-0.04***	0.01	-0.04***	0.00	-0.04***	-0.01
	(0.006)	(0.016)	(0.006)	(0.016)	(0.005)	(0.013)	(0.005)	(0.022)
adl	-0.10***	-0.02	-0.10***	-0.02	-0.08***	-0.04	-0.08***	-0.05
	(0.013)	(0.021)	(0.013)	(0.024)	(0.010)	(0.031)	(0.011)	(0.036)
grchildren	-0.00	-0.00	-0.00	-0.00	-0.01**	-0.01	-0.01**	-0.01
	(0.004)	(0.011)	(0.004)	(0.011)	(0.003)	(0.011)	(0.003)	(0.013)
children	-0.01*	-0.02	-0.01+	-0.02	0.01*	0.01	0.01	0.03
	(0.006)	(0.036)	(0.007)	(0.041)	(0.005)	(0.023)	(0.006)	(0.039)
owner	0.04**	-0.11+	0.04**	-0.11	0.04***	0.04	0.04***	0.02
	(0.015)	(0.063)	(0.015)	(0.067)	(0.013)	(0.038)	(0.013)	(0.060)
rural	-0.02	0.20	-0.02	0.21	0.03*	-0.05	0.03*	0.02
	(0.015)	(0.164)	(0.016)	(0.170)	(0.012)	(0.077)	(0.012)	(0.135)
hhsize	-0.02*	-0.02*	-0.02*	-0.02	0.01*	-0.00	0.01*	-0.01
	(0.008)	(0.012)	(0.010)	(0.019)	(0.006)	(0.014)	(0.007)	(0.021)
native	-0.01		0.00		-0.09***		-0.09***	
	(0.024)		(0.027)		(0.020)		(0.022)	
dwave	-0.02	-0.04	-0.02	-0.04	-0.04***	0.16*	-0.04***	0.15
	(0.013)	(0.073)	(0.013)	(0.074)	(0.010)	(0.064)	(0.010)	(0.092)
Denmark	0.29***		0.30***		0.01		0.01	
	(0.029)		(0.029)		(0.021)		(0.024)	
Sweden	0.39***		0.39***		0.12***		0.12***	
	(0.027)		(0.027)		(0.021)		(0.021)	
Netherlands	0.14***		0.14***		-0.05*		-0.04*	
	(0.027)		(0.028)		(0.021)		(0.022)	
Austria	0.05		0.05		-0.11***		-0.12***	
	(0.036)		(0.037)		(0.026)		(0.027)	
Belgium	0.10***		0.10***		-0.13***		-0.12***	
	(0.027)		(0.027)		(0.021)		(0.026)	
France	0.27***		0.27***		-0.11***		-0.11***	
	(0.030)		(0.030)		(0.023)		(0.023)	
Germany	0.21***		0.21***		-0.07**		-0.07**	
	(0.030)		(0.030)		(0.023)		(0.023)	
Switzerland	0.29***		0.30***		0.09***		0.09**	
	(0.035)		(0.035)		(0.026)		(0.026)	
Italy	0.06*		0.05+		-0.12***		-0.11**	
	(0.028)		(0.029)		(0.023)		(0.034)	
Spain	0.08**		0.08*		-0.03		-0.01	
	(0.029)		(0.030)		(0.025)		(0.031)	
Constant	-3.04	0.16	-3.00		-5.55***	-9.03***	-5.60***	
	(2.505)	(4.165)	(2.511)		(0.953)	(2.378)	(0.963)	
Observations	5,228	5,228	5,228	1,518	6,834	6,834	6,834	1,800
R-squared	0.22	0.03	0.22	0.03	0.31	0.07	0.30	-0.90
F test	86.23	1.68	85.16	1.31	176.92	3.70	171.42	2.14
Number of pid		4,469		759		5,934		900

Table A.6a Validity of instruments mental health (females)

	CARE	PARCARE	ICARE	COCARE	EXCARE	PRAC	PAPER
Correlations:							
Number of siblings alive	**-0.0177**	**-0.0212**	**-0.0025**	**-0.0015**	**-0.0009**	**-0.0077**	**-0.0500**
Children	**-0.0506**	**-0.0263**	**-0.0201**	**0.0204**	**-0.0380**	**-0.0424**	**-0.0456**
Age75	**0.1853**	**0.2379**	**0.1003**	**-0.0155**	**0.1334**	**0.1776**	**0.1894**
Kleibergen –Paap rk LM statistic	**280.027**	**321.794**	**88.475**	**3.836**	**115.611**	**245.114**	**193.682**
Chi-square (3) P-value	**0.0000**	**0.0000**	**0.0000**	**0.279**	**0.0000**	**0.0000**	**0.0000**
Cragg-Donald Wald F statistic	**101.100**	**203.457**	**35.205**	**1.510**	**50.768**	**92.615**	**87.673**
Kleibergen-Paap rk Wald F statistic	**98.683**	**114.209**	**30.048**	**1.277**	**39.395**	**85.265**	**66.732**
Hansen J statistic	**1.470**	**0.916**	**1.604**	**1.571**	**1.405**	**1.298**	**1.004**
Chi-square (2) P-value	**0.4796**	**0.6325**	**0.4484**	**0.4560**	**0.4954**	**0.5226**	**0.6052**

Table A.6b Validity of instruments mental health (males)

	CARE	PARCARE	ICARE	COCARE	EXCARE	PRAC	PAPER
Correlations:							
Number of siblings alive	**-0.0140**	**-0.0274**	**-0.0088**	**0.0040**	**-0.0176**	**-0.0090**	**-0.0359**
Children	**-0.0099**	**-0.0262**	**-0.0254**	**-0.0084**	**-0.0272**	**-0.0055**	**-0.0175**
Age75	**0.1161**	**0.1394**	**0.0478**	**-0.0149**	**0.0774**	**0.1006**	**0.1466**
Kleibergen –Paap rk LM statistic	**98.096**	**106.833**	**35.980**	**12.635**	**33.595**	**78.426**	**104.536**
Chi-square (3) P-value	**0.0000**	**0.0000**	**0.0000**	**0.0055**	**0.0000**	**0.0000**	**0.0000**
Cragg-Donald Wald F statistic	**34.385**	**56.708**	**12.324**	**4.796**	**12.589**	**28.075**	**43.720**
Kleibergen-Paap rk Wald F statistic	**33.295**	**36.476**	**12.111**	**4.204**	**11.286**	**26.439**	**35.595**
Hansen J statistic	**9.826**	**9.913**	**4.113**	**0.295**	**8.033**	**10.428**	**10.442**
Chi-square (2) P-value	**0.0073**	**0.0070**	**0.1279**	**0.8628**	**0.0180**	**0.0054**	**0.0054**

Table A.6c First stage results mental health (females)

VARIABLES	CARE	PARCARE	ICARE	COCARE	EXCARE	PRAC	PAPER
age	0.06***	0.02**	0.03***	0.01	0.03***	0.05***	0.02**
	(0.011)	(0.005)	(0.009)	(0.006)	(0.007)	(0.010)	(0.007)
agesq	-0.00***	-0.00***	-0.00***	-0.00	-0.00***	-0.00***	-0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
winter	0.03*	0.01	0.01	0.00	0.00	0.02+	0.01
	(0.012)	(0.006)	(0.009)	(0.006)	(0.008)	(0.011)	(0.008)
marit1	-0.01	0.00	-0.00	-0.00	0.00	-0.01	-0.02**
	(0.011)	(0.005)	(0.009)	(0.006)	(0.007)	(0.010)	(0.007)
yearseduc	0.00***	0.00*	0.00*	-0.00+	0.00***	0.00	0.01***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
diabetes	-0.02+	-0.00	-0.01	0.00	-0.01+	-0.02	0.00
	(0.014)	(0.006)	(0.011)	(0.008)	(0.008)	(0.013)	(0.008)
lungdis	0.00	0.01	-0.01	-0.00	-0.01	-0.01	0.02
	(0.021)	(0.010)	(0.015)	(0.010)	(0.013)	(0.019)	(0.014)
asthma	0.02	0.01	0.02	0.01	0.01	0.00	-0.00
	(0.019)	(0.009)	(0.015)	(0.009)	(0.013)	(0.018)	(0.013)
arthritis	0.03**	0.00	0.01+	0.00	0.01*	0.02*	0.00
	(0.010)	(0.004)	(0.008)	(0.005)	(0.006)	(0.009)	(0.006)
osteoporosis	0.01	0.00	0.03**	0.03***	0.01	-0.01	0.01
	(0.013)	(0.006)	(0.011)	(0.008)	(0.009)	(0.012)	(0.008)
cataracts	0.02	0.01	0.01	0.01	0.01	0.02	0.02
	(0.019)	(0.008)	(0.014)	(0.010)	(0.011)	(0.017)	(0.011)
lfp	0.00	0.01	-0.01	-0.02***	-0.00	-0.01	0.02**
	(0.011)	(0.006)	(0.009)	(0.005)	(0.008)	(0.011)	(0.008)
hhincome_equippp	0.00**	0.00	0.00+	0.00	0.00	0.00+	0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
rural	0.00	-0.00	-0.00	0.01	-0.00	0.00	-0.00
	(0.010)	(0.005)	(0.007)	(0.005)	(0.006)	(0.009)	(0.007)
hhsize	0.02***	0.00	0.03***	0.03***	0.01	-0.01	-0.00
	(0.005)	(0.003)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)
dwave	0.01	-0.01+	-0.01	0.00	-0.01	0.01	-0.01
	(0.011)	(0.005)	(0.008)	(0.005)	(0.007)	(0.010)	(0.007)
Sweden	-0.04+	0.00	-0.01	-0.01	-0.00	-0.05*	0.03+
	(0.020)	(0.009)	(0.014)	(0.007)	(0.012)	(0.020)	(0.014)
Netherlands	-0.04*	0.02**	0.02	-0.01	0.03*	-0.06**	-0.01
	(0.019)	(0.009)	(0.014)	(0.007)	(0.013)	(0.019)	(0.013)
Belgium	-0.05*	0.01	0.00	0.00	0.00	-0.07***	-0.00
	(0.020)	(0.009)	(0.014)	(0.008)	(0.012)	(0.020)	(0.014)
France	-0.15***	-0.01	-0.01	0.00	-0.01	-0.21***	0.03+
	(0.020)	(0.009)	(0.014)	(0.008)	(0.012)	(0.019)	(0.014)
Germany	-0.14***	-0.01	-0.00	0.01	-0.01	-0.15***	-0.02+
	(0.019)	(0.009)	(0.014)	(0.008)	(0.012)	(0.019)	(0.013)
Austria	-0.17***	-0.01	-0.01	0.01	-0.01	-0.19***	-0.05**
	(0.024)	(0.010)	(0.017)	(0.010)	(0.014)	(0.022)	(0.015)
Switzerland	-0.12***	-0.00	-0.01	0.00	-0.02	-0.16***	-0.00
	(0.025)	(0.012)	(0.017)	(0.010)	(0.015)	(0.024)	(0.017)
Italy	-0.17***	0.02*	0.06***	0.02+	0.06***	-0.25***	-0.01
	(0.020)	(0.010)	(0.015)	(0.010)	(0.014)	(0.019)	(0.014)
Spain	-0.22***	0.01	0.05**	0.04***	0.02	-0.28***	-0.02+
	(0.021)	(0.010)	(0.016)	(0.011)	(0.013)	(0.019)	(0.014)
Greece	-0.21***	0.00	0.02	0.02+	0.02	-0.25***	-0.04**
	(0.020)	(0.009)	(0.015)	(0.009)	(0.013)	(0.019)	(0.013)
siblalive	-0.00	-0.00*	-0.00	-0.00	0.00	-0.00	-0.01***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)
children	-0.02***	-0.00*	-0.01***	-0.00	-0.01***	-0.01***	-0.00*
	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
age75	0.16***	0.11***	0.07***	-0.00	0.08***	0.15***	0.10***

	(0.010)	(0.006)	(0.008)	(0.005)	(0.007)	(0.010)	(0.008)
Constant	-1.47***	-0.50**	-0.92***	-0.29+	-0.71**	-0.84**	-0.54*
	(0.349)	(0.171)	(0.268)	(0.177)	(0.226)	(0.324)	(0.230)
Observations	14,066	14,066	14,066	14,066	14,066	14,066	14,066
R-squared	0.07	0.06	0.03	0.03	0.03	0.08	0.06
Adj. R-squared	0.07	0.06	0.03	0.03	0.03	0.08	0.06
F test	40.08	21.61	13.22	10.45	14.07	48.92	28.38

Table A.6d First stage results mental health (males)

Male sample VARIABLES	CARE	PARCARE	ICARE	COCARE	EXCARE	PRAC	PAPER
age	0.03*	0.00	0.00	0.00	0.00	0.02	0.01
	(0.012)	(0.004)	(0.007)	(0.005)	(0.005)	(0.011)	(0.008)
agesq	-0.00*	-0.00	-0.00	0.00	-0.00	-0.00+	-0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
winter	0.02	0.01	0.00	-0.00	0.00	0.01	0.02+
	(0.012)	(0.004)	(0.007)	(0.005)	(0.006)	(0.011)	(0.009)
marit1	0.01	-0.00	0.01	-0.00	0.01*	0.01	0.01
	(0.014)	(0.004)	(0.008)	(0.006)	(0.006)	(0.013)	(0.010)
yearseduc	0.01***	0.00*	0.00	-0.00**	0.00***	0.00*	0.01***
	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
diabetes	-0.01	-0.00	0.00	0.01	-0.00	-0.02	-0.01
	(0.014)	(0.004)	(0.009)	(0.007)	(0.006)	(0.013)	(0.009)
lungdis	-0.00	-0.00	0.01	0.02+	-0.01	-0.01	-0.01
	(0.019)	(0.005)	(0.012)	(0.010)	(0.007)	(0.017)	(0.012)
asthma	-0.01	0.00	-0.01	-0.01+	-0.00	-0.02	0.05**
	(0.022)	(0.006)	(0.012)	(0.008)	(0.009)	(0.020)	(0.017)
arthritis	0.03*	0.00	0.02*	0.01	0.01	0.03*	0.01
	(0.013)	(0.004)	(0.008)	(0.006)	(0.006)	(0.012)	(0.009)
osteoporosis	-0.03	0.02	0.01	0.00	0.01	-0.05	0.01
	(0.035)	(0.014)	(0.022)	(0.017)	(0.017)	(0.032)	(0.025)
cataracts	-0.01	0.01	0.01	0.00	0.00	-0.01	0.02
	(0.022)	(0.007)	(0.014)	(0.011)	(0.010)	(0.020)	(0.016)
lfp	-0.02+	0.01*	-0.00	-0.01*	0.00	-0.03*	0.00
	(0.012)	(0.004)	(0.007)	(0.005)	(0.005)	(0.011)	(0.009)
hhincome_equippp	0.00**	0.00	0.00	0.00	0.00	0.00	0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
rural	-0.01	0.00	0.00	0.00	-0.00	-0.01	-0.01
	(0.010)	(0.003)	(0.006)	(0.004)	(0.004)	(0.009)	(0.007)
hhsize	0.01+	0.00	0.01***	0.02***	0.00	-0.01	0.00
	(0.005)	(0.002)	(0.003)	(0.003)	(0.002)	(0.005)	(0.004)
dwave	0.02*	-0.00	-0.00	-0.00	-0.00	0.00	0.02*
	(0.011)	(0.004)	(0.007)	(0.005)	(0.005)	(0.010)	(0.008)
Sweden	-0.02	0.00	0.00	-0.01	0.01	-0.04*	0.00
	(0.021)	(0.006)	(0.010)	(0.007)	(0.008)	(0.021)	(0.016)
Netherlands	-0.04*	0.01	0.03*	0.01	0.02**	-0.08***	0.01
	(0.021)	(0.006)	(0.011)	(0.007)	(0.008)	(0.020)	(0.016)
Belgium	-0.03	0.01*	0.05***	0.02*	0.03***	-0.06**	0.01
	(0.021)	(0.007)	(0.011)	(0.008)	(0.009)	(0.021)	(0.016)
France	-0.18***	0.00	0.02+	0.01	0.02+	-0.23***	-0.01
	(0.021)	(0.006)	(0.011)	(0.008)	(0.009)	(0.020)	(0.016)
Germany	-0.15***	-0.01	0.01	0.00	0.00	-0.13***	-0.05**
	(0.021)	(0.006)	(0.010)	(0.007)	(0.008)	(0.020)	(0.015)
Austria	-0.22***	-0.01	-0.00	-0.00	-0.01	-0.20***	-0.09***
	(0.026)	(0.006)	(0.012)	(0.009)	(0.009)	(0.025)	(0.017)
Switzerland	-0.18***	-0.00	0.01	0.00	0.02	-0.22***	-0.03
	(0.025)	(0.008)	(0.014)	(0.009)	(0.011)	(0.024)	(0.019)
Italy	-0.22***	0.02*	0.07***	0.02+	0.05***	-0.29***	-0.02
	(0.021)	(0.007)	(0.013)	(0.009)	(0.010)	(0.019)	(0.015)
Spain	-0.32***	0.01+	0.05***	0.02*	0.03**	-0.37***	-0.05***
	(0.021)	(0.007)	(0.013)	(0.009)	(0.010)	(0.019)	(0.015)
Greece	-0.29***	0.00	0.01	0.00	0.01	-0.33***	-0.04**
	(0.021)	(0.006)	(0.011)	(0.008)	(0.008)	(0.019)	(0.015)
siblalive	-0.00	-0.00***	-0.00	-0.00	-0.00*	-0.00	-0.00**
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
children	-0.01+	-0.00**	-0.01***	-0.01***	-0.00**	-0.00	-0.00
	(0.003)	(0.001)	(0.002)	(0.002)	(0.001)	(0.003)	(0.002)
age75	0.10***	0.04***	0.03***	0.00	0.02***	0.09***	0.08***

	(0.011)	(0.004)	(0.006)	(0.004)	(0.005)	(0.010)	(0.008)
Constant	-0.37	-0.14	-0.10	-0.02	-0.05	-0.01	-0.28
	(0.372)	(0.122)	(0.221)	(0.157)	(0.170)	(0.342)	(0.268)
Observations	12,371	12,371	12,371	12,371	12,371	12,371	12,371
R-squared	0.08	0.03	0.01	0.01	0.02	0.09	0.06
Adj. R-squared	0.08	0.02	0.01	0.01	0.01	0.09	0.06
F test	42.75	6.85	5.67	4.95	6.05	56.36	25.99

Table A.7a Results Depressed last month

Dependent variable: Depressed LM	**F**	**F**	**F**	**F**	**M**	**M**	**M**	**M**
VARIABLES	OLS	FE	IV	IVFE	OLS	FE	IV	IVFE
CARE	0.07***	0.10*	-0.01	-0.04	0.04***	-0.00	-0.13	-1.25
	(0.009)	(0.047)	(0.058)	(0.380)	(0.008)	(0.039)	(0.092)	(2.513)
age	-0.02*	0.14	-0.02+	0.15	-0.03**	-0.19	-0.03**	-0.24
	(0.011)	(0.135)	(0.012)	(0.139)	(0.011)	(0.116)	(0.011)	(0.257)
agesq	0.00+	-0.00	0.00	-0.00	0.00**	0.00	0.00*	0.00
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.002)
winter	0.04***	0.03	0.04***	0.03	0.02+	-0.01	0.02*	0.00
	(0.012)	(0.045)	(0.012)	(0.046)	(0.011)	(0.037)	(0.011)	(0.081)
marit1	-0.11***	-0.26	-0.11***	-0.24	-0.12***	-0.13	-0.11***	-0.10
	(0.011)	(0.170)	(0.011)	(0.173)	(0.014)	(0.127)	(0.014)	(0.227)
yearseduc	-0.00**	-0.00	-0.00*	-0.01	-0.00	0.01	0.00	0.01
	(0.001)	(0.008)	(0.001)	(0.008)	(0.001)	(0.006)	(0.001)	(0.017)
diabetes	0.07***	0.30**	0.06***	0.30**	0.06***	-0.11	0.05***	-0.64
	(0.015)	(0.116)	(0.015)	(0.113)	(0.014)	(0.096)	(0.015)	(1.078)
lungdis	0.08***	0.01	0.08***	0.01	0.15***	0.06	0.15***	0.07
	(0.021)	(0.139)	(0.021)	(0.138)	(0.020)	(0.121)	(0.021)	(0.196)
asthma	0.06**	0.10	0.06**	0.09	0.07**	0.10	0.07**	0.17
	(0.019)	(0.147)	(0.019)	(0.151)	(0.022)	(0.095)	(0.022)	(0.329)
arthritis	0.13***	0.03	0.13***	0.02	0.07***	0.12+	0.07***	0.14
	(0.010)	(0.075)	(0.010)	(0.079)	(0.013)	(0.064)	(0.013)	(0.160)
osteoporosis	0.10***	0.01	0.10***	0.02	0.12**	0.04	0.11**	0.00
	(0.014)	(0.097)	(0.014)	(0.101)	(0.037)	(0.132)	(0.038)	(0.237)
cataracts	0.10***	0.13	0.10***	0.16	0.05*	0.16+	0.05*	-0.00
	(0.019)	(0.109)	(0.019)	(0.125)	(0.022)	(0.089)	(0.022)	(0.359)
lfp	-0.05***	0.04	-0.05***	0.04	-0.07***	-0.09	-0.07***	-0.09
	(0.011)	(0.067)	(0.011)	(0.069)	(0.011)	(0.057)	(0.011)	(0.107)
hhincome_equippp	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	0.00	-0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
rural	-0.01	-0.03	-0.01	-0.01	-0.02*	0.16	-0.02*	0.36
	(0.010)	(0.174)	(0.010)	(0.180)	(0.009)	(0.109)	(0.010)	(0.477)
hhsize	0.00	-0.00	0.00	0.01	0.01*	-0.02	0.01*	-0.04
	(0.005)	(0.049)	(0.005)	(0.067)	(0.005)	(0.026)	(0.005)	(0.071)
dwave	0.03**	0.01	0.03**	-0.01	0.01	-0.23	0.02+	-0.22
	(0.011)	(0.163)	(0.011)	(0.168)	(0.010)	(0.163)	(0.011)	(0.333)
Sweden	0.04*		0.04*		0.01		0.01	
	(0.019)		(0.019)		(0.018)		(0.019)	
Netherlands	-0.01		-0.01		0.03+		0.03	
	(0.019)		(0.019)		(0.018)		(0.019)	
Belgium	0.03		0.02		0.02		0.02	
	(0.020)		(0.020)		(0.019)		(0.019)	
France	0.19***		0.17***		0.11***		0.08**	
	(0.020)		(0.021)		(0.019)		(0.026)	
Germany	0.09***		0.08***		0.07***		0.05*	
	(0.019)		(0.021)		(0.018)		(0.023)	
Austria	0.00		-0.01		0.00		-0.04	
	(0.024)		(0.026)		(0.023)		(0.030)	
Switzerland	0.11***		0.10***		0.06**		0.03	
	(0.024)		(0.025)		(0.023)		(0.028)	
Italy	0.09***		0.08***		0.06**		0.02	
	(0.020)		(0.022)		(0.019)		(0.027)	
Spain	0.10***		0.08***		0.01		-0.05	
	(0.021)		(0.025)		(0.020)		(0.035)	
Greece	-0.01		-0.03		-0.03		-0.07*	
	(0.020)		(0.023)		(0.018)		(0.032)	
Constant	1.31***	-3.17	1.26***		1.48***	9.17+	1.52***	
	(0.353)	(5.314)	(0.356)		(0.342)	(4.939)	(0.348)	

Observations	14,066	14,066	14,066	1,056	12,371	12,371	12,371	940
R-squared	0.06	0.04	0.06	0.02	0.04	0.05	0.00	-2.32
Adj. R-squared	0.06	0.03	0.05	-1.03	0.04	0.04	0.00	-5.88
F test	38.56	1.19	35.19	0.86	17.59	1.55	15.83	0.47
Number of pid		13,538		528		11,901		470

Table A.7b Results high level of depression

Dependent variable: Depressed3	**F**	**F**	**F**	**F**	**M**	**M**	**M**	**M**
VARIABLES	OLS	FE	IV	IVFE	OLS	FE	IV	IVFE
CARE	0.03***	0.10**	0.05	0.04	-0.00	-0.02	-0.09	-0.33
	(0.008)	(0.038)	(0.053)	(0.283)	(0.006)	(0.030)	(0.071)	(1.113)
age	-0.05***	-0.04	-0.05***	-0.03	-0.04***	-0.08	-0.04***	-0.09
	(0.010)	(0.111)	(0.011)	(0.113)	(0.009)	(0.090)	(0.009)	(0.112)
agesq	0.00***	-0.00	0.00***	-0.00	0.00***	0.00	0.00***	0.00
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
winter	0.02+	-0.01	0.02+	-0.01	0.00	0.01	0.00	0.01
	(0.011)	(0.039)	(0.011)	(0.040)	(0.009)	(0.031)	(0.009)	(0.040)
marit1	-0.08***	-0.18	-0.08***	-0.18	-0.09***	-0.14	-0.09***	-0.13
	(0.011)	(0.143)	(0.011)	(0.144)	(0.012)	(0.112)	(0.012)	(0.122)
yearseduc	-0.01***	0.01	-0.01***	0.01	-0.01***	0.00	-0.01***	0.00
	(0.001)	(0.006)	(0.001)	(0.007)	(0.001)	(0.004)	(0.001)	(0.008)
diabetes	0.09***	-0.03	0.09***	-0.03	0.09***	-0.15	0.09***	-0.28
	(0.015)	(0.094)	(0.015)	(0.094)	(0.013)	(0.106)	(0.013)	(0.480)
lungdis	0.09***	-0.20	0.09***	-0.20	0.15***	0.08	0.15***	0.08
	(0.021)	(0.141)	(0.021)	(0.143)	(0.019)	(0.140)	(0.019)	(0.147)
asthma	0.08***	0.05	0.08***	0.04	0.08***	0.20	0.08***	0.21
	(0.019)	(0.087)	(0.019)	(0.092)	(0.019)	(0.178)	(0.019)	(0.182)
arthritis	0.15***	0.10+	0.15***	0.10	0.08***	0.11+	0.08***	0.11
	(0.010)	(0.062)	(0.010)	(0.066)	(0.012)	(0.060)	(0.012)	(0.067)
osteoporosis	0.12***	-0.02	0.12***	-0.01	0.11**	-0.09	0.11**	-0.10
	(0.013)	(0.077)	(0.013)	(0.080)	(0.034)	(0.200)	(0.034)	(0.170)
cataracts	0.09***	0.04	0.09***	0.05	0.06**	0.17+	0.06**	0.13
	(0.019)	(0.107)	(0.019)	(0.115)	(0.019)	(0.095)	(0.019)	(0.170)
lfp	-0.05***	0.07	-0.05***	0.07	-0.08***	-0.02	-0.08***	-0.02
	(0.010)	(0.068)	(0.010)	(0.069)	(0.009)	(0.049)	(0.009)	(0.058)
hhincome_equippp	-0.00	-0.00	-0.00	-0.00	0.00	0.00	0.00	0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
rural	-0.02*	-0.08	-0.02*	-0.07	-0.02*	0.12	-0.02*	0.16
	(0.009)	(0.105)	(0.009)	(0.117)	(0.007)	(0.102)	(0.008)	(0.218)
hhsize	-0.00	0.04	-0.00	0.04	0.01+	0.03	0.01*	0.03
	(0.005)	(0.033)	(0.005)	(0.042)	(0.004)	(0.020)	(0.004)	(0.031)
dwave	0.01	-0.09	0.01	-0.10	0.01	-0.16	0.01	-0.16
	(0.010)	(0.152)	(0.010)	(0.156)	(0.008)	(0.137)	(0.008)	(0.155)
Sweden	0.04*		0.04*		0.00		-0.00	
	(0.016)		(0.016)		(0.013)		(0.014)	
Netherlands	0.03+		0.03+		0.03*		0.02+	
	(0.016)		(0.016)		(0.013)		(0.014)	
Belgium	0.07***		0.07***		0.03+		0.02	
	(0.018)		(0.018)		(0.015)		(0.015)	
France	0.15***		0.15***		0.09***		0.07***	
	(0.018)		(0.019)		(0.016)		(0.020)	
Germany	0.05**		0.05**		0.00		-0.01	
	(0.016)		(0.017)		(0.013)		(0.017)	
Austria	0.02		0.02		-0.03*		-0.05*	
	(0.021)		(0.022)		(0.016)		(0.023)	
Switzerland	0.03		0.03		-0.00		-0.02	
	(0.020)		(0.021)		(0.015)		(0.020)	
Italy	0.12***		0.12***		0.06***		0.04+	
	(0.018)		(0.020)		(0.015)		(0.021)	
Spain	0.16***		0.17***		0.02		-0.01	
	(0.019)		(0.022)		(0.016)		(0.028)	
Greece	0.06**		0.06**		-0.01		-0.04	
	(0.018)		(0.021)		(0.014)		(0.024)	
Constant	2.05***	3.05	2.06***		1.63***	4.80	1.64***	
	(0.322)	(4.693)	(0.323)		(0.274)	(3.902)	(0.276)	

Observations	14,066	14,066	14,066	1,056	12,371	12,371	12,371	940
R-squared	0.09	0.05	0.09	0.04	0.07	0.04	0.06	-0.18
Adj. R-squared	0.09	0.05	0.09	-0.97	0.07	0.04	0.06	-1.46
F test	54.16	1.58	53.53	1.07	26.67	1.09	26.45	1.01
Number of pid		13,538		528		11,901		470

Table A.7c Results EUROD 12-item scale

Dependent variable: EUROD	**F**	**F**	**F**	**F**	**M**	**M**	**M**	**M**
VARIABLES	OLS	FE	IV	IVFE	OLS	FE	IV	IVFE
CARE	0.19***	0.42*	0.20	0.41	0.05	-0.13	-0.99*	-6.63
	(0.037)	(0.174)	(0.262)	(1.673)	(0.034)	(0.147)	(0.389)	(11.748)
age	-0.23***	0.01	-0.24***	0.01	-0.26***	-1.05*	-0.25***	-1.36
	(0.051)	(0.516)	(0.052)	(0.525)	(0.047)	(0.468)	(0.048)	(1.252)
agesq	0.00***	-0.00	0.00***	-0.00	0.00***	0.00	0.00***	0.00
	(0.000)	(0.004)	(0.000)	(0.004)	(0.000)	(0.003)	(0.000)	(0.008)
winter	0.13*	-0.14	0.13*	-0.14	0.02	-0.00	0.04	0.07
	(0.054)	(0.169)	(0.054)	(0.171)	(0.045)	(0.149)	(0.047)	(0.383)
marit1	-0.50***	-1.63*	-0.50***	-1.63*	-0.58***	-0.73	-0.57***	-0.57
	(0.052)	(0.754)	(0.052)	(0.776)	(0.063)	(0.676)	(0.064)	(1.305)
yearseduc	-0.05***	-0.02	-0.05***	-0.02	-0.04***	0.03	-0.03***	0.06
	(0.005)	(0.029)	(0.005)	(0.031)	(0.004)	(0.021)	(0.006)	(0.082)
diabetes	0.53***	0.27	0.53***	0.27	0.52***	-0.22	0.50***	-2.94
	(0.073)	(0.396)	(0.074)	(0.396)	(0.064)	(0.550)	(0.066)	(5.017)
lungdis	0.64***	-0.51	0.64***	-0.51	0.89***	0.35	0.88***	0.39
	(0.107)	(0.590)	(0.107)	(0.590)	(0.091)	(0.577)	(0.092)	(0.997)
asthma	0.47***	0.47	0.47***	0.46	0.56***	0.60	0.55***	0.95
	(0.092)	(0.474)	(0.092)	(0.498)	(0.101)	(0.781)	(0.104)	(1.574)
arthritis	0.84***	0.11	0.84***	0.11	0.55***	0.46+	0.58***	0.53
	(0.048)	(0.284)	(0.049)	(0.303)	(0.058)	(0.239)	(0.061)	(0.794)
osteoporosis	0.68***	-0.25	0.68***	-0.25	0.67***	-0.85	0.63***	-1.06
	(0.067)	(0.418)	(0.067)	(0.440)	(0.169)	(0.715)	(0.176)	(1.304)
cataracts	0.48***	0.71	0.48***	0.72	0.43***	0.52	0.41***	-0.31
	(0.091)	(0.582)	(0.091)	(0.629)	(0.099)	(0.459)	(0.099)	(1.754)
lfp	-0.31***	0.01	-0.31***	0.01	-0.49***	-0.36	-0.50***	-0.39
	(0.049)	(0.282)	(0.049)	(0.284)	(0.047)	(0.223)	(0.049)	(0.517)
hhincome_equippp	-0.00	-0.00	-0.00	-0.00	0.00	0.00	0.00	0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
rural	-0.10*	-0.45	-0.10*	-0.44	-0.12**	1.21*	-0.14***	2.22
	(0.044)	(0.492)	(0.044)	(0.554)	(0.039)	(0.553)	(0.040)	(2.199)
hhsize	-0.02	0.09	-0.02	0.09	0.04*	0.06	0.05*	-0.04
	(0.025)	(0.173)	(0.025)	(0.245)	(0.021)	(0.095)	(0.022)	(0.322)
dwave	0.06	-0.32	0.06	-0.32	0.01	-1.93**	0.04	-1.86
	(0.049)	(0.680)	(0.049)	(0.704)	(0.042)	(0.671)	(0.045)	(1.614)
Sweden	0.32***		0.32***		0.07		0.05	
	(0.078)		(0.079)		(0.069)		(0.073)	
Netherlands	0.17*		0.17*		0.17*		0.13+	
	(0.076)		(0.077)		(0.070)		(0.075)	
Belgium	0.40***		0.40***		0.23**		0.20*	
	(0.086)		(0.086)		(0.076)		(0.079)	
France	0.85***		0.86***		0.61***		0.43***	
	(0.085)		(0.092)		(0.079)		(0.107)	
Germany	0.31***		0.31***		0.08		-0.07	
	(0.077)		(0.084)		(0.069)		(0.091)	
Austria	0.07		0.07		-0.15+		-0.37**	
	(0.101)		(0.110)		(0.087)		(0.122)	
Switzerland	0.13		0.13		0.06		-0.13	
	(0.095)		(0.099)		(0.081)		(0.109)	
Italy	0.69***		0.69***		0.37***		0.16	
	(0.090)		(0.099)		(0.080)		(0.114)	
Spain	1.06***		1.06***		0.22**		-0.10	
	(0.101)		(0.115)		(0.087)		(0.150)	
Greece	0.17+		0.18+		-0.11		-0.40**	
	(0.089)		(0.103)		(0.073)		(0.132)	
Constant	10.87***	9.74	10.88***		11.17***	60.00**	11.37***	
	(1.590)	(21.649)	(1.591)		(1.450)	(19.829)	(1.499)	

Observations	14,066	14,066	14,066	1,056	12,371	12,371	12,371	940
R-squared	0.13	0.05	0.13	0.05	0.11	0.07	0.04	-3.99
Adj. R-squared	0.13	0.05	0.13	-0.96	0.10	0.07	0.04	-9.35
F test	68.62	1.29	67.10	0.95	40.07	2.24	37.73	0.45
Number of pid		13,538		528		11,901		470

Table A.7d Results negative binomial regression (marginal effects)

EUROD	F	F	M	M
VARIABLES	NBREG	XTNBREG	NBREG	XTNBREG
CARE	0.200***	0.186**	0.0605*	-0.0396
	(0.0366)	(0.0724)	(0.0325)	(0.0906)
age	-0.241***	0.0458	-0.255***	-0.669**
	(0.0486)	(0.204)	(0.0428)	(0.292)
agesq	0.00169***	-0.000572	0.00186***	0.00171
	(0.000389)	(0.00155)	(0.000342)	(0.00212)
winter	0.118**	-0.0451	0.0344	0.0241
	(0.0528)	(0.0715)	(0.0442)	(0.0884)
marit1	-0.484***	-0.559***	-0.541***	-0.196
	(0.0510)	(0.213)	(0.0607)	(0.252)
yearseduc	-0.0487***	-0.00369	-0.0349***	0.0187
	(0.00481)	(0.0133)	(0.00397)	(0.0177)
diabetes	0.460***	0.117	0.463***	-0.320
	(0.0663)	(0.175)	(0.0584)	(0.330)
lungdis	0.550***	-0.169	0.728***	-0.0558
	(0.0925)	(0.216)	(0.0788)	(0.231)
asthma	0.413***	0.229	0.433***	0.267
	(0.0845)	(0.200)	(0.0871)	(0.296)
arthritis	0.771***	0.0595	0.476***	0.246
	(0.0453)	(0.0921)	(0.0513)	(0.167)
osteoporosis	0.589***	-0.0994	0.551***	-0.632*
	(0.0617)	(0.121)	(0.145)	(0.377)
cataracts	0.411***	0.227	0.342***	0.457
	(0.0831)	(0.184)	(0.0861)	(0.283)
lfp	-0.329***	0.0435	-0.451***	-0.249*
	(0.0468)	(0.113)	(0.0418)	(0.151)
hhincome_equippp	-5.49e-07	-7.22e-07	-2.37e-09	-3.58e-07
	(6.44e-07)	(1.26e-06)	(5.82e-07)	(1.62e-06)
rural	-0.0909**	-0.342	-0.0897**	0.752**
	(0.0420)	(0.290)	(0.0359)	(0.300)
hhsize	-0.0245	0.0382	0.0313*	0.0389
	(0.0223)	(0.0681)	(0.0182)	(0.0708)
dwave	0.0532	0.00123	0.0206	-1.082***
	(0.0473)	(0.179)	(0.0403)	(0.396)
Sweden	0.389***		0.0888	
	(0.101)		(0.0777)	
Netherlands	0.205**		0.189**	
	(0.0948)		(0.0804)	
Belgium	0.489***		0.257***	
	(0.105)		(0.0847)	
France	1.007***		0.654***	
	(0.114)		(0.0958)	
Germany	0.364***		0.0670	
	(0.101)		(0.0781)	
Austria	0.124		-0.121	
	(0.121)		(0.0902)	
Switzerland	0.142		0.0239	
	(0.119)		(0.0923)	
Italy	0.785***		0.392***	
	(0.113)		(0.0907)	
Spain	1.151***		0.232***	
	(0.131)		(0.0900)	
Greece	0.257**		-0.106	
	(0.104)		(0.0760)	
Observations	14,066	952	12,371	760
Number of groups		476		380

Table A.7e Results Random effects EUROD 12-item scale (females)

EUROD VARIABLES	CARE RE	PARCARE RE	ICARE RE	COCARE RE	EXCARE RE	PRAC RE	PAPER RE
Care variable	0.20***	0.48***	0.47***	0.66***	0.31***	0.08+	0.10+
	(0.037)	(0.080)	(0.052)	(0.090)	(0.058)	(0.039)	(0.054)
age	-0.24***	-0.23***	-0.24***	-0.24***	-0.24***	-0.23***	-0.23***
	(0.051)	(0.051)	(0.051)	(0.051)	(0.051)	(0.051)	(0.051)
agesq	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
winter	0.12*	0.13*	0.13*	0.13*	0.13*	0.13*	0.13*
	(0.053)	(0.053)	(0.053)	(0.053)	(0.053)	(0.053)	(0.053)
marit1	-0.50***	-0.50***	-0.50***	-0.50***	-0.50***	-0.50***	-0.50***
	(0.053)	(0.053)	(0.052)	(0.053)	(0.053)	(0.053)	(0.053)
yearseduc	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
diabetes	0.53***	0.53***	0.53***	0.52***	0.53***	0.53***	0.52***
	(0.074)	(0.074)	(0.074)	(0.073)	(0.074)	(0.074)	(0.074)
lungdis	0.64***	0.64***	0.64***	0.64***	0.64***	0.64***	0.64***
	(0.107)	(0.107)	(0.107)	(0.107)	(0.107)	(0.107)	(0.107)
asthma	0.48***	0.47***	0.47***	0.47***	0.47***	0.48***	0.48***
	(0.093)	(0.093)	(0.093)	(0.093)	(0.093)	(0.093)	(0.093)
arthritis	0.83***	0.84***	0.83***	0.84***	0.83***	0.84***	0.84***
	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)
osteoporosis	0.66***	0.66***	0.65***	0.65***	0.66***	0.67***	0.67***
	(0.067)	(0.067)	(0.067)	(0.067)	(0.067)	(0.067)	(0.067)
cataracts	0.49***	0.49***	0.49***	0.49***	0.49***	0.49***	0.49***
	(0.091)	(0.091)	(0.091)	(0.091)	(0.091)	(0.091)	(0.091)
lfp	-0.32***	-0.32***	-0.31***	-0.30***	-0.32***	-0.31***	-0.32***
	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)	(0.049)
hhincome_equippp	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
rural	-0.10*	-0.10*	-0.10*	-0.10*	-0.10*	-0.10*	-0.10*
	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)
hhsize	-0.01	-0.01	-0.03	-0.03	-0.01	-0.01	-0.01
	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
dwave	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)
Sweden	0.33***	0.32***	0.33***	0.33***	0.32***	0.33***	0.32***
	(0.079)	(0.079)	(0.078)	(0.078)	(0.079)	(0.079)	(0.079)
Netherlands	0.17*	0.15+	0.15+	0.16*	0.15+	0.16*	0.16*
	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)
Belgium	0.40***	0.39***	0.39***	0.39***	0.39***	0.40***	0.39***
	(0.086)	(0.086)	(0.086)	(0.086)	(0.086)	(0.086)	(0.086)
France	0.85***	0.82***	0.83***	0.83***	0.83***	0.84***	0.82***
	(0.086)	(0.085)	(0.085)	(0.085)	(0.085)	(0.086)	(0.086)
Germany	0.31***	0.29***	0.29***	0.28***	0.29***	0.30***	0.29***
	(0.078)	(0.077)	(0.077)	(0.077)	(0.077)	(0.078)	(0.077)
Austria	0.08	0.05	0.04	0.04	0.05	0.06	0.05
	(0.102)	(0.102)	(0.102)	(0.102)	(0.102)	(0.102)	(0.102)
Switzerland	0.13	0.10	0.11	0.10	0.11	0.12	0.11
	(0.096)	(0.095)	(0.095)	(0.095)	(0.095)	(0.096)	(0.096)
Italy	0.69***	0.64***	0.62***	0.64***	0.64***	0.67***	0.66***
	(0.090)	(0.090)	(0.090)	(0.090)	(0.090)	(0.091)	(0.090)
Spain	1.05***	1.00***	0.98***	0.97***	1.00***	1.02***	1.01***
	(0.101)	(0.101)	(0.101)	(0.101)	(0.101)	(0.102)	(0.101)
Greece	0.18+	0.13	0.12	0.13	0.13	0.16+	0.14
	(0.090)	(0.090)	(0.089)	(0.090)	(0.090)	(0.091)	(0.090)
Constant	10.99***	10.81***	11.11***	11.07***	10.97***	10.88***	10.88***
	(1.597)	(1.597)	(1.593)	(1.595)	(1.597)	(1.599)	(1.599)
Observations	14,066	14,066	14,066	14,066	14,066	14,066	14,066
Number of pid	13,538	13,538	13,538	13,538	13,538	13,538	13,538
Wald test (P-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table A.7f Results Random effects EUROD 12-item scale (males)

EUROD VARIABLES	CARE RE	PARCARE RE	ICARE RE	COCARE RE	EXCARE RE	PRAC RE	PAPER RE
Care variable	0.05	0.19+	0.30***	0.40***	0.23**	-0.03	0.04
	(0.033)	(0.112)	(0.064)	(0.097)	(0.080)	(0.035)	(0.045)
age	-0.26***	-0.26***	-0.26***	-0.26***	-0.26***	-0.26***	-0.26***
	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)
agesq	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***	0.00***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
winter	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)
marit1	-0.58***	-0.58***	-0.58***	-0.58***	-0.58***	-0.58***	-0.58***
	(0.063)	(0.063)	(0.063)	(0.063)	(0.063)	(0.063)	(0.063)
yearseduc	-0.04***	-0.04***	-0.04***	-0.04***	-0.04***	-0.04***	-0.04***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
diabetes	0.52***	0.52***	0.52***	0.52***	0.52***	0.52***	0.52***
	(0.065)	(0.065)	(0.065)	(0.065)	(0.065)	(0.065)	(0.065)
lungdis	0.86***	0.86***	0.85***	0.85***	0.86***	0.86***	0.86***
	(0.090)	(0.090)	(0.090)	(0.090)	(0.090)	(0.090)	(0.090)
asthma	0.56***	0.56***	0.56***	0.57***	0.56***	0.56***	0.56***
	(0.101)	(0.101)	(0.101)	(0.101)	(0.101)	(0.101)	(0.101)
arthritis	0.55***	0.55***	0.54***	0.55***	0.55***	0.55***	0.55***
	(0.057)	(0.057)	(0.057)	(0.057)	(0.057)	(0.057)	(0.057)
osteoporosis	0.63***	0.62***	0.63***	0.62***	0.63***	0.63***	0.63***
	(0.172)	(0.172)	(0.172)	(0.171)	(0.172)	(0.172)	(0.172)
cataracts	0.42***	0.42***	0.42***	0.42***	0.42***	0.42***	0.42***
	(0.098)	(0.098)	(0.098)	(0.098)	(0.098)	(0.098)	(0.098)
lfp	-0.48***	-0.49***	-0.48***	-0.48***	-0.48***	-0.48***	-0.48***
	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)	(0.047)
hhincome_equippp	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
rural	-0.12**	-0.12**	-0.12**	-0.12**	-0.12**	-0.12**	-0.12**
	(0.039)	(0.039)	(0.039)	(0.039)	(0.039)	(0.039)	(0.039)
hhsize	0.04*	0.04*	0.04+	0.04+	0.04*	0.04*	0.04*
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
dwave	0.01	0.02	0.02	0.02	0.02	0.02	0.01
	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)
Sweden	0.06	0.06	0.06	0.07	0.06	0.06	0.06
	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)
Netherlands	0.17*	0.17*	0.16*	0.17*	0.16*	0.17*	0.17*
	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)
Belgium	0.23**	0.23**	0.22**	0.23**	0.22**	0.23**	0.23**
	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)	(0.077)
France	0.62***	0.61***	0.61***	0.61***	0.61***	0.61***	0.61***
	(0.080)	(0.080)	(0.080)	(0.080)	(0.080)	(0.080)	(0.080)
Germany	0.07	0.06	0.06	0.06	0.06	0.06	0.06
	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)
Austria	-0.14	-0.15+	-0.15+	-0.15+	-0.15+	-0.15+	-0.15+
	(0.088)	(0.088)	(0.088)	(0.088)	(0.088)	(0.088)	(0.088)
Switzerland	0.05	0.05	0.04	0.04	0.04	0.04	0.05
	(0.082)	(0.082)	(0.082)	(0.082)	(0.082)	(0.083)	(0.082)
Italy	0.39***	0.37***	0.35***	0.37***	0.36***	0.37***	0.38***
	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.082)	(0.081)
Spain	0.23**	0.21*	0.20*	0.20*	0.21*	0.20*	0.21*
	(0.087)	(0.086)	(0.086)	(0.086)	(0.086)	(0.088)	(0.086)
Greece	-0.11	-0.13+	-0.13+	-0.13+	-0.13+	-0.14+	-0.13+
	(0.074)	(0.073)	(0.073)	(0.073)	(0.073)	(0.074)	(0.073)
Constant	11.12***	11.11***	11.11***	11.14***	11.10***	11.15***	11.13***
	(1.456)	(1.455)	(1.454)	(1.455)	(1.455)	(1.456)	(1.456)
Observations	12,371	12,371	12,371	12,371	12,371	12,371	12,371
Number of pid	11,901	11,901	11,901	11,901	11,901	11,901	11,901
Wald test (P-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000