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Working Conditions,Retirement and Health - Longitudinal Evidence from Europe and the US

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Abstract:

I provide new evidence on the effect of retirement on health by exploring the panel dimension of three major old-age surveys. I constructed a harmonized dataset using all available waves of HRS, ELSA and SHARE data, which enables me to conduct comparative cross-country panel analyses. Different health measures were constructed to assess physical and cognitive health during the transition from work to retirement. I further included harmonized measures of working conditions to examine the role of the quality of work within the framework of the health effects of retirement. By applying instrumental variables fixed effects regressions, I was able to control for individual heterogeneity and endogeneity of the retirement decision by using the claiming ages for public pension benefits of the respective countries as source of variation. My results suggest that overall, retirement has a positive effect on physical health and a negative effect on cognitive health. Retiring from a job with low work quality intensifies the positive effect on physical health.

Zusammenfassung:

Ich untersuche den Zusammenhang von Ruhestand und Gesundheit auf Grundlage von internationalen Paneldaten. Die Harmonisierung mehrerer Erhebungswellen der HRS, ELSA und SHARE Studie ermöglicht es, die Analysen über die Zeit und mit verschiedenen Ländern durchzuführen. Ich benutze mehrere Gesundheitsmaße, um die physische und kognitive Gesundheit während des Übergangs von der Arbeit in den Ruhestand zu messen. Zudem untersuche ich die Rolle von Arbeitsbelastung im Zusammenhang mit der Auswirkung von Ruhestand auf die Gesundheit. Durch die Anwendung eines Paneldatenmodells mit fixen Individualeffekten und durch den Einsatz von länderspezifischen Altersgrenzen für den Rentenbezug als Instrumentvariablen kann für Endogenitätsprobleme kontrolliert werden. Die Ergebnisse zeigen, dass der Ruhestand insgesamt einen positiven Effekt auf die physische Gesundheit und einen negativen Effekt auf die kognitive Gesundheit hat. Für Personen, die vor dem Ruhestand unter schlechten Bedingungen gearbeitet haben, ist der positive Effekt auf die physische Gesundheit stärker.

Keywords:
retirement, health, work quality, international comparisons

JEL Classification:
I12, J26, J81

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ELSA data were made available through the UK Data Archive. ELSA was developed by a team of researchers based at the NatCen Social Research, University College London and the Institute for Fiscal Studies. The data were collected by NatCen Social Research. Funding was provided by the National Institute of Aging in the United States and a consortium of UK government departments coordinated by the Office for National Statistics. The developers and funders of ELSA and the Archive do not bear any responsibility for the analyses or interpretations presented here.

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Introduction

Occupationally active years take up half of our lives. Work plays an important role not only in our livelihoods but also in personal fulfillment and self-identification. Furthermore, going to work gives structure to a daily routine and stimulates mental and physical activity (van Domelen et al. 2011, Smart et al. 2014). These positive aspects of work are lost when leaving the labor market; therefore, the transition from work to retirement usually causes drastic changes in different areas of life. In this way, the transition can have different effects on health. Retirement is often connected with a loss of income, status and social networks, which can lead to higher illness vulnerability and poor overall health. On the other hand, one's health status might improve after retiring if harmful aspects of work are abandoned, with leisure time in retirement devoted to health-preserving activities (Insler 2014, Celidoni and Rebba 2016). The aim of this paper is to analyze the effect of entering retirement on the physical and cognitive health of retirees.

Analyzing the consequences of the transition from work to retirement is especially important in times of demographic change. Longer life expectancy and reduced fertility rates have caused (financial) problems in the social security systems of several countries. In order to countervail these problems, older workers are expected to stay in the workforce longer and postpone retirement. Postponing retirement, and therefore possible negative or positive effects on health, might be beneficial and harmful respectively not only for individuals but for society as a whole.

I extend existing literature on this topic by providing additional cross-country evidence on the relation between health and retirement status, with a special focus on the panel dimension. By applying instrumental variables fixed effects regressions, I can control for individual heterogeneity and endogeneity of the retirement decision by using the claiming ages for public pension benefit of the respective countries as instrumental variables. I construct a harmonized dataset using all available waves of the HRS (Health and Retirement Study), ELSA (English Longitudinal Study on Ageing) and SHARE (Survey of Health, Ageing and Retirement in Europe). This harmonization enables me to conduct comparative cross-country panel analyses over a long period of time. Furthermore, the large sample size of the harmonized data offers variability and high statistical power that allow robust analyses. I include harmonized measures of working conditions to evaluate the role of the quality of work within the framework of the health effects of retirement.

Literature

Recent literature on the effects of retirement focuses mainly on cognition or subjective well-being. Rohwedder and Willis (2010) study the effect of retirement on cognitive decline by combining the HRS, ELSA and SHARE

data. In a cross-sectional analysis, they find that early retirement has a negative effect on cognition. Bonsang et al. (2012) confirm this finding in a panel study using HRS data. Mazzonna and Peracchi (2012) use SHARE data; in considering the time spent in retirement, their results suggest an increasing decline of cognition after retirement, which is explained by reduced investments in cognitively stimulating activities. In a study with data on social networks offered by SHARE wave 4, Börsch-Supan and Schuth (2014) conclude that early retirement leads to a decline in cognitive abilities due to the reduction of the size of social networks after early retirement.

These studies show evidence of accelerated cognitive decline with time spent in retirement. However, they ignore the complex interplay of different health components. Therefore, little is known about the overall evolution of health after individuals stop working. Coe and Zamarro (2011) exploit a wide range of health measures by constructing a health index; they find a positive long-lasting effect of retirement on health. Insler (2014) uses a weighted sum of both objective and subjective health variables to determine health status, detecting a significant positive effect of retirement on health. He further analyses the channels through which retirement affects health and finds that the effect may be based on behavior after retirement, e.g., smoking or exercising. Another important aspect that might influence the effects of retirement on health is employment characteristics. Mazzonna and Peracchi (2016) take heterogeneity across occupations into account by building an index of the level of physical burden associated with each job. They find that retirement has a significant negative effect on both mental and overall health. However, if they concentrate on those working in physically demanding jobs, the effect turns positive.

Besides job classification, it is possible to measure work quality by using indicators for working conditions such as effort, reward, control and demand of an occupation. Dal Bianco et al. (2014) use these working conditions to ascertain whether these indicators play a role in the retirement decision. They find that low work quality induces people to retire as early as possible. To the best of my knowledge, the link between working conditions and health after retirement has not yet been made.

I extend the literature on this topic by 1) combining data from the HRS, ELSA and SHARE, which allows me to conduct international panel analyses in Europe and the US; 2) using an advanced econometric modeling of panel fixed effects; 3) constructing health as an all-encompassing measure taking into account different aspects of physical health; 4) estimating the effects for physical and for cognitive measures using identical methodology to disentangle different consequences of retirement on physical and cognitive health; and 5) including working conditions as an explanatory factor for different health effects of retirement.

Data

I use data from three old-age surveys: the Health and Retirement Study (HRS), the English Longitudinal Study of Ageing (ELSA) and the Survey of Health, Ageing and Retirement in Europe (SHARE). All datasets are multidisciplinary household panel surveys including detailed information on health, socioeconomic status, work history and social networks. The first wave of the HRS was initiated in 1992, and the subsequent waves were conducted biennially. The initial sample included 12,652 individuals living in the United States between 51 and 61 years of age, as well as their spouses or partners. Today, 11 waves of HRS data are available.

On the basis of the HRS survey, a longitudinal old-age survey was implemented in England in 2002. The baseline sample contains 12,099 persons representing the population aged 50 and older. Further refreshment samples were added in subsequent waves. Today, 6 waves of ELSA data are available. The SHARE survey began in 2004 as a European cross-national panel study. The first wave included eleven European countries and more than 22,000 individuals aged 50 and older. In subsequent waves, which are conducted biennially, more countries joined the project. In the most recent wave available (wave 5), 19 European countries conducted at least one SHARE wave.

Both the ELSA and SHARE were designed to be comparable to the data from the HRS survey. Therefore, ex-ante harmonization of questions and items was an important prerequisite for the implementation of the ELSA and SHARE. The potential to combine these datasets for cross-country comparisons between Europe and the US has not yet been fully used, with only a few studies striving to harmonize the datasets (e.g., Rohwedder and Willis 2010; Crimmins et al. 2011; Siegrist et al. 2012; Vries et al. 2014). I exploit this opportunity for high sample sizes and cross-country variation by harmonizing the relevant health and retirement variables and combining them in one single dataset, an approach that enables me to conduct comparative analyses for different regions in Europe, the UK and the USA.

Sample

I use all available waves of the HRS (waves 1-11), as well as the ELSA (waves 1-6) and SHARE (waves 1-5). Only wave 3 of SHARE is not used in this analysis because it contains retrospective life history data and does not include our relevant variables. Due to the combination of datasets, I am able to analyze the health effects of retirement in 21 countries: the USA, the UK, Austria, Germany, Sweden, the Netherlands, Spain, Italy, France, Denmark, Greece, Switzerland, Belgium, Israel, Czech Republic, Poland, Slovenia, Ireland, Hungary, Portugal and Estonia. The harmonization of three datasets allows us to exploit a sample size of initially 164,402 individuals and 467,653 observations.

I restrict the sample to individuals between 50 and 75 years old (350,737 remaining observations). Since I am interested in the health effect of the transition from full-time work to full-time retirement, I do not count homemakers and unemployed individuals as retired, nor those reporting part-time retirement (283,096 remaining observations). I further eliminate individuals who have never done paid work in their life or who have not worked since reaching the age of 50 (271,289 remaining observations). I drop individuals who re-enter the labor market after having reported their retirement in a previous wave (252,921 remaining observations). After excluding individuals who participated in the survey only once and after disregarding observations with missing values for the relevant health measures, the remaining sample consists of 48,060 individuals and 156,449 observations. Within this sample, I observe 10,314 individuals transitioning from work to retirement.

Retirement definition

In all three surveys, the respondents are asked about their current employment status. I define those individuals as being retired who self-report the category "Retired" as their current employment status and additionally control that no paid work has been done during the previous four weeks.

Health definition

I exploit the richness of the datasets by using several health measures to study the complex interplay of different health components.

Self-assessed health (SAH): I use the self-assessed health status[1] as a dependent variable for a general impression of one's health status. Self-assessed health may be subject to different bias factors, possibly leading to measurement errors. The main concern in this context is reporting bias, in that individuals with the same health status but from different population groups report different health assessments because they interpret the question in their own specific context (Lindeboom and Doorslaer 2004). This behavior poses a threat that has to be taken into account, especially in the context of a multinational study where the different reference levels are influenced by the culture and language of the different countries (Jürges 2007). In our model framework, this threat is partly absorbed by the use of individual fixed effects. Self-assessed health can also contain measurement errors provoked by social desirability. In our context, it is possible that individuals underreport their health status in order to justify their early exit from the labor market (justification bias). Kalwij and Vermeulen (2008) stress the need to control for objective health indicators when analyzing the relation between health status and labor

[1] The self-assessed health status is rated on a categorical five-point scale with the answers of excellent (5), very good (4), good (3), fair (2) and poor (1).

force participation. This is especially true for panel studies because the observed changes of the health status of an individual might be overestimated (Bound et al. 1999). Given the aforementioned reasons, I include further health information, which is available in the data in different forms.

Health index: Objectively reported health information (such as the number of chronic diseases) contains information that has not been judged subjectively but diagnosed by a doctor. Another type of objective health information is represented by performance-based measures, such as grip strength. These objective health measurements complement the health information reported by respondents. In order to take advantage of all available health information, I apply an indexing technique to combine several measures into one single index variable. I construct a health index via a principal component analysis as suggested by Poterba et al. (2010). It is assumed that latent health status is reflected by the information on health questions answered by the respondent. I use all available information[2] to calculate the first principal component of these health indicators. The estimate for the first principal component represents the weighted averages of the health indicators and is therefore used as a synthetic health index that combines different measurements into one single variable. For a better presentation of the results, I form country-specific percentile scores of this health distribution and group the respondents into quintiles in which a higher quintile corresponds to better health.

Cognition**:** In order to account for the interplay between physical and cognitive health, I add a cognition measure as a dependent variable. All three surveys assess cognitive functioning by reading a random list of ten common words (house, tree, river, etc.) to the respondent. The respondents are then asked to recall as many words as possible in an immediate recall test. After continuing with the questionnaire for approximately five minutes, the respondents were again asked to recall as many words as possible in a delayed recall test. The combined cognition measure includes the aggregated scores from both the immediate and delayed recall test, ranging from 0-20.

Working conditions

Some studies analyze the effect of retirement on health for different occupational groups or for those individuals retiring from a physically demanding job (Coe et al. 2012; Mazzonna and Peracchi 2012). However, stress and strain have become important factors for work-related health problems. Therefore, it is not enough to take the

[2] The following health measures were used: whether a doctor has diagnosed the respondent with high blood pressure/hypertension, stroke, diabetes/high blood sugar, chronic lung disease, arthritis, cancer or heart trouble; whether a respondent has difficulty walking 100 meters, sitting two hours, getting up from chair, climbing one flight of stairs, stooping/kneeling/crouching, reaching or extending arms above shoulder, pulling or pushing large objects, lifting or carrying weights over 5 kilograms or picking up a small coin from a table; body mass index (weight and height reported by respondent); and number of limitations in activities of daily living

degree of physical demand into account; one must also consider the psychosocial work environment. I apply two models describing the relation between the psychosocial characteristics of work and the health of a worker.

According to the Karasek and Theorell (1991) demand-control model, the combination of a low level of control in a job with strong demand represents a risk for health, as observed by a higher prevalence of symptoms of heart disease. According to Karesek et al. (1998), the control measure has higher predictive power than the demand measure and it is sufficient to include the control dimension as an indicator for the job strain given the efficiency aims of multi-disciplinary questionnaires. Our harmonized dataset offers two statements measuring the level of control in the main job[3]. Both statements are ranked on a 4-point scale ranging from "strongly agree" to "strongly disagree". The total assessment of control ranges between 2 and 8, with high numbers reflecting lower control and therefore more psychosocial stress. Referring to previous empirical work (Siegrist and Wahrendorf 2011; Siegrist et al. 2012), I calculate country-specific tertiles and use a binary variable to indicate whether a participant is in the upper tertile of the low control measure and therefore exposed to a stressful work environment.

The main idea behind the Siegrist (1996) effort-reward imbalance model is that an imbalance between effort and reward leads to high psychological stress, which in turn can result in serious health problems (Bosma et al. 1998; Pikhart et al. 2004; Ostry et al. 2003). With respect to the effort-reward model, the harmonized surveys contain two statements to measure effort (physical demand, time pressure) and five statements to measure reward (support, recognition, salary, promotion, job security). With these statements, I construct the effort-reward imbalance index (ERI), which is a weighted ratio of the number of effort rankings and the reward rankings. Again, I calculate country-specific tertiles for this measure and build a binary variable where the value one reflects a higher imbalance between effort and reward and therefore more psychosocial stress.

Taking both models together I create a binary variable with the value of one for bad work quality (either in the upper tertile of the control measure or of the ERI measure) and the value of zero for good work quality (neither in the upper tertile of the control measure nor of the ERI measure).

Empirical strategy

An instrumental fixed-effects variable (IV-FE) approach is used to address endogeneity problems. Dependent on valid instruments, consistent estimates are obtained by a two-stage least-squares method. The basic aim of our study is to determine the effect of retirement on different measures of health. In this context, endogeneity complicates the identification of the causal effect. Retirement is not random among the individuals in the sample,

[3] "I have very little freedom to decide how I do my work" and "I have an opportunity to develop new skills"

but the decision of retirement is a function of different factors. People might self-select into retirement on the basis of individual preferences. For example, individuals who are least satisfied with their job or least healthy are more likely to retire earlier. Thus, I have to consider and address two causes of endogeneity problems. Firstly, there could be unobserved individual variables that influence both the current health status and the retirement decision. I exploit the panel dimension of the data in order to account for unobserved time invariant characteristics, which cancel out when applying individual fixed-effects estimations.

Secondly, retirement and health may be endogenous. The retirement decision may be determined by the health status, and reverse causality causes endogeneity problems. In order to solve this issue, I include exogenous variables to instrument the endogenous retirement variable. The instrumental variable must strongly influence the retirement decision and must not be correlated with the individual's health or all unobserved determinants of health and retirement–in other words, with the error term. For this purpose, I exploit country-specific claiming ages for public pension benefit, a widely accepted strategy in empirical retirement studies (Coe and Zamarro 2011; Bonsang et al. 2012; Fonseca et al. 2014; Mazzonna and Peracchi 2012). In this context, retirement is assumed to be a function of age, and the probability of retiring is expected to change discontinuously at the respective early and normal claiming ages of a country.

In our case, the definition of the instrument is complex in the sense that I have to take into account public pension rights in 21 different countries. Within these countries, I differentiate between the institutional settings for different cohorts and for men and women. With this elaborated classification of individuals that are eligible for social security benefits, I can define a precise instrumental variable reflecting whether the respondent has reached his personal early or normal statutory claiming age. I gain variation of the claiming ages depending on age, gender and the influence of policy reforms within each country. According to Bonsang et al. (2012), it is plausible that the effects of retirement on health occur with a short time lag. For a robustness check, I follow the approach of Bonsang et al. (2012), defining our instrumental variable as reaching the statutory claiming age plus one year. I therefore measure the effect of having spent at least one year in retirement on different health outcomes and can therefore distinguish between the short-term and long-term effect of retirement on health.

Descriptive aspects

Table 1 shows the sample size for each country considered in the analysis. Most respondents are from the HRS; therefore, the US is overrepresented with a sample size of 78,228 person-wave-observations. The ELSA contains 24,551 person-wave-observations that are relevant in our study design. The other European countries covered by the SHARE study vary in sample size between 994 (Greece) and 5,847 (France) person-wave-observations. I will

address the differences in sample sizes per country as part of the robustness checks.

Table 1: Sample sizes per country

Country	Observations	Percent	Persons	Percent	Average observations
UK	24,551	15.69	7,071	14.71	3.88
Austria	4,847	3.10	2,265	4.71	2.23
Germany	2,360	1.51	923	1.92	2.73
Sweden	3,381	2.16	1,318	2.74	2.74
Netherlands	3,032	1.94	1,230	2.56	2.64
Spain	2,235	1.43	946	1.97	2.52
Italy	3,680	2.35	1,466	3.05	2.69
France	5,847	3.74	2,525	3.25	2.46
Denmark	3,747	2.40	1,491	3.10	2.67
Greece	994	0.64	497	1.03	2.00
Switzerland	3,673	2.35	1,622	3.37	2.38
Belgium	5,416	3.46	2,255	4.69	2.58
Israel	1,454	0.93	645	1.34	2.34
Czech	4,946	3.16	2,250	4.68	2.27
Poland	1,132	0.72	566	1.18	2.00
USA	78,228	50.00	17,527	36.47	5.70
Slovenia	1,828	1.17	914	1.90	2.00
Estonia	5,098	3.26	2,549	5.30	2.00
Total	156,449	100.00	48,060	100.00	2.66

Table 2: Summary statistics for pooled sample

Variable	N	Mean	SD	Min	Max
Female	156,449	0.53	0.50	0.00	1.00
Status: Working	156,449	0.52	0.50	0.00	1.00
Status: Retired	156,449	0.48	0.50	0.00	1.00
Living with a partner	156,449	0.63	0.48	0.00	1.00
Age at interview	156,449	63.00	6.70	50.00	75.00
Number of children	156,449	2.36	1.92	0.00	21.00
Over early claiming age	156,449	0.65	0.48	0.00	1.00
Over normal claiming age	156,449	0.45	0.50	0.00	1.00
Self-reported health	156,449	3.25	1.06	1.00	5.00
Health index	156,449	2.98	1.40	1.00	5.00
Cognition	156,449	10.48	3.35	0.00	20.00
Low control at work	70,144	0.30	0.46	0.00	1.00
Effort-reward imbalance at work	70,341	0.71	0.45	0.00	1.00

Table 2 shows some descriptive statistics of the full sample of 156,445 person-wave-observations. A total of 53% of the sample is female, and 52% are working, whereas 48% are retired. The average age in our sample is 63 years. In total, 63% are living with a partner, and the average number of children is 2.36. Overall, 65% have reached the country-specific early claiming age, and 45% have reached the normal claiming age. The

average self-assessed health status (ranging from 1 to 5) is 3.25; the average score of the latent Poterba index (ranging from 1 to 5) is 2.98. On average, 10.48 words are remembered in the cognitive functioning test (out of 20). A total of 30% report having low control over the tasks of their main occupation, and 33% express an imbalance between the effort they give and the reward they receive in their main occupation.

Previous literature on the health effect of retirement has shown that it is important to consider the heterogeneity of the effects depending on occupational characteristics.

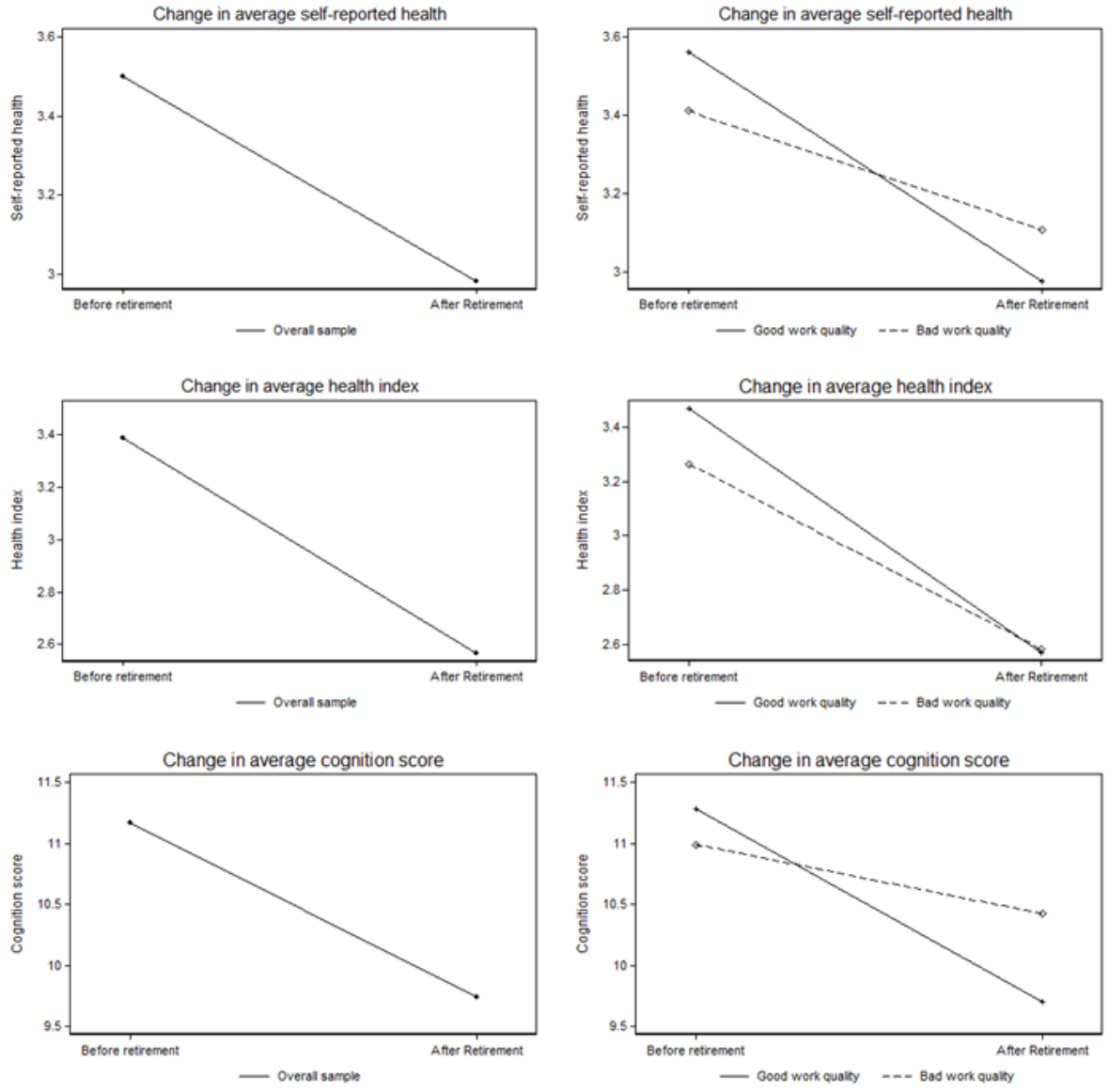

Figure 1: Changes in health for overall sample (left panel) and for work quality groups (right panel)

The graphical illustration in Figure 1 shows the average health of individuals both before and after transitioning from working to retirement. The left panel of Figure 1 represents the change in average health measurements for

the overall sample, indicating a health decline after retirement. I reproduce the change in average health scores separately for those participants with good work quality and those with bad work quality and show the results for the different health measures in the right panel of Figure 1. For those with a good working environment, the change in average health resembles the change for the overall sample. Those individuals exposed to bad working conditions start off with a lower average health before retirement. At the same time, the line is flatter than for those with good working conditions for all three measures, indicating that the health status changes less after retirement for individuals with bad working conditions. This could be explained by the hypothesis that retirement provides relief in particular for those exposed to bad working conditions. In contrast, retirement leads to a loss of cognitive and physical stimulation for those in jobs with high responsibility and high control levels; therefore, I find a steeper health decline for those who worked in good conditions. However, since the graphs do not control for endogeneity problems and do not differentiate between short- and long-term effects, I refrain from interpreting the pattern in the change of health in detail, instead I consider the graphs as descriptive evidence to motivate separate empirical analyses depending on work quality.

Empirical analysis

Main results

The instrument relevance assumption requires a strong first stage, which means that the statutory claiming ages must have significant effects on the propensity to retire. Table 3 shows the results of an individual fixed-effects estimation of the first stage relationship, indicating the probability of retirement, given the statutory claiming ages and respondents' age as further control variables. The results indicate that the statutory claiming ages have predictive effects on retirement behavior. Having reached the early claiming age increases the probability of being retired by 9 percentage points, and having reached the normal statutory claiming age increases the probability of being retired by 13 percentage points at a 1% significance level.[4]

[4] The Kleibergen-Paap rk Wald F statistic is used as a weak identification test, since we use clustered robust standard errors. With a value of 286.08, our instruments are confirmed to have predictive power for retirement status. According to the Kleibergen-Paap rk LM statistic, our model is well identified, since the null hypothesis of underidentification can be rejected with a p-value of 0.0087. The Hansen J statistic is applied as an over-identification test of all instruments (being older than the early and normal claiming ages). The joint null hypothesis is that the instruments are valid and uncorrelated with the error term. With a p-value of 0.2891, the null hypothesis is not rejected.

Table 3. First stage: The effect of reaching the claiming age on retirement probability

VARIABLES	Retirement
Normal claiming age	0.13***
	(0.004)
Early claiming age	0.09***
	(0.004)
Age	0.03
	(0.017)
Age^2/10	-0.00**
	(0.000)
Constant	-1.09
	(0.832)
Observations	156,449
Number of ID	48,060
R-squared	0.29
Year FE	YES
F	632.8

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

Table 4 shows the instrumental individual fixed-effects (IV-FE) and individual fixed-effects (FE) estimations as the main results of my analysis. I include age and second-order polynomials of age as covariates to account for the effect of the normal aging process on health status. In the IV-FE estimation results I find that retirement is associated with better physical health, as measured by the self-assessed health (SAH) and the health index. On the other hand, retirement has a negative effect on cognition, represented by the memory recall test. These results suggest that retirement has a positive effect on the overall physical health status but a negative effect on cognition.

Table 4. Main results: The effect of retirement on health and cognition (IV-FE and FE estimation)

	IV-FE estimation			FE estimation		
	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	SAH	Health index	Cognition	SAH	Health index	Cognition
Retirement	0.33***	0.24***	-0.38**	-0.07***	-0.15***	-0.13***
	(0.041)	(0.061)	(0.153)	(0.010)	(0.012)	(0.031)
Age	0.00	-0.07	0.44***	0.01	-0.06	0.44***
	(0.027)	(0.049)	(0.079)	(0.037)	(0.069)	(0.101)
Age^2/10	-0.00*	0.00**	-0.04***	-0.00**	0.00***	-0.04***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
Observations	156,449	156,449	156,449	156,449	156,449	156,449
R-squared	0.01	0.13	0.03	0.03	0.16	0.03
Number of ID	48,060	48,060	48,060	48,060	48,060	48,060
Year FE	YES	YES	YES	YES	YES	YES
F	360.2	568.2	245.5	127.9	608.0	144.6

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

For comparison, I also perform individual fixed-effects (FE) estimations without including statutory claiming ages as instruments. The fixed-effects estimators are significantly negative for all dependent variables, indicating that retirement leads to worse health both in terms of physical and cognitive health. Thus, the effect on the physical health measures changes from negative to positive when taking into account the endogeneity of the retirement decision by including the instrument. One explanation for this could be that the individual fixed-effects only absorb the endogeneity problems caused by unobserved individual heterogeneity. These estimations do not account for the fact that health may induce retirement. Thus, the negative results may be driven by those individuals retiring because of health problems. Controlling for this cause of endogeneity reveals the Local Average Treatment Effect (LATE), and our results suggest that retirement has a positive average short-term effect on health for those individuals who retire at the statutory claiming ages. This could also explain why the direction of the effect does not change for the cognitive functioning measure. Due to occurrent symptoms and feelings of pain or discomfort, the awareness of physical health is much higher than the awareness of mental health. Thus, being physically ill is more likely to cause one to retire than the decline of the cognitive functioning. Therefore, individuals retiring due to health problems are more of a threat to the results for physical health than cognition measures.

Working conditions

As shown in the descriptive part of the paper, it is interesting to analyze the role of working conditions within the framework of the causal effect of retirement on health. I use two different assessments of working conditions: low control at work and an imbalance of effort and reward at work.

Information on working conditions is not available for all waves, which leads to a reduction in sample size to 70,545 observations. I repeat the instrumental individual fixed-effects (IV-FE) estimations for the reduced sample size to avoid misinterpretation of the working conditions due to a different sample composition. The estimation results become more distinct in size and remain significant for the physical health measurement. Concerning cognitive assessment, the coefficients are positive but insignificant for this sample.

I run two separate regressions for persons with bad working conditions and for those with good working conditions in Table 5. The coefficients for the physical health measurements are positive and highly significant; indicating that retiring from a job with bad working conditions is associated with better health in terms of physical assessment. Similar to the results for the reduced sample, the coefficient measuring the effect of retirement on cognition is positive but insignificant. For those with good working conditions the coefficients for all health measures are positive but insignificant.

Table 5. Effect of retirement on health and cognition considering working conditions (IV-FE)

	Bad working conditions			Good working conditions		
	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	SAH	Health index	Cognition	SAH	Health index	Cognition
Retirement	0.60***	0.30*	0.55	0.20	0.33	0.45
	(0.198)	(0.171)	(0.429)	(0.206)	(0.257)	(0.746)
Age	0.14***	-0.06	0.57***	0.12***	0.24***	0.63***
	(0.048)	(0.071)	(0.128)	(0.032)	(0.046)	(0.123)
Age^2/10	-0.01***	-0.00	-0.06***	-0.00	-0.01	-0.06***
	(0.003)	(0.004)	(0.009)	(0.003)	(0.004)	(0.014)
Observations	36,893	36,893	36,893	33,652	33,652	33,652
R-squared	-0.02	0.14	0.02	0.02	0.16	0.02
Number of ID	11,348	11,348	11,348	10,643	10,643	10,643
Year FE	YES	YES	YES	YES	YES	YES
F	43.17	47.01	1.420	25.91	173.9	102.9

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

Delayed effect of retirement

I redefined our instrument as being at least one year over the normal claiming age. As mentioned earlier, the instantaneous effect of retirement on health might underestimate or overestimate the true effect since the behavior and the overall condition of an individual directly after the transition from work to retirement might be different than after some time when the individual adapt to the new situation. The results taking into account the year spent in retirement are shown in Table 6.

Table 6. Effect on health and cognition after one year in retirement (IV-FE)

	(1)	(2)	(3)
VARIABLES	SAH	Health index	Cognition
Retirement	0.12	0.23***	-1.44***
	(0.104)	(0.074)	(0.219)
Age	-0.00	-0.14***	0.58***
	(0.009)	(0.020)	(0.051)
Age^2/10	-0.00***	0.00**	-0.05***
	(0.001)	(0.001)	(0.003)
Observations	156,449	156,449	156,449
R-squared	0.02	0.14	0.01
Number of ID	48,060	48,060	48,060
Year FE	YES	YES	YES
F	79.56	778.2	280.0
Fp	2.80e-07	0	6.07e-10

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

The effect of retirement on self-assessed health is insignificant, whereas the effect on the physical health index

remains stable in size and significance level. The effect of retirement on the cognitive outcome gets bigger after one year in retirement, suggesting that the cognitive decline after retirement continues. This is in line with findings from previous studies on the effect of retirement on cognition (Rohwedder and Willis 2010; Bonsang et al. 2012; Mazzonna and Peracchi 2012).

Robustness checks

I include different functions of age (linear, quadratic, cubic, quartic terms) and age dummies as further robustness checks[5]. Since the results are insensitive, I conclude that there is no underlying relationship between age and health that our model fails to capture.

As previously mentioned, I also control for the differences in sample sizes between the countries. The main concern is that the results are driven by the effect of retirement on health observed in the US, since the US represents around half of our sample. As a robustness check, I draw random samples from the HRS respondents. I stepwise reduce the sample to 50%, 25%, 10% and 5% and monitor whether the results change. Since the UK is also overrepresented compared to other European countries, I perform the same procedure for the ELSA respondents. Table 7 shows the results for a random 5% sample from HRS and a random 20% sample from ELSA. With 3,911 respondents from the HRS and 4,910 respondents from the ELSA, the samples are comparable to the sample sizes in Europe, which vary between 994 in Greece and 5,847 in France.

Table 7. Robustness check for random 5% HRS and 20% ELSA sample (IV-FE)

VARIABLES	(1) SAH	(2) Health index	(3) Cognition
Retirement	0.28**	0.50***	0.34
	(0.127)	(0.100)	(0.236)
Age	0.04	0.03	0.52***
	(0.030)	(0.045)	(0.081)
Age^2/10	-0.00**	-0.01***	-0.05***
	(0.001)	(0.001)	(0.003)
Observations	56,726	56,726	56,726
R-squared	0.01	0.04	0.01
Number of ID	24,872	24,872	24,872
Year FE	YES	YES	YES
F	1156	107.9	320.1

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

The magnitude of the effects and the standard errors change after the reduction of sample sizes,

[5] Results are available on request.

although the effect of retirement on health is still positive overall. The effect on cognition is positive but insignificant. I also run separate analyses for the three subsamples of HRS, ELSA and SHARE, which reveal no significant differences in the direction and size of the effects. Since the data collection of the HRS started in 1992, these data cover different retirement cohorts than the ELSA and SHARE, which began data collection in 2002 and 2004, respectively. As a further robustness check, I reduce the HRS data to the same time period of data collection as SHARE and ELSA, meaning that I use only data collected in years 2004, 2006, 2010 and 2012 for all three datasets and run the regression with this reduced sample. As before, the results suggest a significant positive effect of retirement on physical health, whereas the effect on cognition is insignificant.

I further estimate the regression model separately for men and women and for different educational levels and do not find any changes in the results based on these demographic differences.

Discussion

This study addresses the research question of how retirement affects an individual's physical and cognitive health and the role of working conditions in this context. I find that overall, retirement has significant positive effects on physical health, as measured by self-reporting and an encompassing health index. In contrast, retirement has a negative effect on cognition, measured by the memory recall score. While the results regarding physical health are confirmed in different robustness checks, the cognitive health measure becomes insignificant in some specifications.

The second research question studies the impact of working conditions in the context of retirement and health. Work quality is measured by the level of control and the balance between effort and reward at work. Our results show that retiring from a job with low work quality has a positive effect on physical health, both objectively and as measured by self-reporting, which indicates the positive relief for physical health when retiring from bad working conditions. I do not find significant effects for cognitive health and for those with good working conditions.

Future research should concentrate on the following question: Why does retirement have different effects on physical and mental health? This difference could possibly be explained by the post-retirement behavior of the individuals and therefore needs to be analyzed in further studies. Future research of working conditions in this context should take into account the characteristics of the main job by including the type of occupation. Also, whether the characteristics of the final job play a bigger role than the main job should be investigated. Last, it would be helpful to have more harmonized cognition measures to establish more robust results for cognitive health. This depends on the development of the different surveys.

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