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Master Thesis

The Relationship Between Retirement and Mental Health

Investigating the Causal Relationship in Eleven European Countries Using SHARE

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LIST OF ABBREVIATIONS AND ACRONYMS

2SLS	Two-Stages Least-Squares
ADL	activities of daily living
ATE	average treatment effects
ATET	average treatment effects of the treated
c.p.	ceteris paribus (other things being equal)
CAPI	computer assisted personal interview
CDF	conditional distribution function
CES	Center for Epidemiologic Studies
CES-D	Depression scale as defined by the CES
Coeff.	Coefficient
et al.	et alia (and others)
FE	Fixed Effects
GALI	Global Activity Limitation Index
HRS	Health and Retirement Study
i.e.	id est (that is)
IADL	instrumental activities of daily living
ISCED	International Standard Classification of Education
IV	Instrumental Variable
LATE	local average treatment effects
LPM	Linear Probability Model
MH	mental health
OLS	Ordinary Least Squares
p.	page
pp	percentage points
PPP	purchasing power parity
Probl.	Problems
QR	Quantile regression
QTE	quantile treatment effects
RE	Random Effects
SHARE	Survey of Health, Ageing and Retirement in Europe
SE	standard error
US	United States

ABSTRACT

Our society is aging drastically and the sustainability of social security systems might be compromised. This development in age-pattern implies a potential change in retirement behavior and the impact of retirement on mental health therefore seems vital. This has been noticed in the literature and some effort has been made in understanding the (causal) impact on health. However, focus has been limited with respect to mental health. Studies find ambiguous impacts be it associations or causal effects. We carry out several approaches in order to answer the question on how retirement influences mental health. We focus on the causal relationship using retirement eligibility ages as instruments that vary in the observed countries. While previous work has focused only on average effects we add a relatively unexplored approach of quantile regression to test whether there are differences in returns depending on the conditional distribution of mental health, against the assumption that the effects are constant for all workers. Not much work has been born using quantile regression and to our knowledge this has not been done in the context given. We find limited causal, statistically relevant impact on clinically defined depression, but once examining the impact on the depression scale itself we find increases in severity of depression, that can be heterogeneous for different individuals. The evidence suggests that this impact is most prominent around the median of the distribution and less severe for those at the start and end of the distribution, i.e. those with extreme (lowest or highest) mental health problems. We find significant causal impact of retirement that increases severity of depression by 0.29 to 0.85 points on a scale from 0 to 12, depending on the quantile chosen. When retirement is an underlying source of depression this can have considerable implications for policies regarding retirement eligibility ages and occupational offerings after those ages.

1. INTRODUCTION

Sustainability of a social security system can be jeopardized by the current trend in aging combined with certain retirement patterns (Bonsang et al., 2010). The average age of the population is increasing substantially and a growing part of the population is moving into retirement:

Predictions for OECD countries foresee an essential increase in the population aged 55 plus due to higher life expectancies while falling birth-rates reduce the share of the younger (see Figure A.1). This tendency affects the composition of labor force and income. A higher share of retirees claiming pension benefits implies a higher tax burden for the working population. Further, an aging population demands different goods and services such as (long-term) health care (Börsch-Supan, 2003; Anderson and Hussey, 2000).

In many OECD countries elderly have a tendency to exit the labor market earlier than in the past. The rates of labor force participants of 60 to 64 year old men decreased by up to 75 percent within thirty years[1] (Blundell et al., 2002; Gruber and Wise 1999). An increasing number of retirees have to be supported by a diminishing share of working individuals. E.g. by 1992, the ratio of working to the number of retired in Germany was ten to four and by 2030 the amount of retirees that have to be supported by this number of employees will more than double (Börsch-Supan, 1992). Demands on public's financial resources rise which brings up initiatives to increase eligibility ages of retirement. This has already been done in a number of countries (e.g. Germany, Italy) and is planned in several further, e.g. Austria, France, Greece, UK (OECD, 2011). However, resulting changes in peoples' health and other socio-economic aspects of life and consequently economies' welfare have to be considered when proposing public policies, especially guidelines regarding retirement eligibility rules (Charles, 2004).

Argumentation in the literature on the relationship of retirement and physical as well as mental health and the associated effects of the change in lifestyle are diverse:

People might experience positive effects of retirement. Negative aspects of work can be avoided and withdrawal from the labor force is seen as a relief. Retirement can lessen (work-induced) stress and increases the amount of spare time available to the retiree, therefore provides enjoyable leisure time.

On the other hand, retirement itself can be experienced as a stressful happening. Being out of the labor force could result in negative emotions emerging, such that the retiree sees himself no longer

[1] E.g. in the Netherlands from 1960 to 1996 the participation rate has fallen from approximately 80% to less than 20%; similar patterns are observed for other countries, e.g. Belgium (from approximately 70% to 20%) and France (from around 70% to less than 20%)

as a valuable part of society. She might be feeling unproductive and experiencing boredom. Abolition of social networks can result in isolation and feelings of being obsolete and old and thoughts of nearby end of life become apparent (Charles, 2004; Coe and Zamarro, 2011).

People might self-select themselves into early or late retirement based on the ambiguous perceptions of working experiences, individual preferences or health state before retirement (Coe and Zamarro, 2011). Individuals might base their choices on predetermined unobserved conditions, i.e. “genes select their own environment” (Rohwedder and Willis, 2010). This further provokes endogeneity. Being retired might not necessarily induce mental health problems, but the health problems induce retirement. We will account for this reverse causality by implementing Instrumental Variable estimation.

Our research question consequently addresses how retirement influences the mental health of elderly individuals in eleven European countries once we control for distinct factors that might render previous results unreliable. Amongst these factors are unobserved heterogeneity and reverse causality. We additionally address the question whether the effect of retirement on depression is the same for everyone or if it depends on the conditional distribution of mental health.

Psychological well-being itself has for a long time been limited subject of examination with rather modest progress (Charles, 2004). There has not been done much research of how retirement affects mental health and until recently associations rather than causal impacts have been investigated, yet often are inconclusive. Most work focuses on overall health or cognitive functioning. However, the main results with respect to mental health remain ambivalent, ranging from positive (Coe and Lindeboom 2008) to negative impact on good mental health (e.g. Dave et al., 2008) or no significant impact (Coe and Zamarro, 2011). However results might be compromised because certain aspects such as endogeneity might not be accounted for or approaches might be disputable (see section 2).

Labor activity and a change within is a substantial part of virtually everyone’s life. Since retirement entails a crucial lifestyle change, this decision presumably has a considerable impact on a person’s psychological well-being (Rohwedder and Willis, 2010). The motivation for our research is driven by this idea. Mental health or more specific depression is one aspect of happiness and therefore essential in the maximization of utility and quality of life (Charles, 2004).

Retiring after a long-lasting professional life is a concept widely spread throughout most developed countries. It seems this is a consensus by the people, however personal perceptions on the timing might be diverse and people might not get the same utility out of retirement. Free choice is not necessarily granted in this context. Incentives to retire at certain ages are given and some countries have mandatory retirement ages for certain professions.

Bearing in mind the above mentioned, the research question can be assessed considering Grossman's human capital theory (Grossman, 2000). Health is a central component in the maximization of one's utility, and can be seen as an investment as well as a consumption commodity. Health (stock) determines the time that can be assigned to labor, education[2], recreational activities and health (care) itself. Income and assets which are generated on basis of the productivity that results from interaction and combination of these factors influence the individual's utility function[3]. Further, health influences the individuals' utility directly since illness and bad health are decreasing overall satisfaction (Dave et al., 2008; Grossman, 2000; Bonsang et al., 2010).

Determinants of physical and mental health can consist of a wide range of factors and a great part can be outlined as health care. Health care expenditures are driven by the demand for these inputs (Grossman, 2000). Especially long-term expenditures are fundamental in the context given as mental health illnesses are mostly chronic (Bonsang et al., 2010). Aside from direct medical costs from health care expenditures, costs are increased by the time spent in bad health and the decreased time spent for production[4] (Grossman, 2000).

To develop our hypothesis that retirement determines mental health in a causal way we implement instrumental variables approaches in addition to baseline OLS and further quantile and instrumental-variable quantile estimations. We use the first two waves of data from the Survey of Health, Ageing and Retirement in Europe (SHARE)[5] and exploit the institutional variation in retirement age across European countries in order to identify the causal effect of retirement on mental health. More specifically, we instrument retirement by the country-specific eligibility ages for early and full retirement. These retirement ages are based on political decisions and are put in place by the government. It is therefore adequate to assume that these constitutionally set retirement ages – although they evoke retirement – are not connected to the individual respondents' mental condition (Bonsang et al., 2010; Coe and Zamarro, 2011).

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[2] Which leads to accumulation of stock of knowledge, or human capital.

[3] Although Grossman stresses that health is different from other varieties of human capital as it (mostly) determines the time spent for production, we argue that a more direct link seems plausible – it influences human capital and stock of knowledge which further affects (non)market productivity.

[4] We notice that direct influence on production might be limited when analyzing health of retirees. However, indirect medical costs should be considered. Informal caregivers might be involved as well which can affect their health and productivity (e.g. van den Berg et al., 2004)

[5] This paper uses data from SHARELIFE release 1, as of November 24th 2010 or SHARE release 2.4.0, as of March 17th 2010. 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).

Our research will add to the existing literature by taking advantage of several methods that include exploitation of the panel-structure of the data. We account for unobserved heterogeneity and reverse causality using Linear Probability Models with Ordinary Least Squares (OLS) and Fixed Effects (FE) estimation while making use of cross-country variation in the instruments. We contribute further to the existing literature by implementing a new approach on the topic. We provide a quantile regression model that allows us to identify how retirement affects subgroups of the distribution of mental health. Thus, in addition to estimating the mean effect of retirement we further address the question to whom retirement matters most.

When only taking into account the reverse causality of the retirement status, our results show insignificant coefficients[6]. Our results derived by quantile regression on the other hand suggest significant positive impact over almost the whole distribution, i.e. increasing the number of depressive symptoms, with peaks around the median of the distribution, i.e. around one to two depressive symptoms.

2. LITERATURE REVIEW

A broad overview on studies that concentrate on whether early retirement is beneficial for (mental) health is provided by Burdorf (2010). The pattern he describes implies that retirement causes a reduction in "mental fatigue", indicating that the withdrawal from the labor force might be perceived as a comforting situation, depending on working conditions and view of one's individual job environment. However, he stresses, that more research has to be done once appropriate longitudinal data becomes available, besides including more data collected before transition into retirement.

A large body of research shows that mental health and retirement are associated. These studies find differing correlations between mental health problems and retirement that are either positive (Bossé et al., 1987; Kasl, 1980), negative (Herzog et al., 1991), or no correlation (Rowland, 1977) is indicated. Mein et al. (2003) e.g. who try to establish whether retirement at age 60 is related to physical and mental health development find positive and negative associations for the latter, depending on the rank, i.e. position of the employee. Favorable associations however are restricted to those retiring from higher positions. They explain this pattern with the possibilities that these employees receive higher pensions resulting in broader choice of lifestyle and uncertainties eventually caused by monetary difficulties for those with lower pensions.

[6] These results would suggest a 9 to 39 percentage points (pp) higher likelihood of being depressed when retired.

On the other hand, Doshi et al. (2008) examine whether US workers aged 53 to 58 with diagnosed depression are more likely to retire. Using data from the Health and Retirement Study (HRS) and eight items of the Center for Epidemiologic Studies Depression scale (CES-D) their analysis suggests that individuals with depression have a higher possibility to withdraw from the labor force (an odds ratio of 1.37), however the effect was stronger for individuals working part-time rather than full-time. They account for reverse causality by ascertaining that depression is indicated before transition into retirement and additionally, they also take into consideration the degree of depression. Their results emphasize the necessity to disentangle causal effects from pure associations.

More recent studies use different sets of Instruments to obtain the causal effect of retirement on health. Studies are typically limited to a one country setting and mostly are directed to the US framework: Dave et al (2008) investigate how retirement affects mental and physical health using HRS data of individuals aged 50 to 75. They include the “probability of cancer” and the “spouse’s retirement status for those who claim they want to retire at the same time as their spouse” as instruments for retirement. They find negative impact on mental health as indicated by the CES-D: a mental health state that is between six and nine percent worse after a period of six years. They explain the decline in mental health with social isolation. However they stress the difficulty to find valid instruments.

Bonsang et al (2010) investigate the effect of retirement on cognitive functioning in a longitudinal setting using HRS data and the first two waves of SHARE. They account for individual effects by applying a within estimator and use expected age of retirement as an instrument in addition to eligibility ages. They find a negative association between the length of withdrawal from the workforce and cognitive functioning. Similarly, Rohwedder and Willis (2010) use variation in public policies that address taxes, pensions and disability as instruments for retirement using data from HRS, SHARE and the English Longitudinal Study of Ageing (ELSA). They compare retired individuals to individuals still in the labor force. Both studies find that retirement increases cognitive decline.

The Instrumental Variables approach of Coe and Zamarro (2011) exploits the cross-country variation in retirement eligibility ages throughout Europe in similar manner as our analysis, using early and full retirement ages. They use the first wave of SHARE. Their results indicate that being retired is associated with a 27 pp and 3 pp increases in the probability to be depressed or to report feeling depressed in the previous month respectively. Coefficients from IV estimation suggest that retirement induces a 0.07 pp decrease in the likelihood to be depressed and an 11.83 pp decrease in the probability of reporting to feel depressed. IV results are not significant so that they draw no conclusions regarding causal mechanisms.

Coe and Lindeboom (2008) use HRS panel data over a 14 year period and instrument retirement with eligibility ages for early retirement benefits. They solely find a short-term improvement in self-reported health for men, which includes outcome of ADL tests, and indicators whether the participant suffers or suffered from diabetes, cancer or a heart attack. Their analysis identifies a positive development in health for individuals with higher education after a two-year period. Improvements on mental health measured by the CES-D scale are expected in the short-run for OLS estimations.

Our study will add to this collection with an analysis that uses data of eleven European countries. We deal with the endogeneity bias and use a short panel that consists of two waves. We further make an effort to get a better insight on which parts of the distribution of mental health effects are most prominent. We do this by modeling a Quantile Regression (QR) design that allows us to investigate the impact of retirement on different points of the distribution of mental health. This represents a relatively new approach and to our current knowledge has not been implemented to date in the context given.

3. RESEARCH DESIGN AND METHODOLOGY

Several econometric approaches are carried out in order to answer the question of our analysis. Our investigation can be divided into two sub-divisions. The first section focuses on the clinical definition of depression as indicated by the EURO-D scale with a clinically defined cut-off point at four symptoms identifying the respondent as depressed, i.e. having severe mental health problems. The second part displays an investigation on the EURO-D scale itself which runs from 0 to 12, counting the number of depressive symptoms.

We begin our study with a basic cross-section analysis by means of estimates obtained by a Linear Probability Model (LPM). Further we apply Fixed-Effects Models to take into account unobserved heterogeneity and further considering the problem of endogeneity by implementing 2SLS estimation.

In consideration of the possibility that effects are not constant across the whole spectrum or that effects might be present only at certain levels of depression, a quantile regression is applied. Our investigation on the depression scale follows the same strategy as the first part of the analysis. We begin with estimating a basic quantile regression, followed by an IV estimator for conditional quantile treatment effects.

3.1 Linear Probability Model

We describe mental health (m_{it}) as a function of retirement and other covariates:

$$m_{it} = x_{it}\beta_x + r_{it}\beta_r + \varepsilon_i + \nu_{it} \qquad (1)$$

where x_{it} describes a vector of observable exogenous regressors, i.e. individual control variables. These explanatory variables include age, weight, family status, occupation, education and indicators on physical health and others[7]. The binary variable of retirement status is denoted as r_{it}. The part of the unobserved error term u_{it} that refers to the individual heterogeneity is represented by the time-invariant ε_i and an idiosyncratic time-varying error term ν_{it}. We assume no correlation between the regressors and both parts of the error term.

The probability of the event occurring in an LPM equals the expected value of m which is a linear function of the regressors[8]. We therefore consider the coefficients in an LPM as – ceteris paribus (c.p.) – indicating the change in the probability of being depressed when the regressor changes by one unit (Wooldridge, 1999).

3.2 Fixed Effects Design

Unobserved heterogeneity can lead to correlation between the regressors and the error term. If unobserved factors u_{it} contribute to ones mental health the true causal effect of retirement cannot be estimated but we obtain inconsistent estimates (Wooldridge, 2002). People might self-select into retirement early because of individual characteristics or preferences. They might not be content with their jobs and retiring could be a relief that adds to their overall utility (Coe and Zamarro, 2011). Less able and less flexible might retire earlier because they do not perform well at their job or they are not able to keep up with new developments. Because these individual specific factors are unobserved, they are included in the error term. The endogeneity resulting from correlation between the explanatory variables and the error leads to estimators that are no longer unbiased.

Unobserved individual heterogeneity can be correlated with the retirement decision and mental health as well. This rests e.g. on the nature of the individuals' personality which is included in (1) as the time constant error in $u_{it} = \varepsilon_i + \nu_{it}$. Therefore there is a potential correlation between the indicator for being retired and the error term that might arise because of self-selection. It is possible

[7] The explanatory variables are specified in further detail in section 4.4

[8] In our case, the regressands retired (first stage) and depressed (second stage) respectively are binary variables. In this case the usual $E(m|\boldsymbol{x},r) = \boldsymbol{x}\boldsymbol{\beta}_x + r\beta_r$ given that $E(\varepsilon|\boldsymbol{x},r) = 0$ extents to $E(m|\boldsymbol{x},r) = P(m=1|\boldsymbol{x},r) = 1 - P(m=0|\boldsymbol{x},r) = \boldsymbol{x}\boldsymbol{\beta}_x + r\beta_r$. The event, i.e. the individual is depressed occurs when $\mathrm{m} = 1$ as opposed to not, $\mathrm{m} = 0$

that both retirement decision and mental health depend on e.g. individual personality or genetic predetermination. The problem of endogeneity can arise if there is a correlation between the unobserved fixed individual heterogeneity from retirement decision and mental health (Bonsang et al., 2010).

The use of panel data offers the possibility to isolate unobserved heterogeneity that is fixed over time. Constant characteristics can be eliminated if not controlled for (Cameron and Trivedi 2010):

To take into account unobserved individual-specific characteristics that are constant over time we take advantage of the fixed-effects model which exploits the within variation in our data. We can allow for a limited form of endogeneity, i.e. correlation of the regressors with individual specific time constant effects is manageable. In our equation (1) the ε_i denotes this individual-specific fixed effect.

For the estimation of fixed-effects models we apply a within-transformation, which is done by adjusting our equation by the mean so that we obtain:

$$(m_{it} - \bar{m}_i) = (\mathbf{x}_{it} - \bar{\mathbf{x}}_i)'\boldsymbol{\beta}_{\boldsymbol{x}} + (r_{it} - \bar{r}_i)'\beta_r + (\varepsilon_i - \bar{\varepsilon}_i) + (\nu_{it} - \bar{\nu}_i) \qquad (2)$$

Time-invariant variables will be eliminated, which also accounts for the unobserved time-invariant part of the error term because of $\varepsilon_i = \bar{\varepsilon}_i$. Here, the main advantage of the panel structure becomes apparent. As influence of the unobserved fixed characteristics is cancelled out, i.e. we can control for them, the assumption of no correlation of ε_i with the regressors is no longer problematic. We can obtain consistent estimates for the coefficients even if ε_i is correlated with x_{it} (Cameron and Trivedi, 2010). The adjusted data is the basis for least squares estimation[9].

3.3 Two-Stages Least-Squares

There is the possibility that the retirement decision itself is explained partly by the mental health condition. We focus on a structural simultaneous equation problem that extents equation (1)

$$m_{it} = \boldsymbol{x}_{it}\beta_x + r_{it}\beta_r + \varepsilon_i + \nu_{it}$$

by

$$r_{it} = \boldsymbol{x}_{it}\gamma_x + m_{it}\gamma_m + w_{it}\gamma_w + \omega_i + \mu_{it} \qquad (3)$$

[9] The FE model only takes into consideration the within variation. We cannot explain differences between the individuals. This variation remains unexplained. Another issue we have to acknowledge is that for t → ∞ consistence of the estimators is affected positively, however we are limited in the observed number of periods (Arminger and Müller, 1990).

If people who show signs of depression tend to retire earlier, then $\gamma_m \neq 0$ meaning there is a reverse causality in the relationship between these variables[10]. Endogeneity is further induced when there is correlation between ν_{it} and $\mathrm{r_{it}}$. This implies $\mathrm{E(r_{it}u_{it}|x_{it})} \neq 0$. The estimators we obtain if we do not correct for this endogeneity are inconsistent and biased. We cannot draw conclusions on the effect of retirement on depression per se, but only identify associations between those variables (Wooldridge, 1999; Coe and Zamarro, 2011; Bonsang et al., 2010).

To acquire unbiased and consistent estimates of β_r that properly describe the causal effect of retirement status on mental health it is not sufficient to estimate the initial equation (1), but we implement an Instrumental Variables approach. The vector w_{it} represents the instrumental variables that are assumed to directly influence the individuals' retirement decision but not mental health. For the variables in the vector $\mathrm{w_{it}}$ to be suitable instruments, they have to be relevant, i.e. (highly) correlated with the retirement dummy, so that $\gamma_w \neq 0$. They have to be valid, i.e. uncorrelated with the idiosyncratic error term in the equation for mental health (1) so $\mathrm{E(w_{it}v_{it}|x_{it}, \varepsilon_i)} = 0$, indicating that they influence mental health status solely through the effect of retirement (Bonsang et al., 2010). More specifically, these variables are the eligibility ages for early and full retirement in the distinct countries. We argue that eligibility ages for early and normal retirement that vary in the countries observed by up to 7 years fulfill these requirements[11].

Our strategy therefore will focus on estimating our equation system by means of Two-Stages Least-Squares (2SLS) with indicators whether an individual has reached the eligibility ages to collect early and full pension benefits as instruments for the endogenous variable of retirement. Our dependent variables in both stages of the 2SLS model are binary outcomes that both can take on two values – being retired or not and being depressed or not.

We additionally apply fixed-effects estimation to our simultaneous equation modeling. This method is seen to be very powerful because we are able to take into account unobserved heterogeneity as well as simultaneity (Wooldridge, 1999).

3.4 Quantile Regression Design

Retirement might not affect mental health of each person in the same way so that the effects of our regressors are not constant across the range of mental health statuses. Different effects at different ranges of the EURO-D scale would mean different implications of the treatment and is a useful

[10] See also (Charles, 2004)

[11] The argumentation for identification of suitable Instruments will be discussed in further detail in section 4.3.

addition to the medical indication of depression with cut-off point at four or more symptoms. If some specified quantiles of the conditional distribution function (CDF) of the depression scale are more affected by the treatment variable of retirement than others, the effect of retirement is different for people whose mental health status is situated at lower and higher levels of the depression scale, i.e. those at different parts of the mental health distribution (Cameron and Trivedi, 2010). We chose deciles and examine whether the impact varies.

We therefore expand our investigation by implementing a Quantile Regression approach on the depression scale itself. In this case, the notation of mental health condition varies from our definition that we applied before. While we do not have a cut-off point that indicates straight whether a person is depressed or not, a higher score on the scale indicates a person as more depressed[12].

Quantile regression follows a semi-parametric approach that does not make assumptions of normality on the distribution of the residuals. QR is asymptotically normally distributed. In the case of heteroskedasticity, OLS is no longer fully efficient while QR is appropriate[13] (Cameron and Trivedi, 2010).

Estimations from OLS provide information on the impact of the regressor on the conditional mean of our response variable on mental health given the covariates. OLS would under- or overestimate effects if these differ across quantiles. Contrary, the conditional mean function is not needed to obtain consistent estimates in a quantile regression. Parameter estimates are based on the median instead of the mean, so the model is less affected by outliers. Accordingly, a more detailed depiction of the data can be drawn. We are able to distinguish different effects of an explanatory variable on different parts of the distribution of the dependent variable – conditional on values of the covariates – that depend on the quantile chosen. QR minimizes the sum of absolute residuals weighted and penalizes over- and underestimation (Koenker and Hallock, 2001; Cameron and Trivedi, 2010).

To obtain the estimator $\hat{\beta}_q$ the standard estimator for conditional QR therefore minimizes the linear function

$$Q(\boldsymbol{\beta}_q) = \sum_{i:y_i \geq \boldsymbol{x}_i'\boldsymbol{\beta}}^{N} q\left|\boldsymbol{x}_i'\boldsymbol{\beta}_q\right| + \sum_{i:y_i < \boldsymbol{x}_i'\boldsymbol{\beta}}^{N} (1-q)\left|\boldsymbol{x}_i'\boldsymbol{\beta}_q\right|$$

[12] Although the EURO-D scale in its initial form is a count variable, we handle it as a continuous variable. We do not consider this a big problem as a higher count is simply seen as a higher score on the scale, that is a higher score means more depressed.
[13] Formal tests indicate heteroskedasticity in the errors. We reject the Null hypotheses of homoskedasticity with p-values of 0.0000 in a Breusch-Pagan/ Cook-Weisberg test for heteroskedasticity.

where $\boldsymbol{\beta}_q$ depends on the quantile q chosen (Cameron and Trivedi, 2010; Koenker and Bassett; 1978).

We use approaches for conditional quantile regression by Koenker and Bassett (1978). To take into account the endogeneity problem, we implement an IV estimator that was proposed by Abadie et al. (2002) and further developed by Frölich and Melly (2010).

3 DATA

We use data from the Survey of Health and Retirement in Europe (SHARE) release 2.4.0. It contains the latest version of the first two waves, released in March 2011 and is representative for the population aged 50 plus. The release 2.4.0 of SHARE contains data of more than 45.000 individuals aged 50 or older from fifteen European countries. The sample sizes range between approximately 700 and 2400 individuals for every country (depending on the wave). The countries that contribute to SHARE since the 2004 baseline study are Austria, Belgium, Denmark, France, Germany, Italy, Greece, the Netherlands, Spain, Sweden and Switzerland[14]. The dataset is complemented by 2008-2009 data from SHARELIFE, the third wave of SHARE. This extension provides retrospective gathered information on respondents' earlier life background regarding childhood and family, accommodation, partners as well as work and finances (MEA, 2010). Data acquisition was made using a Computer Assisted Personal Interview program (CAPI) and an additional paper and pencil questionnaire. The data collected by SHARE shows some important aspects, making it well suited for the analysis provided in this study. Harmonized data drawn from generic (and country-specific) questionnaires makes cross-national comparison possible. A reasonably complete picture can be drawn as the approach is of multidisciplinary panel design, providing a short panel to date, but being ultimately longitudinally (MEA, 2011; Coe and Zamarro, 2011; Bonsang et al., 2010).

3.1 Mental Health

We use three different measurements for mental health; depression as indicated by the EURO-D scale with clinically defined cut-off point at four or more symptoms as being depressed, the scale

[14] Further data was collected from Israel (2005-2006), Czech Republic, Poland and Ireland (second wave 2006-2007) however is incomplete and thus do not fulfill the requirements needed for our analysis (MEA, 2010).

itself and an indicator of self-assessed mental health[15]. The uni-dimensional EURO-D scale is a recognized measurement of mental health. It was developed by the EURODEP collaboration, which is a project dedicated to the study of depression in individuals aged 65 plus throughout Europe (Larraga, et al., 2006; Prince et al., 1999). The intention behind the development is to provide a measure of mental health that makes comparison concerning prevalence and risk possible. Measurement of the mental condition is realized by covering questions that indicate the presence of depression, pessimism, suicidality, guilt, sleep, interest, irritability, appetite, fatigue, concentration, enjoyment and tearfulness[16]. The scale runs from 0-12; with the number of depressive symptoms denoting the score. Validity, feasibility and convenience of application in European context has been investigated and confirmed by several studies (Castro-Costa et al., 2008; Larraga et al., 2006; Prince et al., 1999). Depression is indicated when the individual reports having four or more positive symptoms (Castro-Costa et al., 2007).

In the questionnaire of SHARE, individuals are further asked directly if they felt sad or depressed in the previous month. This variable is used additionally to assess the concern of depression. However it implies shortcomings of self-reported health, e.g. justification bias and possibly short-term indication (Coe and Zamarro, 2011). Nonetheless, diagnostic validity based on self-reported mental health ,i.e. a considerable connection to diagnosis reported by physicians, has been shown[17] (Ferraro, 1980; Perlmutter and Nyquist, 1990; Spitzer et al., 1999).

3.2 Retirement

Different definitions for retirement can be adopted depending on the research question. One might want to consider different understandings of the definition of retirement, as the selection can have vital impact on the results derived from the analysis. Because we are investigating the effect of labor force participation by a certain age, over time and cross-sectional, the use of the definition that denotes an individual as retired, when she "is out of the labor force with the intention of remaining out permanently" is most suitable[18] (Lazear, 1986).

An individual can be considered as retired when stating to be retired (self-reported retirement status) and when permanent absence from the labor force is indicated. Our definition of retirement

[15] Depression for self-assessed mental health is indicated when the respondent answered if she felt depressed in the previous month. If not indicated otherwise, results are reported for depression as derived from the EURO-D scale.
[16] See Table A.0 for complete questions on EURO-D scale.
[17] Instead of focusing only on physical or mental health studies are mostly directed to general health.
[18] The definition that denotes an individual as retired, when he receives some of his income as pension benefits also could have been acceptable.

for the most part is consistent with Lazear's descriptions (Lazear, 1986): We consider individuals as being retired when they report being retired, being permanently sick or disabled or being a homemaker, and additionally not having done any paid work in the past month. Correspondingly, a person is considered to be labor force participant when claiming to be employed or self-employed (including working for a family business). Unemployed that are looking for work are included in this group, because we assume that this is only short term unemployment.

3.3 Instruments

The instruments we use for estimating the retirement decision are indicators for having reached the eligibility ages for early and full retirement. The age thresholds for early and full public retirement benefits are part of public policies and differ in the selected countries by up to 8 years (table 1a)[19]. These policies induce retirement, since monetary incentives are given for individuals to retire at these ages. The variables used as instruments have been shown to explain retirement decisions (Gruber and Wise, 2004).

The causal effect of retirement on mental health can be determined by using the variation in public policies across countries that influence retirement behavior. Rohwedder et al. (2010) explain that differences in retirement behavior that occur across countries cannot be attributed to mental health patterns within the population but are motivated by distinct national policies such as pension, tax and disability policies. This implies that variation in labor supply is a result of national policies. There should be no direct relation between these policies and mental health; it does not seem plausible to argue that after monitoring mental health conditions for different ages these policies have been established in reaction to patterns found within the population (Rohwedder and Willis, 2010). Variations in policies are not to a large extend present within one country, as changes in policies are rare. However, there is variation across the countries investigated, as can be seen in Table A.2. Eligibility ages for early and normal retirement differ by up to eight and five years respectively. We use this variation in different countries' policies that have an effect on the timing of retirement by creating dummy variables that indicate when a person has reached the country specific age making him eligible for either form of retirement.

[19] These public policies have been legal practice in 2004 (Coe and Zamarro, 2011).

3.4 Explanatory variables

Besides our focus of interest several control variables are included in the model, which are expected to affect the mental health status of individuals. Determination of an individual's mental health status is a complex field with many variables combined. Herrman et al. (2005) explain contributors in a broad context: mental health is influenced by "socioeconomic and environmental factors" as well as "biological and psychological" elements. This includes at least general health status, education, accommodation and income, along with vulnerability i.e. factors that capture risk in social and personal life as well as threats and opportunities concerning leisure activities that the individual is exposed to. Although we are aware of the vast complexity of contributing factors of a person's well-being, we intend to capture these determinants as far as it is possible and reasonable regarding the data limitations given.

The individuals' income is PPP (Purchasing Power Parity) adjusted on prices in Germany from 2005 in order to make a cross-country comparison over time possible. We include variables on education that specify basic, medium and higher education derived from the 1997 International Standard Classification of Education (Table A.3): the SHARE questionnaire provides information about years of education, schooling degrees and other education or training. Because educational practice can differ substantially between countries as well as within, the information provided is converted by "local experts" into ISCED-97 coding using standard classification rules in order to generate a comparable variable (OECD, 1999; UNESCO, 2006; MEA, 2011).

We include variables measuring limitations in usual activities caused by health problems (GALI) and the number of limitations with (instrumental) activities of daily living, denoted as IADL[20] and ADL[21]. Additionally, the number of limitations in mobility (arm function and fine motor limitations) and a dummy on whether or not the individual is (almost) never involved in any physical activity. All these indicators measure different limitations of physical health. We expect these limitations to have a negative impact on well-being.

An indicator variable on whether or not the respondents' parents had mental health problems or not is added in order to control for (part of) biological and social factors that could indicate predetermination of mental health.

Area of housing (rural vs. urban) is included as well, however we do not have strong expectations in either direction. We include country dummy variables for our instruments to be valid and further

[20] Includes orientation using a map, preparing a hot meal, shopping for groceries, making telephone calls, taking medications, doing work around the house or garden, managing money.

[21] Includes dressing, walking across a room, bathing or showering, eating, getting out of bed and using the toilet.

control dummy variables for the seasons of the year to control whether suffering from depression is linked to a certain term of the year. The occurrence of this phenomenon is well-known in psychology as seasonal affective disorder, or SAD (e.g. (Lurie et al., 2006) and is seen to be a "clinical subtype of major depression"[22] (Lam and Levitan, 2000).

3.5 Descriptive Statistics

Individuals who were not eligible or with incomplete survey records were dropped, i.e. if they did not participate in an interview in any of the waves or had serious history of mental health problems (i.e. stayed in a psychiatric hospital or were hospitalized with mental health problems). Considering the research question, only men and women aged 50-70 are included. People who have been out of the labor force since age 50 or have never been working are excluded.

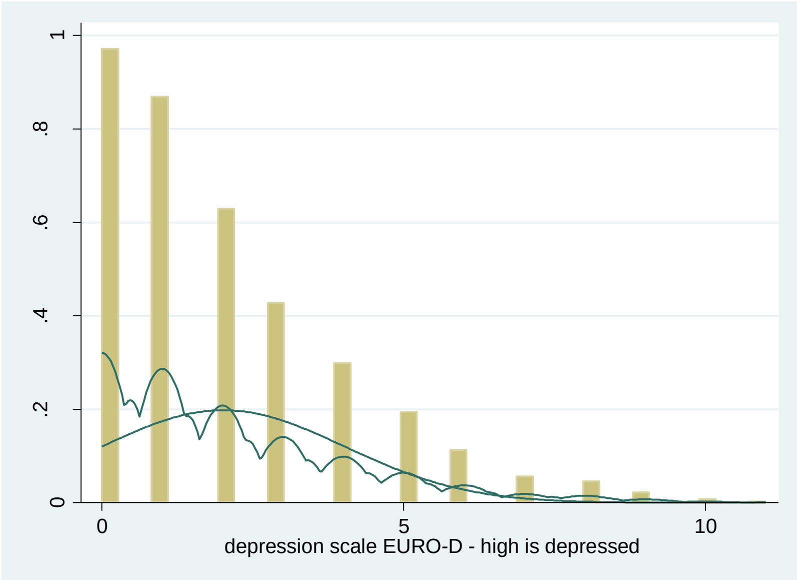
The final sample consists of 7768 individuals and 12104 observations in two time periods. Approximately 56% of the individuals have observations in both periods. Country representation of the final sample varies from approximately 4% to 15% each, showing a relatively even representation for all countries (Table A.4).

The descriptive statistics are summarized in Table A.5. The individuals of our sample have two symptoms of depression on average. The indication variable with standard cut-off point at four symptoms reports one fifth (20.79%) of the individuals being depressed and our indicator variable for self-reported mental health shows an even bigger share of the sample feeling depressed (35.8%).

We deal with a distribution of the dependent variable that is not normal, but positively skewed with a high amount of observations in the very low regions and a kurtosis that is greater than three. More precisely, we observe approximately 80 percent of the population having less than four depressive symptoms. Figure 1 illustrates this pattern and compares the distribution of EURO-D to a normal distribution.

[22] With several episodes of depression during the year.

Figure 1 – Distribution of mental health; EURO-D



Density is shown on the y-axis; the EURO-D scale is drawn on the x-axis; high values mean depressed.
Skewness 1.224775; kurtosis 4.347317

Almost 52% passed the early retirement age and about 30% are over the full retirement age in the respective countries. There is little difference in pattern of retirement eligibility for males and females, but almost the same share has reached the relevant ages. Concerning our main variables of interest, the descriptive statistics further show that 50% of the sample is retired in the first wave, 52% in the second. Most of the individuals remain in their previous working status in the following period and we observe a transition probability from working to retired of 10.89%. We observe that 18% of those still in the labor force are depressed. Almost 6% less than those who are retired. Accordingly, 82% of working population and only 76% of the retired are not depressed. Similar pattern in differences is observed for self-reported depression (Tables A.6 to A.8).

The average age of the final sample (taking into account observations of both waves) is 60 years. Approximately 70% of the respondents are married. Males and females account for almost the same share of the sample. Individuals have on average two children and a household income of approximately 28,500 Euro per year (PPP adjusted). Roughly 23% of the population has only basic education, half has medium and nearly one third has higher education. There is a clear pattern in physical limitations regarding severity of physical limitations. While only 5.2% have one or more limitations in activities of daily living, 11.8% have limitations in instrumental activities of daily living and even one third of the sample (33.48%) has the less severe GALI limitations. Consulting the standard categorization for BMI we see a somewhat concerning pattern with more than 60% of the sample being overweight or obese. However, a limited number of people have serious mobility limitations: one limitation on average in arm function and fine motor skills, more than 60% have none, 77% have one or less; 4.5% are physically inactive.

4 RESULTS

Tables A.10a and A.10b display the results of the first part of our investigation, i.e. results obtained from Linear Probability Models. Figures 2a and 2b at the end of section 4 depict these findings for retirement graphically. Tables A.11 and A.13 show the Quantile Regression results and Figures 3a and 3b at the end of section 5 illustrate the findings for retirement graphically[23].

4.1 Baseline Results - Linear Probability Model

The numbers presented in this section are the baseline results for the two indicators of depression obtained by OLS estimation of the pooled data with individual cluster-robust standard errors and are reported in the first column of Table A.10a and Table A.10b respectively.

The results obtained from a Linear Probability Model assuming exogeneity of retirement show a negative, but insignificant estimator for the indicator of retirement on depression and positive, yet insignificant association in the case of self-assessed health. We cannot draw useful conclusions in any direction, but there is no evident impact of retirement on mental health, according to this model. Intuitively, it does not seem plausible that a major change in lifestyle – such as being retired compared to not – has no or very little effect on well-being of the individuals. Further, Euro-D results and self-assessed health coefficients differ in magnitude, sign and significance level.

The explanatory variables are jointly significant with a p-value of 0.0000 for the F-test. The majority of the control variables' coefficients are individually statistically significant and as we would anticipate. Concerning age we deal with an inverse U shaped pattern; age has a negative impact on the probability of depression until the turning point at 70 years of age. Having one more children increases the probability of depression by one percentage point; having medium or higher education lowers this probability by 2.8 and 4.7 percentage points respectively, compared to individuals with only basic education. Being married compared to those not living in a committed relationship decreases the probability of depression by 6.1 pp and males have a 10.3 pp lower probability to be depressed than females. For individuals that report their parents had mental health problems, the respondents' probability of depression is increased by 5.1 pp. Any type of physical limitation increases the probability of depression by 3.9 to 9.8 percentage points. Physically inactive have 6.7 pp higher and those living in rural areas 2.2 pp lower probability of depression than the reference category. Coefficients on weight and income are insignificant.

[23] All coefficient interpretation given is meant ceteris paribus (c.p.), i.e. holding all other factors constant.

We find significant estimators for about half of the country dummies, as well as joint significance[24]. Although the indicators for SAD are closely linked to the indicators of the depression scale, we do not find statistically significant coefficients for seasonal indicators, not individually, nor jointly[25].

4.2 Unobserved Heterogeneity - Fixed Effects

A pooled OLS estimation makes use of differences between and within individuals at a certain time, however analyses are likely to be biased because of unobserved heterogeneity. When we account for individual-specific fixed effects, we notice considerably higher statistic significance for the effect of retirement which is now significant at 10% and 5% significance level for EURO-D and self-reported depression respectively. Being retired improves mental health, i.e. lowers the probability to be depressed by 4.75 and 6.8 percentage points respectively. Our control variables however become insignificant, despite our controls on marriage and physical limitations.

Comparing our results so far, we would assume a negative association between retirement and depression, i.e. retirement lessens mental health problems. Although FE accounts for unobserved heterogeneity, which might cause endogeneity problems, we have to note that the results of this model are still without explicitly accounting for endogeneity due to simultaneous causation and unobserved time variant factors. This can still lead to inconsistent estimators, so we leave our results as indefinite until this point.

4.3 Accounting for Endogeneity

Our baseline FE model accounts for unobserved heterogeneity that can provoke problems of endogeneity. While retirement can induce mental health problems, it is plausible to believe that being depressed while still in the labor force can have influence on the decision whether to retire. The disturbances of our simultaneous equation model can be correlated if e.g. mental health and retirement share a common cause. We account for this bias by modeling an Instrumental Variables approach.

[24] We find $F(10, 7767) = 18.43$; $Prob > F = 0.0000$ for depression as indicated by EURO-D and $F(10, 7767) = 18.77$ $Prob > F = 0.0000$ for self-reported depression.

[25] Results show $F(3, 7767) = 0.41$; $Prob > F = 0.7479$ for depression as indicated by EURO-D and $F(3, 7767) = 0.86$ $Prob > F = 0.4587$ for self-reported depression.

4.3.1 Instrumental Validity and Relevance

Policies regarding full and early retirement ages vary considerably across countries, and are likely well-suited instruments for our analysis (Rohwedder and Willis 2010).

We are concerned about validity and relevance of our instruments[26]. The assumption of $corr(r_{it}, w_{it}) \neq 0$ for relevance holds in our case with correlation among 0.53 and 0.55[27] between our instruments and the endogenous regressor (Table A.9a).

From the first stage results we see that the Instruments, i.e. being over the early and full retirement age respectively, are highly significant and can be seen as central drivers in the decision of retirement (Table A.9b). Having reached the age of early and full retirement eligibility increases the probability to retire by 14.6 and 12.4 percentage points respectively. Both instruments are highly significant at 1% significance level even after controlling for the exogenous regressors. To affirm the relevance of our instruments we do an F-test of joint significance in the first stage of 2SLS. The Staiger-Stock rule of thumb for relevant instruments is an F-statistic for the instruments that is bigger than 10 when dealing with one endogenous regressor. With two instruments, the F-statistic should be greater than 11.59. In our case F(2, 7767) = 89.67 clearly fulfills this condition (Staiger and Stock, 1997; Stock et al., 2002). This suggests that our instruments are not weak.

We argue that our instruments are valid (exogenous) and are uncorrelated with the error term, i.e. (unobserved) determinants of depression. This cannot be fully tested. However, we argue that there is no direct effect of policies regarding early and full retirement ages on an individual's mental health, and there is no reverse effect of mental health that has influence on the policies.

Because two instruments for retirement status are identified we can implement a test on overidentifying restrictions (OIR). We test for under- and weak identification. We cannot reject the null that the excluded instruments are valid (Table A.9a). This means that there is significant evidence that there is no correlation with the error and that it is accurate not to include the instruments in the initial model for mental health. The tests suggest that the model is identified so we are reinforced in the assumption that our instruments are valid[28] (Schaffer and Stillman, 2010; Cameron and Trivedi, 2010).

When we control for the eligibility ages, the remaining coefficients are as we would expect or as can be argued is reasonable. Education is negatively correlated with the indicator for retirement,

[26] Proving validity is not entirely possible and might merely hold in theory.
[27] We therefore rule out the possibility that we have weak instruments which would mean that OLS could acquire even better than our IV estimation (Stock et al., 2002).
[28] Note that acceptance of the Null does not assure the validity of all instruments but is merely a sign for it. Rejection of the Null would be a sign of misspecification.

meaning that individuals with higher educational background are 10.1 percentage points more likely to remain in the labor force and with medium education 3.2 pp than individuals with only basic education. Males have a 10.7 pp lower probability to retire than females. Presence of any kind of physical limitations increases the probability to retire by 7.1 (GALI), 6.2 (IADL Limitations), 3.9 (ADL Limitations) and 1.4 percentage points (mobility limitations[29]) respectively.

As a robustness check we estimate a Logit model. One could argue this method is better suited as the indicator for retirement status is a dummy variable. It yields the same direction of the coefficients' signs as well as same significance levels for the instruments (Table A.9a).

Given our tests we conclude that IV estimation seems appropriate, our data fits the theory and we are confident that early and full retirement eligibility ages are suitable instruments for retirement in regressions with mental health as assessed by the EURO-D scale.

4.3.2 Two Stages Least Squares

The Two-Stages Least-Squares is the most efficient IV estimator. Estimations obtained from Instrumental Variable regressions are not as efficient as OLS estimations in case that the regressors are actually exogenous and we might obtain larger standard errors (Wooldridge, 1999).

We include multiple instruments (early and full retirement ages) and the 2SLS is estimated as a linear probability model (LPM). Once controlling for the causal relationship between retirement and mental health we observe a considerable difference in the coefficient of the retirement status and some changes in the remaining ones (Table A.10a column 3 and Table A.10b column 3).

Being retired does not show significant impact on the probability of being depressed. The indicator of self-assessed depression on the other hand is much bigger in value and highly significant on a 5% level. Being retired increases the probability of reporting to feel depressed by 19.6 percentage points. The estimates for the coefficients on age and age² are highly significant[30] which indicates a non-linear relationship. Getting older decreases the likelihood of being depressed significantly with turning point at 65 years, which interestingly is the full retirement age in most of the countries. This stresses the importance to model incentives concerning retirement carefully. Our IV estimates differ from the FE results and are similar to OLS estimations. Individuals with higher BMI than the normal weight, those that are married or live in a comparable relationship, men and people living in rural areas rather than bigger towns or cities are less likely to be depressed. Especially the variable on

[29] Per additional limitation in arm and fine motor function.
[30] Joint significance of chi2(2) = 10.47; Prob > chi2 = 0.0053.

gender seems to have a bigger impact and is highly significant. A likelihood to be depressed that is 9.32 and 14.01 percentage points lower for men than for women is indicated for EURO-D and self-assessed depression respectively. The coefficient for years of schooling measured by means of ISCED is significant on the Euro-D scale and shows a negative impact of medium and higher education compared to basic education. Medium educated are 2.43 pp. and highly educated are 3.67 pp. less likely to be depressed. The coefficient however remains insignificant for self-assessed health for medium education but is significant for higher education, while it is positive in both cases for the self-assessed health variable.

A consistently higher likelihood of having mental health problems can be observed when some limitation in physical health or mobility is given with relatively high magnitudes. The impact on depression rises from mobility limitations over ADL and IADL to GALI limitations with an impact of having a higher likelihood of being depressed that varies between 3.76 and 9.12 percentage points. However, being physically inactive (almost) does not have an impact on whether an individual felt depressed in the last month but does have a substantial impact on the clinical definition of depression; being physically inactive adds to the likelihood of being depressed with 6.56 percentage points. This discrepancy might suggest a long-term impact. Interestingly, our indicator whether parents had clinically indicated mental health problems has a relatively big, significant impact: indication of parents' depression adds to the probability of being depressed by 4.74 to 5.10 percentage points. This might be a sign for genetic disposition or influence from conditions in (early) childhood when exertion of influence from parental authorities was still given.

Interestingly, being underweight compared to having normal weight as well as household income both seem to have no significant effect on depression of elderly when measured by EURO-D. Given the components of the scale it seems plausible that being overweight or obese has significant impact on the level of depression only by self-assessment. Nevertheless, a lower probability to report depression (2.7 to 3.5 pp. lower) seems contrary to what one might expect.

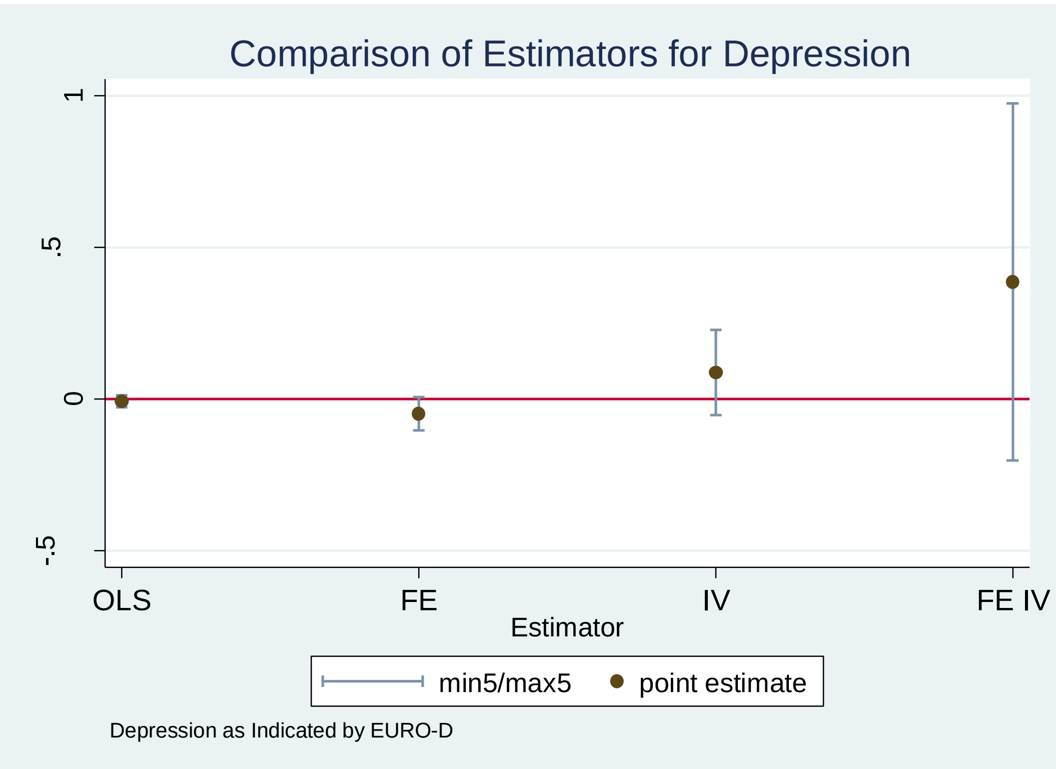
Having children does not seem to influence a person's mental health considerably; however having more children is somewhat associated with approximately one percentage point higher probability of being depressed.

When taking into account the problem of reverse causality and time-variant factors, fixed-effects estimators become slightly less significant (table 9b). The coefficient of retirement is again positive but with a very high magnitude for both indicators of depression. However, both do not show high significance. Nevertheless, our results suggest that being retired increases the probability of being depressed by 38.53 percentage points for the EURO-D scale. Although a p-value of over 0.2 is relatively high we are aware of this elevated big impact on depression. Nevertheless, we recognize the high standard errors for almost all coefficients except employment status, being married and the indicators on physical limitations. However the change from the basic fixed-effects approach regarding these is not too large. There is almost no change in magnitude and significance for the indicator on marriage and the indicators on physical limitations.

Using a fixed effects model can have some drawbacks. We can only take into account the within variation so a big part of the variation might stay unexplained. Lack of this within variation in the variables could lead to inaccurate estimates and a loss in precision and insignificant estimators. When decomposing standard deviations into its components of within and between variation, we see that the variation in being retired between (0.4894) is much higher that within individuals (0.1141). This pattern seems legitimate because we observe individuals between 50 and 70 years of age. We would assume the variation in retirement status between elderly is higher than the variation attributable to people changing their status from being retired to working (or vice versa) (table 11). However, Fixed-Effects estimation only exploits the within variation, which is why a big share of the variation remains unexplained.

Figure 2a and 2b compare these and our previous findings with respect to retirement graphically:

<u>Figure 2a: Comparison of Estimators for Depression</u>

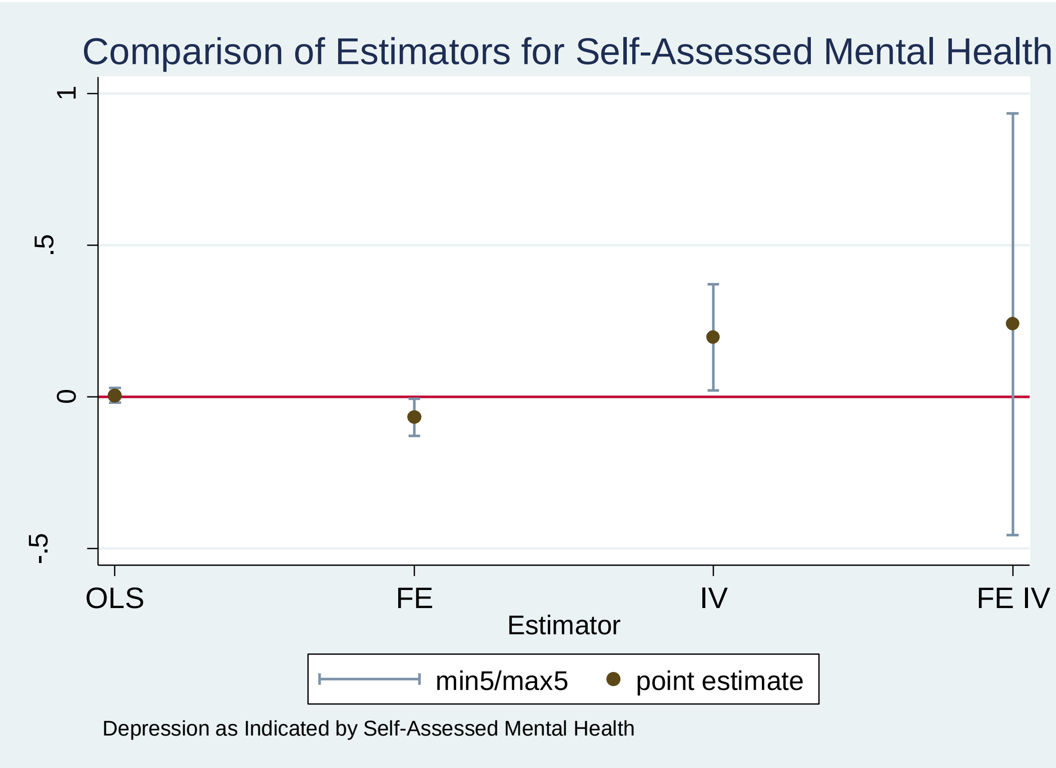


Comparison of Estimators for Depression

	OLS		FE		IV		FE IV	
Coeff.	-0.0083		-0.0485	+	0.0871		0.3853	
SE	0.010		0.028		0.072		0.301	
CI 95%	[-0.0285	0.012]	[-0.1031	0.0062]	[-0.0541	0.2283]	[-0.2037	0.9742]

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Figure 2b: Comparison of Estimators for Depression



Comparison of Estimators for Self-Assessed Mental Health

	OLS		FE		IV		FE IV	
Coeff.	0.0046		-0.0675	*	0.1964	*	0.2396	
SE	0.012		0.031		0.089		0.355	
CI 95%	-0.0195	0.0286	-0.1288	-0.0062	0.0210	0.3718	-0.4555	0.9347

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

4.4 Quantile Regression

In the previous section we found difficulties to make out highly significant effects of retirement on depression when using IV estimations, as seems appropriate. Nevertheless, we might expect positive impact on the probability to be depressed based on the results obtained and based on results of self-assessed depression particularly.

A probable scenario is that the retirement status is affecting depression in a non-linear way. It could be the case that there is no or little effect at certain levels of the distribution while consequences take place at other levels of the distribution of mental health. We decide to get a more detailed look on where we have to expect greater impact, i.e. where events are most prominent. In order to get a better insight on this, we estimate a quantile regression. If the assumption of varying impact is true we will observe different coefficients for varying values of the quantiles (Cameron and Trivedi, 2010). Contrary to regular OLS regression, the quantile regression model therefore assumes that the effects are not constant over the whole range of the depression scale.

4.4.1 Baseline Quantile Treatment Effects

OLS estimation could over- or underestimate effects for lower or higher levels of depression and is subsequently only accurate for a certain part of the distribution. We use the continuous variable of the depression scale and define a higher score as depressed. We use a series of quantiles that is evenly dispersed over the interval [0.1, 0.9] (see Brunello et al., 2010).

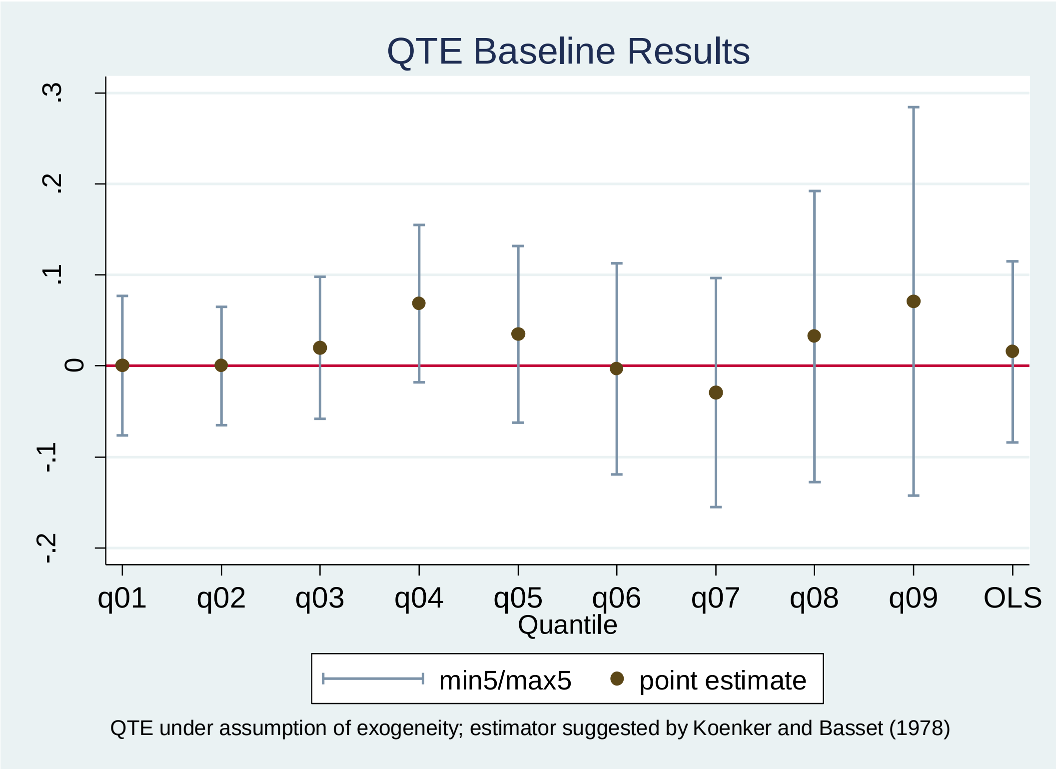
To test our hypothesis that the impact of retirement on mental health varies depending on the values for the quantiles q, we start by implementing a basic quantile regression without taking into account endogeneity. We obtain results by using the estimator suggested by Koenker and Basset (1978) which makes it possible to obtain consistent standard errors in case of heteroskedasticity. This basic regression of conditional quantile treatment effects (QTE) under the assumption of exogeneity leads to (mostly) positive regression coefficients for retired with significance levels that are highest around the fourth quantile, however estimators are throughout insignificant (See Figure 3a and Table A.11).

We observe zero impact for the two lowest quantiles. Except for estimations of the fourth quantile, where the treatment effect of being retired increases the EURO-D scale by 0.07 pp[31], all estimations of coefficients are insignificant and we cannot observe a consistent pattern. We have to keep in mind, that results depicted are based on the assumption that retirement is exogenous. We suggest that the insignificant results might be due to the fact that we do not take into account that retirement possibly is endogenous.

Figure 3 illustrates our findings and shows the broad confidence intervals especially at the end of the distribution. Our OLS estimate is depicted as the last point estimate:

[31] Almost significant at 10% level.

Figure 3a: QTE Baseline Results, assuming exogeneity



The point estimates are indicated as well as the 95% confidence interval which is narrowed down by the horizontal dashes.

QTE Baseline Results for retirement, assuming exogeneity:

	q01		q02		q03		q04		q05	
Coeff.	0.0000		0.0000		0.0200		0.0689		0.0348	
SE	0.04		0.03		0.04		0.04		0.05	
CI 95%	-0.0767	0.0767	-0.0654	0.0654	-0.0578	0.0978	-0.0177	0.1554	-0.0621	0.1318
	q06		q07		q08		q09		OLS	
Coeff.	-0.0032		-0.0290		0.0324		0.0710		0.0157	
SE	0.06		0.06		0.08		0.11		0.05	
CI 95%	-0.1192	0.1127	-0.1549	0.0969	-0.1274	0.1923	-0.1428	0.2847	-0.0839	0.1153

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

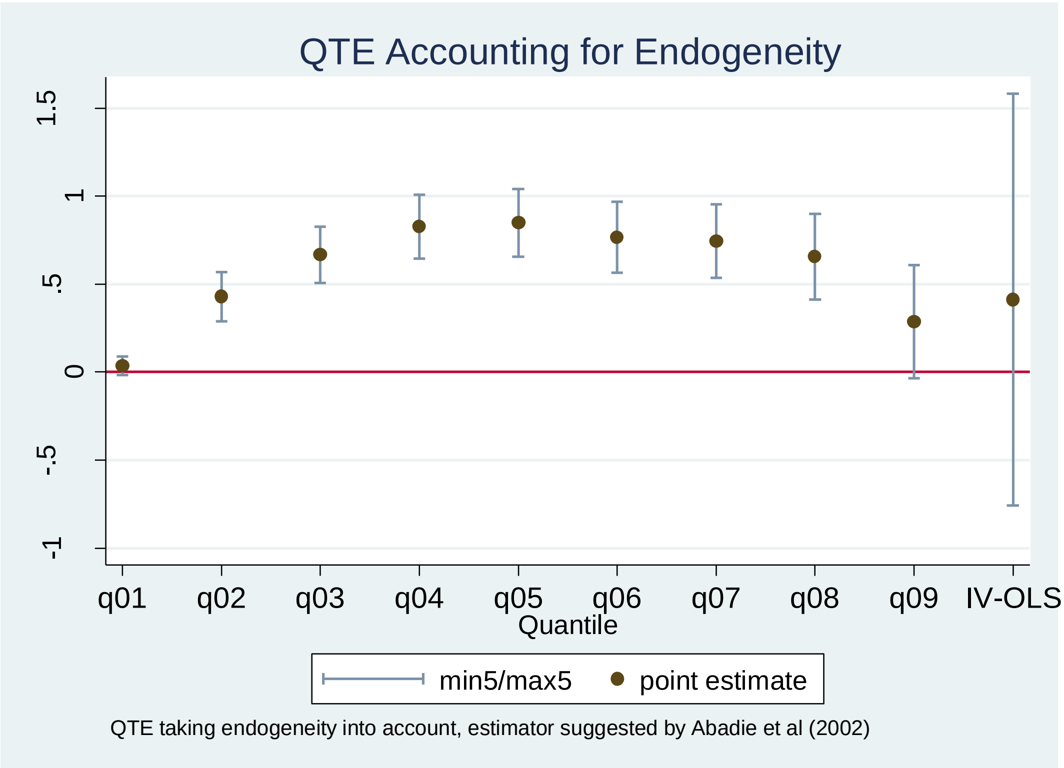
4.4.2 Accounting for Endogeneity in Quantile Regression

Similarly to our investigation concerning the Linear Probability Model, we also account for endogeneity in the Quantile Regression Model. One drawback is that current estimation methods allow us implementing only one instrument at a time but obtaining more efficient estimates could be achieved when using more than one valid instrument. We use the indicator on whether an individual has passed the age for full retirement eligibility as an instrument[32]. We use the estimator suggested by Abadie et al. (2002).

Our results after implementing Instrumental Variable estimation on the quantile treatment effects with full retirement eligibility as instrument are presented in Figure 3b and Table A.13. The regressors for retirement that were found to be mostly insignificant in the previous models are positive and mostly significant. While the effect of retirement on mental health stays close to zero for the first quantile (0.098 with a p-value of 0.014), the effect becomes to a large extent higher compared to baseline Quantile Regression (0.9485 at the median and 0.2049 at the ninth quantile. Graph4 illustrates our findings: the coefficients of retirement change when we move from the bottom to the upper quantiles on the conditional distribution of mental health.

There is a slightly smaller impact at lower levels of the quantiles and a noticeable higher effect towards the middle of the distribution with a peak at the fifth quantile.

Figure 3b: QTE Accounting for Endogeneity



The point estimates are indicated as well as the 95% confidence interval which is narrowed down by the horizontal dashes.

[32] Estimates do not differ substantially when only using eligibility ages for full retirement as an instrument in 2SLS estimations of our analysis we have done so far except for FE-IV which is shows insignificant results using only full retirement eligibility ages (Table A.12).

QTE Baseline Results for retirement, assuming endogeneity

	q01		q02		q03		q04		q05	
Coeff.	0.0358		0.4293	***	0.6672	***	0.8258	***	0.8498	***
SE	0.03		0.07		0.08		0.09		0.10	
CI 95%	-0.0181	0.0896	0.2905	0.5681	0.5075	0.8268	0.6435	1.0081	0.6574	1.0422
	q06		q07		q08		q09		IV OLS	
Coeff.	0.7653	***	0.7442	***	0.6546	***	0.2867	+	0.4130	
SE	0.10		0.11		0.12		0.16		0.60	
CI 95%	0.5632	0.9674	0.5355	0.9530	0.4114	0.8978	-0.0364	0.6098	-0.7560	1.5819

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

For a direct comparison of quantile treatment effects versus mean effects we run an IV-OLS regression on the depression scale which is further depicted in the graph as the last point estimate. We see that these results are close to IV-QR estimates at the lower and upper end of the distribution. This lets us assume that the effect of retirement on mental health seems to be largely driven by observations at the median of the distribution. Effects there “compensate” for no or low effects at the lower percentiles. We see relatively smaller standard errors, i.e. narrower confidence intervals for the lower quantiles. We therefore assume more accuracy in those areas. According to our estimations for the very lowest quantile we expect no effect of retirement among those in very good health, i.e. those at the bottom of the distribution.

We obtained high, yet insignificant estimators for clinically indicated depression. The cut-off point of four symptoms is at the eighth quantile, still a region with a relatively high impact. However, we also see high impact for quantiles around the median. Those quantiles are at the lower ends of the EURO-D scale, i.e. individuals with relatively good health with no or one symptom of depression. This would mean that the impact of retirement on the probability to be depressed occurs on relatively healthy individuals rather than (only) those who show higher severity of depression.

We calculate again the turning point for the impact of age as in 2SLS results which was estimated at what is currently the age for full retirement in many countries. Age has a highly significant positive impact on well-being according to our QR model (decreasing the severity of depression), and the estimated turning point when the effect of age changes is calculated at age 56 to 57 depending on the quantile chosen.

5 DISCUSSION

Our findings suggest that being retired has a negative impact on an individual's well-being, i.e. increasing the severity of depression. Our findings obtained by quantile regression suggest negative effects of retirement on well-being, i.e. increasing depressive symptoms, depending on the conditional distribution of mental health. These findings are highly significant for almost all quantiles chosen. These results are different from some other studies that solely find limited or no evidence of causal impact.

One important drawback of the investigation is that we are dealing with self-assessed health. This induces bias because people tend to judge their health in different ways and have different standards. This might be apparent in the context given, as we are dealing with individuals from different cultural backgrounds, i.e. different countries or other socio-economic backgrounds. A vignettes approach that accounts for possible different perceptions could be advisable in order to correct for discrepancies in reporting self-assessed health measures (e.g. Bago d'Uva et al., 2008, 2011; Tandon, et al. 2002; Pfarr et al., 2011).

Because the assumption of no correlation between the error term and the instruments cannot be examined, the conclusions drawn from our estimates rely on disputable assumptions. We further cannot take into account the nature of the scale as being a count variable when using IV in a quantile regression context. Applying a quantile count regression design might be appropriate.

We considered the limitations regarding heteroskedasticity of pooled cross-section analysis and used FE models. Although our regressor of interest is time-varying, only few observations change, which results in large standard errors. Nevertheless, from the strategies used in the first part of our investigation, we consider FE estimation using IV as the theoretically most powerful or the ones with the most potential. There is evidence that our expectations of differing impact of retirement depending on the conditional distribution is true and we assume the QTE when accounting for endogeneity as being the most appropriate.

IV estimates are local average treatment effects (LATE) (Imbens and Angrist, 1994). The impact on depression is different from whether retirement was chosen randomly[33] or whether it is resulting from retirement of someone who actually retired[34] (Kennedy, 2008). The estimated impact from being retired is found for the compliers, the people that retire because they passed the eligibility ages; their retirement status can be altered by the instrument (Angrist et al., 1996; Angrist, 2004). Individuals with the highest incentives to retire at those ages, e.g. those that are unsatisfied with

[33] Average Treatment Effects (ATE).
[34] Average Treatment Effect of the Treated (ATET).

their jobs and want to retire early or those that need the full retirement benefits are most likely to be compliers. However, the subpopulation of the compliers cannot be identified and to draw generalized inference we have to assume homogeneity for the whole sample (Angrist, 2004; Schroeder, 2010).

As our data to date only contains two waves, we consider a short panel or cross-section analysis which does not show much power to explain the rates of increase or decline in depression over a longer period of time for a certain individual (Rohwedder and Willis, 2010). This means that we also cannot observe whether an effect is temporary or persistent for the retiree. The effects might also depend on the duration of the retirement spell. A recently retired may experience his situation different from someone retired for a longer period and there might be very well variation throughout the years (Rohwedder and Willis, 2010). We explore also transitions for different people in different waves over two years so that our analysis only captures the dimension of time in a very limited way. As theory of the hedonic treadmill suggests, people adapt to certain situations. Although this theory suggests that the negative effects on mental health that we found could be only temporary, this also implies that any efforts on increasing happiness are destined to lack in success as well (Brickman and Campbell, 1971; Eysenck, 1990; Diener et al., 2009).

Investigation over a longer period of time consequently seems appropriate. Once suitable data becomes available, investigations should focus on these aspects or in any case take them into consideration. To investigate whether the effects are stable over time we would suggest using dynamic panel models (Cameron and Trivedi, 2010; Arellano and Bond, 1991).

Mental health can be affected and eventually enhanced by other policies than those directly related to health for example in schooling, accommodation and child care (Dave et al., 2008). Considering changes in policies regarding eligibility incentives to retire or common practice in retirement behavior seems valuable, not only for budgetary reasons, but also intrinsic (mental) health reasons. One might assume people to expect positive implications from retiring; however concerning depressive symptoms and self-indicated mental health problems, this assumptions seem to be somewhat compromised. The outcome of our research might support ideas to decrease incentives to retire and raise eligibility ages to receive retirement benefits.

An option for postponement of retirement eligibility ages could involve a higher than the current share of part-time work in old ages for a longer time. A smoother transition into retirement would be possible with an increased time staying in the labor force. This means less free time for negative thoughts, but staying active and challenged. An early start of part-time work, depending on the extended period of time worked, could compensate for the time worked longer after the current eligibility ages and further for increased unemployment rates. We could anticipate positive financial implications with a higher share of working compared to retirees, increasing production and need of fewer taxes to pay retirement benefits. Additionally, diversification in job opportunities of the elderly might be an opportunity to lessen "mental fatigue" (e.g. Burdorf 2010) in older workers that might be caused by everlasting same routine and lack of excitement (compared to only stress). Incentives could be given to find another (part-time) job including volunteer work instead of retiring from a job.

6 CONCLUSION

Our study focuses on the relationship between retirement and mental health and is based in a cross-country setting that gives us the opportunity to obtain valid and relevant instruments. This differs from early studies that mainly focused on single-country settings or associations. We departed from the previous literature by examining how retirement status affects depression conditional on the distribution of mental health.

Conclusions we can draw from our research are that being retired has a negative impact on ones mental health, increasing the probability of being depressed or reporting to have feelings of depression in the previous month. The magnitudes of the effects should not be neglected and vary between 9 to 37 pp higher probability of having mental health problems when being retired, although estimations with higher magnitude show relatively high standard errors. Our findings obtained by quantile regression suggest almost only significant negative effects of retirement on well-being, i.e. increasing severity of depressive symptoms by 0.29 to 0.85 points on a scale from 0 to 12 depending on the quantile depicted. For some retirees, however, retirement shows no significant effects on their well-being, especially at the very bottom and top of the conditional distribution.

Concerning the heterogeneity of impact across the spectrum of the distribution of mental health we have seen that individuals with four to six depressive symptoms respond most to changes in the retirement status. Interventions such as longer (part-time) work, voluntary work after retirement, etc could be most effective in reducing depression in elderly to those groups in the middle of the distribution rather to those at the lowest and highest quantiles of the distribution. This might have policy implications such that these groups should receive particular attention and closer examination and follow-up.

Our outcomes imply that there very well may be differing treatment effects at distinct points of the conditional distribution of mental health and that the negative effect of retirement on well-being shows diverse severity for different individuals.

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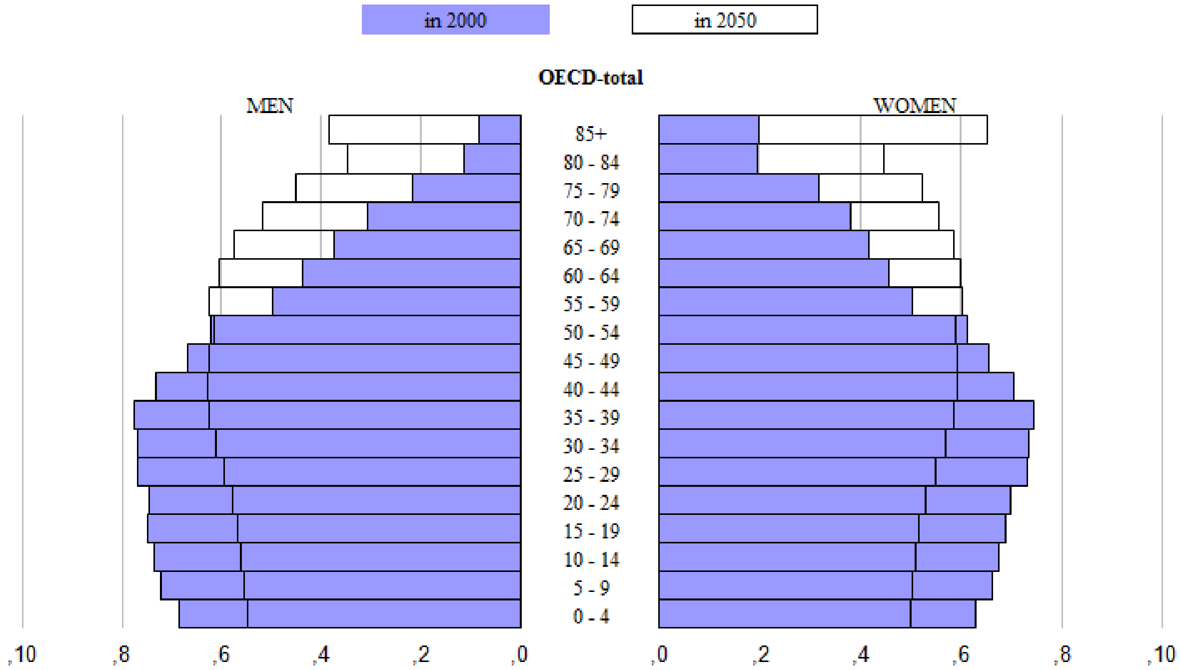
APPENDICES

LIST OF APPENDICES

APPENDIX I – Figures

Figure A.1: Ageing - Population pyramids in 2000 & 2050



Population by age group, gender in 2000 and 2050, in percentage of total population in each group. Total Population (in millions): 1,129.6 in 2000; 1,334.0 in 2050. Old age dependency ratio (65+ in % versus group 20-64): 22 in 2000; 47 in 2050. OECD-total. Countries that contribute to this analysis show similar pattern. Source: (OECD, 2011); http://www.oecd.org/dataoecd/52/31/38123085.xls

APPENDIX II – Tables

Table A.1 EURO-D Scale Questionnaire

Question 1: SAD OR DEPRESSED LAST MONTH 'In the last month, have you been sad or depressed?' 0 No 1 Yes	**Question 7: IRRITABILITY** 'Have you been irritable recently?' 0 No 1 Yes
Question 2: HOPES FOR THE FUTURE 'What are your hopes for the future?' 0 Any hopes mentioned 1 No hopes mentioned	**Question 8: APPETITE** 'What has your appetite been like?' 0 No diminution in desire for food, non-specific or uncodeable response 1 Diminution in desire for food
Question 3: FELT WOULD RATHER BE DEAD 'In the last month, have you felt that you would rather be dead?' 0 No such feelings 1 Any mention of suicidal feelings or wishing to be dead	**Question 9: FATIGUE** 'In the last month, have you had too little energy to do the things you wanted to do?' 0 No 1 Yes
Question 4: FEELS GUILTY 'Do you tend to blame yourself or feel guilty about anything?' 0 No such feelings 1 Obvious excessive guilt or self-blame, mentions guilt or self-blame, but it is unclear if these constitute obvious, or excessive guilt or self-blame	**Question 10: CONCENTRATION** 'How is your concentration?' (Difficulty in concentrating on entertainment or reading) 1 Difficulty in concentrating on entertainment 2 No such difficulty mentioned
Question 5: TROUBLE SLEEPING 'Have you had trouble sleeping recently?' 0 No trouble sleeping 1 Trouble with sleep or recent change in pattern	**Question 11: ENJOYMENT** 'What have you enjoyed doing recently?' 0 Mentions any enjoyment from activity 1 Fails to mention any enjoyable activity
Question 6: LESS OR SAME INTEREST IN THINGS 'In the last month, what is your interest in things?' 0 No mention of loss of interest, non-specific or uncodeable response 1 Less interest than usual mentioned	**Question 12: TEARFULNESS** 'In the last month, have you cried at all?' 0 No 1 Yes

Source: (Castro-Costa et al., 2008)

Table A.2: Eligibility for Public Retirement Benefits in 2004

	Men		Women	
	early	normal	early	normal
Austria	60	65	57	60
Belgium	60	65	60	65
Denmark	65	65	65	65
France	57	60	57	60
Germany	63	65	63	65
Greece	57	65	57	65
Italy	57	65	57	65
Netherlands	60	65	60	65
Spain	60	65	60	65
Sweden	61	65	61	65
Switzerland	63	65	62	64

In practice in 2004; source: (Coe and Zamarro, 2011)

Table A.3: ISCED coding

Level 0	Pre-primary education	**Basic education**
Level 1	Primary education or first stage of basic education	
Level 2	Lower secondary or second stage of basic education	**Medium education**
Level 3	(Upper) secondary education	
Level 4	Post-secondary non-tertiary education	**Higher education**
Level 5	First stage of tertiary education	
Level 6	Second stage of tertiary education	

Table A.4: Country Representation

	Sample		all available data	
	Percent	Frequency	Percent	Frequency
Austria	5.83 %	2,117	5.40 %	654
Belgium	12.19 %	4,428	15.38 %	1,861
Denmark	8.04 %	2,921	7.01 %	849
France	10.78 %	3,915	10.36 %	1,254
Germany	10.84 %	3,937	8.75 %	1,059
Greece	9.99 %	3,628	12.00 %	1,453
Italy	9.40 %	3,414	9.72 %	1,176
Netherlands	10.82 %	3,929	10.09 %	1,221
Spain	6.73 %	2,443	6.63 %	802
Sweden	10.90 %	3,957	10.66 %	1,290
Switzerland	4.49 %	1,630	4.01 %	485
Total		36,319		12,104

Table A.5: Descriptive Statistics (on average or in percent respectively)

		Pooled	wave1	wave2
Demographics				
Individuals		7768	6968	5136
Observations		12104	6968	5136
Age		59.88	59.25	60.74
Over Early Ret. Age		51.67%	47.70%	57.05%
Over Full Ret. Age		29.70%	27.55%	32.58%
Gender	Male	50.13%	51.08%	48.85%
	Female	49.87%	48.92%	51.15%
Married		69.82%	70.62%	68.73%
Children		2	2	2
Living in Rural Area		41.65%	41.42%	41.96%
Education	Basic	22.68%	23.38%	21.73%
	Medium	49.55%	49.28%	49.90%
	High	27.78%	27.34%	28.37%
Employment				
Retired		50.69%	49.89%	51.77%
Household Income		28,652 Euro	32,169 Euro	23,879 Euro
Health				
EURO-D scale		2.04	2.08	1.99
Depressed EURO-D		20.79%	21.53%	19.78%
Self-Reported Depression		35.77%	36.95%	34.15%
GALI Limitation		33.48%	33.67%	33.24%
IADL Limitations (1+)		11.86%	11.68%	12.09%
ADL Limitations (1+)		5.21%	5.27%	5.14%
BMI		26.64%	26.59%	26.69%
	Underweight	1.00%	1.00%	1.10%
	Normal	37.88%	38.09%	37.60%
	Overweight	42.28%	42.82%	41.55%
	Obese	18.98%	18.37%	19.80%
Mobility limitations		1	1	1
Physically inactive		4.51%	4.33%	4.75%
Parents had MH Probl.		2.46%	2.34%	2.63%

Table A.6: Percent of individuals that passed eligibility ages

	pooled		wave1		wave2	
	early	full	early	full	early	full
Austria	68.20%	46.94%	65.00%	42.37%	72.63%	53.28%
Belgium	47.02%	25.20%	43.55%	23.67%	51.33%	27.11%
Denmark	20.49%	20.49%	18.01%	18.01%	23.77%	23.77%
France	63.96%	45.61%	59.64%	43.27%	69.79%	48.78%
Germany	41.64%	30.69%	38.10%	27.12%	46.29%	35.37%
Greece	63.39%	24.50%	58.05%	23.90%	70.30%	25.28%
Italy	74.06%	31.46%	68.16%	27.20%	81.85%	37.08%
Netherlands	47.58%	21.05%	43.13%	19.69%	54.00%	23.00%
Spain	50.00%	25.81%	46.96%	23.68%	54.87%	29.22%
Sweden	44.73%	23.49%	41.37%	22.42%	49.81%	25.10%
Switzerland	34.02%	22.27%	31.62%	21.69%	37.09%	23.00%
Total	51.67%	28.49%	47.70%	26.36%	57.05%	31.37%

Table A.7: Transitions

Labor Force Participants	to	Labor Force Participants	89.11%
Labor Force Participants Retired	to	Retired	10.89%
Retired	to	Retired	96.96%
Retired	to	Labor Force Participants	3.04%

Table A.8: Prevalence of depression by occupational status

	Depressed	Depressed in Previous Month
Labor Force Participants	17.88%	32.92%
Retired	23.62%	38.53%
Total	20.79%	35.77%

Table A.9a: Instrumental Validity

Correlation with retired		
Early	0.5529	
Full	0.5303	
Logit		
early	0.2483	**
	0.090	
full	0.5255	***
	0.124	
Test of overidentifying restrictions		
Score chi2(1)	0.9062	
Underidentification test		
Kleibergen-Paap rk LM statistic	26.6580	
Chi-sq(2) P-value	0.0000	
Weak identification test		
Cragg-Donal Wald F statistic	16.8110	
Kleibergen-Paap rk Wald F statistic	13.4500	
Stock-Yogo weak ID test critical values		
10% maximal IV size	19.9300	
15% maximal IV size	8.7500	
25% maximal IV size	7.2500	
Hansen J statistik		
Overidentification test for all instruments	0.6250	
Chi-sq(1) P-value	0.4292	

Table A.9b: First Stage Results

	First Stage OLS	
full	0.1235	***
	0.015	
early	0.1460	***
	0.015	
age	0.0035	
	0.016	
age2	0.0002	+
	0.000	
underweight	0.0156	
	0.041	
overweight	-0.0042	
	0.009	
obese	0.0004	
	0.012	
hhincome_e~i	0.0000	***
	0.000	
children	-0.0023	

	0.003	
edmed	-0.0324	**
	0.012	
edhigh	-0.1010	***
	0.013	
married	0.0801	***
	0.010	
male	-0.1066	***
	0.009	
parentsmh	0.0016	
	0.029	
gali	0.0708	***
	0.009	
iadl2	0.0624	***
	0.016	
adl2	0.0388	*
	0.019	
mobility	0.0142	***
	0.003	
phactiv	0.0161	
	0.018	
rural	-0.0013	
	0.009	
spring	-0.0077	
	0.010	
summer	0.0076	
	0.010	
winter	-0.0581	***
	0.010	
AU	0.2335	***
	0.026	
GER	0.0956	***
	0.024	
SE	-0.0501	*
	0.024	
IT	0.1796	***
	0.025	
GR	0.0696	**
	0.025	
DK	0.0635	*
	0.025	
NL	0.1477	***
	0.025	
ESP	0.1057	***
	0.027	
FR	0.0927	***
	0.024	

BE	0.1808	***
	0.023	
_cons	-0.7427	
	0.473	
R2	0.4675	
Adj. R2	0.4660	
Robust F(2, 7767)	89.6682	
Prob > F	0.0000	

+ p<0.10, * p<0.05, **, p<0.01, *** p<0.001;
SE given below coefficient

Table A.10a: Results EURO-D Depression Scale

	Euro-D Depression Scale							
	OLS		FE		IV		FE IV	
retired	-0.0083		-0.0485	+	0.0871		0.3853	
	-0.010		-0.028		-0.072		-0.301	
age	-0.0421	**	-0.0230		-0.0390	*	-0.0028	
	-0.015		-0.030		-0.015		-0.033	
age2	0.0003	**	0.0001		0.0003	+	-0.0001	
	0.000		0.000		0.000		0.000	
underweight	-0.0252		0.0143		-0.0267		0.0218	
	-0.043		-0.073		-0.043		-0.074	
overweight	-0.0111		-0.0151		-0.0108		-0.0198	
	-0.008		-0.021		-0.008		-0.022	
obese	-0.0151		-0.0412		-0.0152		-0.0511	
	-0.011		-0.033		-0.011		-0.036	
hhincome_equi	0.000		0.000		0.000		0.000	
	0.000		0.000		0.000		0.000	
children	0.0071	*	0.017		0.0073	*	0.0145	
	-0.003		-0.017		-0.003		-0.018	
edmed	-0.0280	*			-0.0247	*		
	-0.011				-0.011			
edhigh	-0.0473	***			-0.0375	**		
	-0.012				-0.014			
married living tog~s	-0.0614	***	-0.1391	+	-0.0689	***	-0.1351	
	-0.009		-0.081		-0.011		-0.083	
male	-0.1031	***			-0.0926	***		
	-0.008				-0.011			
did parents: have ~	0.0509	+			0.0509	+		
	-0.027				-0.027			
limitations with a~l	0.0978	***	0.041	**	0.0912	***	0.0323	+
	-0.009		-0.015		-0.011		-0.017	
iadl limitations n~s	0.0809	***	0.0835	**	0.0751	***	0.0653	*
	-0.018		-0.026		-0.019		-0.03	
1+ adl limitations	0.0528	*	0.0564		0.0491	*	0.0546	
	-0.022		-0.035		-0.022		-0.036	
mobility, arm func~	0.0389	***	0.0225	***	0.0376	***	0.0232	***
	-0.004		-0.007		-0.004		-0.007	
physical inactivity	0.0670	**	0.0657	*	0.0656	**	0.0651	+
	-0.022		-0.033		-0.022		-0.034	
rural	-0.0223	**			-0.0222	**		
	-0.008				-0.008			
spring	0.0114		0.0269	+	0.0121		0.0333	*
	-0.011		-0.014		-0.011		-0.015	
summer	0.0095		0.0008		0.0086		0.0088	
	-0.011		-0.016		-0.011		-0.017	
winter	0.0096		0.0329	*	0.0154		0.0389	*
	-0.011		-0.016		-0.012		-0.017	

AU	-0.0315				-0.0589	+	
	-0.023				-0.031		
GER	-0.0081				-0.0174		
	-0.02				-0.021		
SE	-0.023				-0.0193		
	-0.019				-0.02		
IT	0.1077	***			0.0863	**	
	-0.022				-0.027		
GR	0.0067				-0.0041		
	-0.02				-0.022		
DK	-0.0236				-0.0283		
	-0.021				-0.021		
NL	-0.0056				-0.0218		
	-0.02				-0.023		
ESP	0.0927	***			0.0805	**	
	-0.024				-0.026		
FR	0.1317	***			0.1161	***	
	-0.021				-0.025		
BE	0.0596	**			0.0402		
	-0.02				-0.024		
constant	1.5646	***	1.3151		1.5778	***	
	-0.451		-0.896		-0.454		
R-sqr	0.1471		0.0255		0.1396		-0.0422
dfres	7767		7767				
p-value	0.0000		0.0000		0.0000		.

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001
SE given below coefficient

Table A.10b: Results Self-Assessed Mental Health

	Felt Depressed in a Month							
	OLS		FE		IV		FE IV	
retired	0.0046		-0.0675	*	0.1964	*	0.2396	
	-0.012		-0.031		-0.089		-0.355	
age	-0.0311	+	-0.0350		-0.0250		-0.0207	
	-0.018		-0.036		-0.018		-0.04	
age2	0.0002		0.0001		0.0001		-0.0001	
	0.000		0.000		0.000		0.000	
underweight	0.0356		0.1579	+	0.0327		0.1632	+
	-0.05		-0.092		-0.05		-0.092	
overweight	-0.0276	**	0.0073		-0.0271	**	0.004	
	-0.01		-0.026		-0.01		-0.026	
obese	-0.0345	**	-0.0133		-0.0346	**	-0.0203	
	-0.013		-0.039		-0.013		-0.04	
hhincome_equi	0.0000		0.0000		0.0000		0.0000	
	0.000		0.000		0.000		0.000	
children	0.0074	*	-0.0041		0.0078	*	-0.0059	
	-0.004		-0.018		-0.004		-0.018	
edmed	-0.0022				0.0043			
	-0.013				-0.013			
edhigh	0.0025				0.0221			
	-0.014				-0.017			
married living tog~s	-0.0841	***	-0.2742	**	-0.0992	***	-0.2713	**
	-0.011		-0.087		-0.013		-0.088	
male	-0.1598	***			-0.1386	***		
	-0.010				-0.014			
did parents: have ~	0.0476				0.0474			
	-0.032				-0.031			
limitations with a~l	0.0919	***	0.0221		0.0786	***	0.0159	
	-0.011		-0.018		-0.013		-0.020	
iadl limitations n~s	0.0632	***	0.0305		0.0516	**	0.0176	
	-0.019		-0.028		-0.02		-0.032	
1+ adl limitations	0.0262		0.0278		0.0187		0.0266	
	-0.023		-0.038		-0.023		-0.039	
mobility, arm func~	0.0293	***	0.0207	**	0.0266	***	0.0213	**
	-0.004		-0.007		-0.004		-0.007	
physical inactivity	0.0060		0.0200		0.0031		0.0196	
	-0.023		-0.038		-0.023		-0.038	
rural	-0.0188	+			-0.0186	+		
	-0.010				-0.010			
spring	0.017		0.0106		0.0183		0.0151	
	-0.013		-0.017		-0.013		-0.018	
summer	0.0028		-0.028		0.0009		-0.0223	
	-0.013		-0.019		-0.013		-0.021	
winter	0.0136		0.0524	**	0.0252	+	0.0567	**
	-0.013		-0.019		-0.015		-0.02	

AU	-0.0759	*			-0.131	***	
	-0.03				-0.039		
GER	0.0512	+			0.0325		
	-0.027				-0.029		
SE	-0.0469	+			-0.0393		
	-0.026				-0.027		
IT	0.0718	**			0.0286		
	-0.028				-0.035		
GR	-0.0927	***			-0.1145	***	
	-0.026				-0.029		
DK	-0.0655	*			-0.075	**	
	-0.028				-0.029		
NL	-0.0373				-0.0698	*	
	-0.027				-0.031		
ESP	0.0279				0.0034		
	-0.03				-0.032		
FR	0.1148	***			0.0834	**	
	-0.027				-0.031		
BE	-0.0019				-0.0409		
	-0.026				-0.032		
constant	1.4455	**	2.3684	*	1.4722	**	
	-0.537		-1.109		-0.544		
R-sqr	0.1075		0.0175		0.0858		-0.0055
dfres	7767		7767				
p-value	0.0000		0.0000		0.0000		.

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001
SE given below coefficient

Table A.11: Quantile Regression under assumption of exogeneity

	Q01	Q02	Q03	Q04	Q05	Q06	Q07	Q08	Q09
retired	0.0000	0.0000	0.0200	0.0689	0.0348	-0.0032	-0.0290	0.0324	0.0710
	0.04	0.03	0.04	0.04	0.05	0.06	0.06	0.08	0.11
age	0.0000	0.0000	-0.0120	-0.0708	-0.2119 **	-0.2425 **	-0.3001 **	-0.3360 **	-0.5542 **
	0.06	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.16
age2	0.0000	0.0000	0.0001	0.0005	0.0016 *	0.0019 **	0.0023 **	0.0025 **	0.0042 **
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
underweight	0.0000	0.0000	-0.2106	-0.1326	-0.2246	-0.3105	-0.3743	-0.0022	-0.1686
	0.17	0.15	0.18	0.23	0.25	0.26	0.30	0.35	0.54
overweight	0.0000	0.0000	0.0165	0.0047	-0.0091	-0.0266	-0.0331	-0.1160 +	-0.1082
	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.07	0.09
obese	0.0000	0.0000	0.0049	-0.0255	-0.1242 *	-0.1463 *	-0.1269 +	-0.1681 +	-0.1407
	0.04	0.04	0.04	0.05	0.05	0.07	0.07	0.09	0.11
hhincome_e~i	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
children	0.0000	0.0000	0.0150	0.0334 **	0.0200	0.0270	0.0112	0.0271	0.0202
	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03
edmed	0.0000	0.0000	-0.0309	-0.0742	-0.2060 ***	-0.2113 **	-0.2258 **	-0.2048 *	-0.3043 *
	0.04	0.04	0.04	0.05	0.06	0.06	0.07	0.08	0.12
edhigh	0.0000	0.0000	-0.0423	-0.1348 **	-0.3052 ***	-0.2695 ***	-0.2670 ***	-0.3106 **	-0.3749 **
	0.05	0.04	0.05	0.05	0.06	0.07	0.08	0.09	0.14
married	0.0000	0.0000	-0.1259 **	-0.3032 ***	-0.4148 ***	-0.3673 ***	-0.4299 ***	-0.5336 ***	-0.6293 ***
	0.04	0.03	0.04	0.04	0.05	0.05	0.06	0.07	0.10
male	0.0000	0.0000	-0.5251 ***	-0.6463 ***	-0.6155 ***	-0.7867 ***	-0.9431 ***	-0.9970 ***	-0.9695 ***
	0.03	0.03	0.04	0.04	0.04	0.05	0.05	0.06	0.08
parentsmh	0.0000	0.0000	0.3842 **	0.3420 **	0.4474 **	0.4654 **	0.5691 ***	0.4918 **	0.3154
	0.11	0.09	0.12	0.12	0.16	0.15	0.15	0.19	0.21
gali	0.0000	0.0000	0.4095 ***	0.5681 ***	0.5976 ***	0.6606 ***	0.7861 ***	0.9319 ***	1.1833 ***
	0.04	0.03	0.04	0.05	0.05	0.06	0.06	0.07	0.10

iadl2	0.0000	0.5000 ***	0.4824 ***	0.4799 ***	0.5465 ***	0.5100 ***	0.5774 ***	0.5620 ***	0.5627 **
	0.09	0.09	0.09	0.10	0.10	0.11	0.13	0.13	0.21
adl2	1.0000 ***	0.2500 *	0.3913 ***	0.2668 **	0.2193 +	0.2693 +	0.2111	0.0815	0.0084
	0.12	0.11	0.11	0.12	0.13	0.14	0.14	0.14	0.18
mobility	0.0000	0.2500 ***	0.1978 ***	0.2174 ***	0.2737 ***	0.2945 ***	0.3263 ***	0.3398 ***	0.3377 ***
	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.04
phactiv	0.0000	0.5000 ***	0.4435 ***	0.4947 ***	0.4737 ***	0.5118 ***	0.5266 **	0.5419 **	0.4159 +
	0.10	0.12	0.12	0.12	0.13	0.14	0.16	0.16	0.22
rural	0.0000	0.0000	-0.0220	-0.0626 +	-0.0802 *	-0.1287 **	-0.1012 *	-0.1355 *	-0.1270
	0.03	0.02	0.03	0.03	0.04	0.04	0.05	0.06	0.08
spring	0.0000	0.0000	0.0121	0.0272	0.0436	0.0539	0.0847	0.1148	0.1187
	0.05	0.04	0.05	0.05	0.06	0.07	0.07	0.09	0.12
summer	0.0000	0.0000	-0.0089	-0.0205	0.0090	-0.0097	0.0378	0.0681	0.2047 +
	0.05	0.04	0.05	0.05	0.06	0.07	0.07	0.08	0.12
winter	0.0000	0.0000	0.0005	0.0279	0.0492	0.0409	0.0621	0.1627 +	0.2507 *
	0.05	0.04	0.05	0.06	0.06	0.07	0.07	0.09	0.13
AU	0.0000	0.0000	-0.0593	-0.1256	-0.3554 **	-0.3984 **	-0.2641 *	-0.4604 **	-0.2828
	0.09	0.06	0.08	0.09	0.11	0.13	0.13	0.17	0.22
GER	0.0000	0.0000	-0.0067	0.0285	-0.0520	-0.0514	-0.0080	-0.1045	-0.1387
	0.08	0.06	0.08	0.09	0.11	0.12	0.12	0.16	0.18
SE	0.0000	0.0000	-0.0176	0.0111	-0.0293	-0.0660	-0.0529	-0.1535	-0.0896
	0.08	0.06	0.08	0.09	0.11	0.11	0.11	0.15	0.18
IT	0.0000	0.0000	0.4085 ***	0.5935 ***	0.4983 ***	0.5269 ***	0.8074 ***	0.9944 ***	1.2266 ***
	0.09	0.07	0.09	0.10	0.12	0.13	0.14	0.18	0.20
GR	0.0000	0.0000	-0.0416	-0.1098	-0.3371 **	-0.2950 *	-0.1291	-0.0984	0.3435
	0.08	0.06	0.07	0.08	0.10	0.12	0.12	0.17	0.21
DK	0.0000	0.0000	-0.0249	-0.0470	-0.0776	-0.1236	-0.1356	-0.1717	0.0402
	0.08	0.06	0.08	0.09	0.11	0.12	0.12	0.17	0.21
NL	0.0000	0.0000	-0.0122	-0.0155	-0.0739	-0.0607	0.0328	0.0141	0.2156
	0.08	0.06	0.08	0.08	0.11	0.12	0.12	0.16	0.20

ESP	0.0000	0.0000		0.4038	***	0.6585	***	0.4992	***	0.6177	***	0.8317	***	0.9766	***	1.2116	***
	0.09	0.07		0.11		0.11		0.13		0.15		0.15		0.19		0.24	
FR	0.0000	0.2500	**	0.5124	***	0.8095	***	0.6623	***	0.6971	***	1.0023	***	0.9659	***	1.1378	***
	0.09	0.07		0.09		0.09		0.11		0.12		0.13		0.16		0.20	
BE	0.0000	0.0000		0.0380		0.2385	**	0.2876	**	0.1824		0.5383	***	0.4641	**	0.7566	***
	0.08	0.06		0.07		0.08		0.11		0.11		0.12		0.15		0.18	
_cons	0.0000	0.0000		1.1282		3.5229	+	8.6284	***	10.0936	***	12.2715	***	14.5263	***	22.1787	***
	1.73	1.52		1.77		1.99		2.32		2.59		2.92		3.42		4.88	

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001
SE given below the coefficient

Table A.12: Comparison of Instrumental Variable Estimates using Early and Full vs. only Full Retirement Eligibility Ages as Instruments

	Instruments: Early and Full Retirement Eligibility Ages				Instruments: Full Retirement Eligibility Ages			
	Euro-D Depression Scale		Felt Depressed in a Month		Euro-D Depression Scale		Felt Depressed in a Month	
	IV	FE IV	IV	FE IV	IV	FE IV	IV	FE IV
retired	0.087	0.385	0.196*	0.24	0.075	-0.057	0.14	0.177
	-0.07	-0.3	-0.09	-0.35	-0.13	-0.61	-0.15	-0.74
age	-0.039*	-0.003	-0.025	-0.021	-0.039*	-0.023	-0.027	-0.024
	-0.02	-0.03	-0.02	-0.04	-0.02	-0.04	-0.02	-0.05
age2	0.000+	0.000	0.000	0.000	0.000+	0.000	0.000	0.000
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
underweight	-0.027	0.022	0.033	0.163+	-0.026	0.014	0.034	0.162+
	-0.04	-0.07	-0.05	-0.09	-0.04	-0.07	-0.05	-0.09
overweight	-0.011	-0.02	-0.027**	0.004	-0.011	-0.015	-0.027**	0.005
	-0.01	-0.02	-0.01	-0.03	-0.01	-0.02	-0.01	-0.03
obese	-0.015	-0.051	-0.035**	-0.02	-0.015	-0.041	-0.035**	-0.019
	-0.01	-0.04	-0.01	-0.04	-0.01	-0.04	-0.01	-0.04

hhincome_equi	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
children	0.007*	0.015	0.008*	-0.006	0.007*	0.017	0.008*	-0.006
	0.00	-0.02	0.00	-0.02	0.00	-0.02	0.00	-0.02
edmed	-0.025*		0.004		-0.025*		0.002	
	-0.01		-0.01		-0.01		-0.01	
edhigh	-0.037**		0.022		-0.039*		0.016	
	-0.01		-0.02		-0.02		-0.02	
married living tog~s	-0.069***	-0.135	-0.099***	-0.271**	-0.068***	-0.139+	-0.095***	-0.272**
	-0.01	-0.08	-0.01	-0.09	-0.01	-0.08	-0.02	-0.09
male	-0.093***		-0.139***		-0.094***		-0.145***	
	-0.01		-0.01		-0.02		-0.02	
did parents: have ~	0.051+		0.047		0.051+		0.047	
	-0.03		-0.03		-0.03		-0.03	
limitations with a~l	0.091***	0.032+	0.079***	0.016	0.092***	0.041*	0.083***	0.017
	-0.01	-0.02	-0.01	-0.02	-0.01	-0.02	-0.02	-0.02
iadl limitations n~s	0.075***	0.065*	0.052**	0.018	0.076***	0.084*	0.055**	0.02
	-0.02	-0.03	-0.02	-0.03	-0.02	-0.04	-0.02	-0.04
1+ adl limitations	0.049*	0.055	0.019	0.027	0.050*	0.056	0.021	0.027
	-0.02	-0.04	-0.02	-0.04	-0.02	-0.03	-0.02	-0.04
mobility, arm func~	0.038***	0.023***	0.027***	0.021**	0.038***	0.023***	0.027***	0.021**
	0	-0.01	0	-0.01	0	-0.01	0	-0.01
physical inactivity	0.066**	0.065+	0.003	0.02	0.066**	0.066*	0.004	0.02
	-0.02	-0.03	-0.02	-0.04	-0.02	-0.03	-0.02	-0.04
rural	-0.022**		-0.019+		-0.022**		-0.019+	
	-0.01		-0.01		-0.01		-0.01	
spring	0.012	0.033*	0.018	0.015	0.012	0.027	0.018	0.014
	-0.01	-0.02	-0.01	-0.02	-0.01	-0.02	-0.01	-0.02
summer	0.009	0.009	0.001	-0.022	0.009	0.001	0.001	-0.023
	-0.01	-0.02	-0.01	-0.02	-0.01	-0.02	-0.01	-0.02

winter	0.015	0.039*	0.025+	0.057**	0.015	0.033+	0.022	0.056*
	-0.01	-0.02	-0.01	-0.02	-0.01	-0.02	-0.02	-0.02
AU	-0.059+		-0.131***		-0.055		-0.115*	
	-0.03		-0.04		-0.04		-0.05	
GER	-0.017		0.032		-0.016		0.038	
	-0.02		-0.03		-0.02		-0.03	
SE	-0.019		-0.039		-0.02		-0.042	
	-0.02		-0.03		-0.02		-0.03	
IT	0.086**		0.029		0.089*		0.041	
	-0.03		-0.03		-0.04		-0.04	
GR	-0.004		-0.115***		-0.003		-0.108***	
	-0.02		-0.03		-0.02		-0.03	
DK	-0.028		-0.075**		-0.028		-0.072*	
	-0.02		-0.03		-0.02		-0.03	
NL	-0.022		-0.070*		-0.02		-0.06	
	-0.02		-0.03		-0.03		-0.04	
ESP	0.080**		0.003		0.082**		0.011	
	-0.03		-0.03		-0.03		-0.04	
FR	0.116***		0.083**		0.118***		0.093*	
	-0.02		-0.03		-0.03		-0.04	
BE	0.04		-0.041		0.043		-0.029	
	-0.02		-0.03		-0.03		-0.04	
constant	1.578***		1.472**		1.576***		1.464**	
	-0.45		-0.54		-0.45		-0.54	
R-sqr	0.14	-0.042	0.086	-0.006	0.141	0.026	0.097	0.003
dfres								
BIC	.	-1081.3	.	1982.7	.	-1663.8	.	1909.6

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001
SE given below the coefficient

Table A.13: Quantile Regression under assumption of endogeneity

	Q01		Q02		Q03		Q04		Q05		Q06		Q07		Q08		Q09	
retired	0.0358		0.4293	***	0.6672	***	0.8258	***	0.8498	***	0.7653	***	0.7442	***	0.6546	***	0.2867	+
	0.027		0.071		0.081		0.093		0.098		0.103		0.106		0.124		0.165	
age	-0.1189		-2.1289	***	-1.9405	***	-2.8204	***	-3.3925	***	-2.9974	***	-3.4872	***	-3.9268	***	-4.2133	***
	0.182		0.269		0.364		0.430		0.310		0.274		0.340		0.361		0.640	
age2	0.0009		0.0190	***	0.0168	***	0.0247	***	0.0298	***	0.0264	***	0.0306	***	0.0346	***	0.0375	***
	0.002		0.002		0.003		0.004		0.003		0.002		0.003		0.003		0.005	
hhincome_e~i	0.0000		0.0000	**	0.0000	+	0.0000	**	0.0000	*	0.0000	***	0.0000	***	0.0000	***	0.0000	***
	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	
children	0.0194	*	0.0697	***	0.0691	***	0.0504	***	0.0107		-0.0261	+	0.0003		0.0449	***	-0.0201	
	0.009		0.013		0.018		0.014		0.013		0.014		0.015		0.012		0.037	
mobility	0.1389	***	0.2171	***	0.2629	***	0.2648	***	0.2778	***	0.2661	***	0.3128	***	0.3067	***	0.3981	***
	0.006		0.009		0.017		0.013		0.014		0.009		0.013		0.022		0.024	
underweight	-0.0851		0.1313		-0.3260	**	-0.5277	***	-0.3338	**	-0.5194	***	0.4420	***	-0.2620	**	-1.1730	***
	0.069		0.083		0.107		0.129		0.100		0.116		0.069		0.099		0.162	
overweight	0.0068		-0.0498		0.1246	**	0.0806	*	0.0183		0.1721	***	0.4187	***	0.3176	***	0.3185	***
	0.016		0.034		0.041		0.033		0.030		0.037		0.037		0.059		0.071	
obese	-0.0088		-0.0432		0.0316		0.2314	***	0.3225	***	0.3687	***	0.2183	***	0.1545	*	0.1541	*
	0.022		0.047		0.065		0.047		0.043		0.036		0.036		0.061		0.077	
edmed	0.0011		0.1327	**	0.0543		0.2841	***	0.4532	***	0.3164	***	0.3198	***	0.1226		-0.0625	
	0.022		0.040		0.060		0.032		0.039		0.037		0.048		0.084		0.175	
edhigh	-0.0275		-0.0391		-0.2642	***	0.0704		0.1322	*	0.0076		0.1783	**	-0.0125		-0.4751	*
	0.028		0.050		0.068		0.057		0.059		0.069		0.060		0.100		0.211	
married	-0.0545	**	-0.5331	***	-0.5592	***	-0.6470	***	-0.7592	***	-0.8719	***	-0.9329	***	-0.6720	***	-0.0562	
	0.017		0.037		0.051		0.052		0.047		0.042		0.046		0.062		0.068	
male	-0.0431	*	-0.2511	***	-0.2834	***	-0.5161	***	-0.5464	***	-0.5303	***	-0.4828	***	-0.5362	***	-0.6905	***
	0.020		0.039		0.051		0.041		0.044		0.045		0.045		0.079		0.065	
parentsmh	1.0296	***	1.2523	***	0.4415	***	0.7717	***	0.7418	***	1.4445	***	1.4038	***	1.9749	***	1.0701	***

	0.091		0.059		0.063		0.119		0.077		0.123		0.098		0.149		0.153	
gali	-0.0340	+	-0.0350		0.3032	***	0.2723	***	0.2562	***	0.5746	***	0.4977	***	0.4759	***	0.3485	**
	0.018		0.035		0.040		0.038		0.040		0.040		0.038		0.058		0.116	
iadl2	-0.1135	***	-0.0192		0.2405	**	0.7387	***	0.9999	***	1.2342	***	1.2195	***	1.1186	***	0.9221	***
	0.028		0.072		0.081		0.062		0.054		0.065		0.046		0.065		0.096	
adl2	0.6460	***	0.9390	***	0.6085	***	0.7649	***	0.5623	***	0.2336	**	0.1397	**	0.1145		-0.5251	***
	0.035		0.100		0.163		0.070		0.069		0.068		0.053		0.073		0.107	
phactiv	0.1589		0.3120	***	0.7341		0.7164	***	0.7192	***	0.7374	***	0.1556	*	0.4044	**	0.4226	
	0.105		0.086		0.238		0.120		0.069		0.066		0.070		0.121		0.269	
rural	0.0321	*	0.0126		0.0129		0.0615	+	0.0244		0.1695	***	0.1750	***	0.2103	***	0.2130	**
	0.015		0.035		0.035		0.032		0.033		0.031		0.032		0.049		0.063	
spring	0.0266		0.3599	***	0.3344	***	0.0891		0.1326	**	0.1847	***	0.2745	***	0.1430		-0.0790	
	0.024		0.045		0.080		0.061		0.054		0.053		0.051		0.091		0.102	
summer	0.0025		-0.0242		-0.0838		-0.0200		0.0419		0.0295		0.1047	*	0.2595	**	0.2697	*
	0.024		0.041		0.082		0.045		0.048		0.045		0.050		0.081		0.113	
winter	-0.0319		0.1445	**	0.1258		0.1463	*	0.2494	***	0.2311	***	0.2480	***	0.5882	***	0.2251	+
	0.027		0.045		0.082		0.068		0.063		0.049		0.058		0.092		0.116	
AU	0.2649		0.6260		0.0037		0.2264		0.9270	**	1.1290	***	1.3064	**	1.5478	*	3.6028	***
	0.282		0.388		0.340		0.498		0.348		0.315		0.401		0.624		0.387	
GER	-0.1210	+	-0.3187		-0.5501	***	-0.8829	***	-0.8135	***	-0.2455	**	0.3289	***	-0.0104		-0.3845	**
	0.063		0.204		0.157		0.092		0.075		0.079		0.082		0.197		0.148	
SE	-0.1237	+	-0.3880	+	-0.6524	***	-0.7543	***	-0.2265	+	0.3556	**	0.8611	***	0.3560		0.7437	***
	0.067		0.199		0.142		0.111		0.130		0.106		0.090		0.243		0.172	
IT	-0.0751		-0.0946		-0.0981		0.0658		0.2879	***	0.7874	***	1.4954	***	1.1784	***	1.2083	***
	0.063		0.200		0.152		0.089		0.067		0.074		0.076		0.213		0.220	
GR	-0.2534	***	-0.6821	**	-0.9129	***	-0.7579	***	-0.2118	**	0.1410	*	0.5494	***	0.2751		1.0794	***
	0.063		0.197		0.137		0.096		0.075		0.070		0.074		0.180		0.169	
DK	-0.2112	**	-0.6014	**	-0.9398	***	-1.2148	***	-1.1959	***	-0.8496	***	-0.5924	***	-1.0233	***	-0.9442	***
	0.066		0.198		0.136		0.078		0.059		0.082		0.075		0.212		0.147	
NL	-0.1263	*	-0.4449	*	-0.8527	***	-1.0448	***	-0.6679	***	0.0441		0.4710	***	-0.0093		0.8725	***

	0.061		0.196		0.139		0.093		0.082		0.081		0.077		0.208		0.132	
ESP	0.0417		0.6808	**	0.6701	**	0.9107	***	1.2744	***	1.9449	***	2.6295	***	1.9932	***	2.5430	***
	0.069		0.198		0.226		0.108		0.075		0.090		0.084		0.224		0.231	
FR	-0.0938		1.2074	***	0.7580	**	1.1445	***	1.7501	***	2.2184	***	3.0005	***	3.0748	***	3.5778	***
	0.098		0.240		0.253		0.262		0.225		0.242		0.221		0.422		0.302	
BE	-0.0655		-0.3177		-0.4893	**	-0.5300	***	-0.1802	**	0.4809	***	0.7615	***	0.3758	+	0.8712	***
	0.064		0.194		0.147		0.079		0.069		0.086		0.077		0.208		0.130	
_cons	3.7441		58.9029	***	56.0826	***	80.8359	***	96.5080	***	84.9936	***	99.1164	***	111.6461	***	119.5618	***
	5.337		7.725		10.571		12.232		8.715		7.727		9.679		10.334		18.753	

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001
SE given below the coefficient