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How Does Retirement Impact Health Behaviors? An International Comparison

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Abstract:

Recent work has found that retirement may lead to improvements in health, although the literature has not yet reached a consensus. This could be due to actual differences in the relationship of interest between countries or due to methodological differences between studies. The first goal of this paper is to estimate the causal impact of retirement on self-reported health using consistent estimation techniques on three harmonized longitudinal data sets, representative of the United States, England, and continental Europe. Using panel data and instrumental variable methods exploiting variation in statutory retirement ages, this paper then estimates how retirement causally affects health and health-related behaviors. We find, in all settings, retirement leads to better self-reported health, but that magnitude of the effect varies considerably. We also find that retirement increases the amount of exercise for those retiring from non-physical jobs in all settings. The effect of retirement on addictive behaviors (drinking and smoking) was more mixed across settings. These findings suggest that public health interventions targeted to get near retirees to exercise more could allow countries to reap the benefits of a longer-working life while minimizing the associated health decline.

JEL Codes: I10; J26; C23; C26

Keywords: Health; Retirement; Health behaviors; Instrumental Variables

1. Introduction

The notion that retirement might independently affect physical health is an old and persistent hypothesis (see Minkler 1981 for a review). Recent literature has focused on estimating the causal impact of retirement on health, but the literature is far from reaching a consensus about this size, or even the sign, of this relationship. For example, some studies find that retirement improves self-assessed health for at least subsets of retirees (Neumann 2008; Coe and Lindeboom 2008; Johnston and Lee 2009; Coe and Zamarro 2011; Insler 2014), some studies find no effect (Bound and Waidmann 2007), and others find detrimental effects (Dave et al. 2008; Behnke 2012; Calvo et al. 2013). Even among studies that find positive effects of retirement on health within the US, the size of the effect remains debated. It is currently unclear if the differences in the estimated relationship of retirement on overall health are due to methodological differences between studies or due to actual differences in the relationships between the countries studied.

A more recent strand of the literature has begun estimating the impact of retirement on health-related behaviors, such as physical activity, eating, drinking, smoking, in order to try to understand why retirement influences health. Evenson et al. (2002) and Insler (2014) finds that retirement is associated with increased physical exercise and decreased smoking, but neither estimate causal models. Zheng et al. (2008) find that retirement decreases physical activity among men retiring from physically strenuous employment. Eibich (2015) finds that retirement leads to an increase of physical activity in Germany. Aguiar and Hurst (2005) and Zheng et al.

(2008) find that retirement does not affect food consumption. This literature largely has focused on the US, so it is hard to know if the findings from one country are applicable to other settings, or if the health gains in Europe are due to different behavioral changes.

In order to further understand the relationship between retirement and health and health-related behaviors, this paper uses a cross-national setting and makes use of panel data from three recently available, harmonized, longitudinal studies on middle-aged and elderly adults in three different settings (eight waves of the Health and Retirement Study (HRS) (United States); three waves of the English Longitudinal Study of Ageing (ELSA) (England); and two waves of the Survey of Health Aging and Retirement in Europe (SHARE)[1] (continental Europe)). This allows us to estimate the impact of retirement on health in a multi-country setting using identical methodology, to first estimate what are the underlying differences in the relationship between retirement and health due to country differences and not methodological ones.

An important issue that complicates the analysis is determining the causal mechanism between retirement and health and health behaviors, since retirement can be caused by a decline in health (see e.g. Boskin and Hurd 1978, Burkhauser 1979,

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

among many others). To address this potential for reverse causality, this paper makes use of panel data and instrumental variable methods to assess how retirement causally affects health-related behaviors. In constructing instrumental variables, this paper exploits information about statutory retirement ages, taking advantage of the fact that the timing of retirement is partly determined by the incentives imbedded in the rules determining Social Security benefits, as well as by employer-provided pension benefits. (See Hurd 1990 and Lumsdaine and Mitchell 1999 for reviews, and Zissimopoulos et al. 2007, Poterba and Venti 2004, Anderson et al. 1999, Samwick 1998.) Cross-national research, such as Gruber and Wise (1999, 2004), note that there is a strong negative correlation between labor force participation at older ages and the generosity of early retirement benefits. These instruments have been used successfully before to measure the causal effects of retirement on health (Charles 2004, Neuman 2008, Bound and Waidmann 2007, Coe and Zamarro 2011, Rowhedder and Willis 2010, Coe et al. 2012). Thus we have a set of instruments for retirement that will work across national boundaries and give us estimates on the same type of individuals – those induced into retirement by the financial incentive to retire – across countries.

The rest of the paper is organized as follows. Section 2 presents the analytical framework for measuring the relationship between health behaviors and employment/retirement, including the data and econometric methods and model specification. Section 3 presents the results. Finally, Section 4 concludes that while the direction of the causal relationship between retirement and health is positive, the size of the effect is quite disparate across countries, ranging from a 22 percentage point decrease in the likelihood of reporting they are in bad health among men retiring in

Europe to a 2 percentage point decrease among men retiring from physically demanding jobs in the US. We also find that retirement leads to a significant increase in the amount of vigorous exercise in all country settings, while the effect of retirement on addictive behavior (drinking and smoking) is more mixed. Together, it suggests that programs that increase exercise among all citizens before retirement, could help individuals reap the health benefits of retirement without having to leave the labor force.

2. **METHODS**

2.1. Conceptual model

We start with a simple framework for modeling the relationship between health and work, focusing on the health production function (Grossman, 1972). Health in any given time period is a function of the previous health stock and the biologically determined rate of health deterioration. Individuals can make investments in their health to help counteract the national deterioration due to aging and potentially improve their health.

Retirement can impact the health through either the substitution effect or the income effect. The income effect occurs if expected lifetime income changes with retirement or consumption smoothing between working and retirement is incomplete. Thus if retirement leads to lower income, optional health levels may decrease, or the costs of health investments become too high, suggesting retirement would lead to lower health. The substitution effect can manifest itself in many ways, by essentially lowering the opportunity cost of health investment during leisure time, reducing on-the-job

activity, stress, and hazardous work, and potentially changing the optimal investments made in health. The substitution effect could lead to either health improvements or declines in retirement. Thus the causal relationship between retirement and health is theoretically ambiguous, and we must rely on empirical studies.

Health-related behaviors may change with retirement as a direct result of the change in how one spends time during the week, from work to leisure. Evenson et al. (2002) find that those who retire are more likely to start a new physical activity and more likely to maintain their sports activity than those who continue working. On the other hand, evidence suggests that retirees also increase their television viewing (Robinson and Godbey, 2008). Slingerland et al. (2007) expand on this idea, and while they find that Dutch retirees increase their sports- and leisure-time physical activity, their total physical activity decreases, primarily due to the loss of exercise related to commuting. If the job was physically demanding, retirement may also decrease the amount of total exercise one gets. Zheng et al. (2008) find that retirement causes more weight gain for those who leave physically demanding jobs than for those leaving a sedentary job. Similarly, Chung et al. (2009) found that those already overweight retiring from physically demanding jobs suffer from a modest weight gain. Also, retirement increases leisure time, which may in turn have an impact on where and what one eats and, thus, on how many calories one consumes. Chung et al. (2007) find that retirement, particularly of the female member of a couple, leads to fewer meals eaten outside the home, which in turn lowers weight gain in retirement.

In addition to causing changes in exercise and calorie intake, retirement is a major life change and can be a stressful event (Carp 1967, Eisdorfer and Wilkie 1977, MacBride 1976, Sheppard 1976) that may have an impact on health. If one deals with this stress through increased drinking, eating, or smoking, then this can have a direct impact on one's health. Previous work is inconclusive. Some studies find a positive association between retirement and problematic drinking (Ekerdt et al. 1989, Perreira and Sloan 2001), while others find retirement to be associated with fewer drinking problems and lower levels of alcohol consumption (Gallo et al. 2001, Neve et al. 2000, Roman and Johnson 1996, Bacharach et al. 2004). Lang et al. (2007) find a negative association between smoking and retirement in England. Further, none of these studies isolate the causal relationship or take into account the potential reverse-causation or an omitted third factor that is causing both retirement and the change in behavior.

Zantinge et al. (2014) conduct a systematic review of the literature on how retirement impacts health behaviors. Overall, their analysis of 20 papers in various countries suggests that the effect of retirement on alcohol consumption is mixed, and that existing studies on smoking and dietary habits were too limited to draw strong conclusions. Leisure time physical activity tends to increase, but not enough to compensate for the loss of physical activity related to work.

2.2 Data

This paper makes use of the Health and Retirement Study (HRS) (United States) (1992-2008 (9 waves)), Survey of Health Aging and Retirement in Europe

(SHARE) (11 European countries) (2004-2006 (2 waves))[2][3]and the English Longitudinal Study of Ageing (ELSA) (England) (2002-2006 (3 waves)). ELSA and SHARE, were developed having HRS as role model and with cross-country studies in mind, as a result, they collected conceptually comparable data in the key domains of demographics, health, work and retirement, income and assets, family and social networks (See Lee (2010) for a detailed discussion on the comparability of the surveys at conceptual level). Despite the intention for cross-survey comparability, creating comparable data between data sets remains non-trivial. In this respect this paper benefits from harmonization efforts as part of the Global Aging Data Repository (http://gateway.usc.edu/). Table 1 summarizes the information available in each survey used. Although the list of mechanisms is not exhaustive, we have data on a large range of behaviors and activities in a variety of countries to study which paths might be more important. In addition, both objective and subjective measures of health are available, as are detailed socio-demographic information that allows us to control for health events and socioeconomic factors.[4]

There are very few sample restrictions necessary for this analysis. First, we eliminate incomplete survey records. Second, we eliminate those individuals who have never worked and those who have not worked since age 50, either due to individual

[2] SHARE contains information on approximately 31,000 individuals over the age of 50 in Austria, Germany, Sweden, the Netherlands, Spain, Italy, France, Denmark, Greece, Switzerland, and Belgium. The first wave of SHARE also included Israel and the second wave, administered in 2006 adds Poland and the Czech Republic. However, we limit the analysis to the 11 initial countries for which we have data available for both waves.

[3] An additional wave of data is now available for SHARE for the year 2010. However, the wave in between corresponding to 2008 was dedicated to a life events survey and did not collect all the necessary variables for analysis. Therefore, we focus the analysis only of the first two consecutive waves of data for SHARE.

[4] Appendix A shows the definition of key variables used in our analysis.

choice or physical or mental limitations. Finally, we limit our analysis to men, since we are less worried about the potential for cohort effects in the characteristics of the working population for men than for women. The final sample consists of 51,110 total observations for the HRS, 11,545 total observations for ELSA and 22,056 total observations for SHARE.

We supplemented these data sets with information regarding country-specific statutory ages of retirement, presented in Table 2. All countries studied except Denmark have both an early retirement age – the age at which men are first eligible for retirement benefits – and a full retirement age – the age at which men are eligible for the "full" benefits. The full retirement age is almost universally 65 for the countries and birth cohorts studied, with the exception being France set at age 60. Early retirement ages show more variation across countries, ranging from 57-63. In the US, while there is a normal retirement age of 65 for men of these birth cohorts, we do not use this as an instrumental variable since it is also the age of Medicare eligibility.

Using these data, we construct instruments based on dummy variables indicating whether the individual is above the full or early retirement ages set in his country:

$$Instrument_{ict} = 1(age_{it} \geq Statutory\_retirement\_age_{ct}) \qquad (1)$$

where *i* refers to the individual, *c* a country and *t* a particular year. Note that these instruments present variation among individuals of different ages in a given country (depending on the individual being above or below the statutory retirement age set in his country in a particular year) and among individuals residing in different countries

given a particular age (as statutory retirement ages vary across countries). Finally, for the analysis of drinking behaviors, whenever available, we also included measures of number of cafes or pubs per million inhabitants to capture cultural and context effects (van den Broek, 2002).

2.3 Econometric Methods

We want to determine the effect of the binary decision of being retired (R_{ict}) on each potential pathway for health changes (P_{ict}). The estimates are based on slight variations of the following main empirical model:

$$P_{ict} = \gamma_1 + \beta_1 R_{ict} + \beta_2 X_{ict} + \beta_3 C_i + u_{ict} \qquad (2)$$

where P_{ict} refers to the specific outcome we are interested in studying (e.g., health, drinking, smoking, exercise, etc.). β_1 is our main coefficient of interest as it estimates how retirement affects health and health-related behaviors. X_{ict} is a vector of socio-demographic explanatory variables relevant for the analysis such as age, age squared, household income, household wealth, years of education, marital status, ethnic group and race.

Separate models are estimated for the HRS, ELSA and SHARE surveys. In the case of SHARE, time-invariant country-specific characteristics are captured introducing country dummies (C_i), while region dummies are used for the US sample. Finally, including an individual constant term (γ_i) allows us to control for individual unobserved heterogeneity. If we make the more plausible assumption that γ_i is correlated with the

explanatory variables, fixed-effect models are needed and the effects of time-invariant regressors (e.g. country specific effects (C_i)) are not separately estimable from the individual's fixed effect. Fixed effect models and IV fixed effect models were estimated for HRS and ELSA data sets were more waves of data are available.[5]

A selection problem may arise because R_{ict} can be correlated with the unobservable characteristics. This would be the case if, for example, individuals who expect to benefit more in terms of health and who invest more on their health when retired try to retire earlier. Fixed effects panel data estimation of equation (2) corrects for a time-invariant correlation among retirement decisions and the unobservables.[6] However, this does not account for time-varying factors such as a sudden change in the individual's environment. The addition of instrumental variable methods to the panel data methods above aims to correct for these time-varying factors. Note that combining fixed effects and instrumental variables methods is possible because the instruments change over time with the age of the individual. Although health, health behaviors, retirement and the instruments are both a function of age, for the case of retirement and the instruments this function is nonlinear and non-monotonic. That is, a discrete jump in the probability of retirement is observed at the eligibility ages for early and full retirement pensions. Our approach therefore still allow us to control for smooth-age effects on health and health behaviors when at the same time using eligibility for early and full retirement ages as instruments. The identifying assumptions that we have to make is

[5] For SHARE, where only two consecutive waves of data are available, we only present results for OLS and IV methods.
[6] Note that simpler OLS methods make the stronger assumption that retirement decisions are not correlated with the unobservables.

that health and health behaviors do not change in a discontinuous way at the exact ages of eligibility for early and full retirement pensions. The availability of data from multiple countries with different statutory retirement ages allow us to better satisfy this assumption.

Despite of the difficulty to claim that OLS estimates are consistent in this context, due to the endogeneity or retirement, we also estimate equation (3) using OLS methods to compare the results with panel data and instrumental variable approaches. Specifically, linear probability models (OLS, IV, fixed effects and IV fixed effect models) are estimated for binary outcomes (i.e. bad health status, drinking, smoking, exercise, and obesity status).[7]

Finally, we test for heterogeneous effects of retirement depending on the type of job one retires from by including a specification with information about the level of physical activity in the previous job and the interaction term with the retirement variable.

3. RESULTS

3.1 Descriptive statistics

Table 3 shows descriptive statistics for the three data sets used in this paper. Considering the number of different countries involved in the analysis, the demographic characteristics are similar between the three data sources. The average age is between 64.5 and 66.5, with the percent self-reported retired between 60 and 62 percent. The

[7] For binary outcomes we also estimated non-linear probability models (i.e. probit and logit) and obtained similar results to the ones presented here using linear probability models. Results are available from the authors upon request.

SHARE is the youngest sample and the most retired, consistent with broad labor force participation patterns in continental Europe compared to the US or the UK. The HRS sample has more years of education, on average, and is more likely to be married. The British sample is the least likely to report working in a physical job. These differences, however, can be due to small divergences in the way this information is collected in these surveys.[8]

There is more variation between the different countries in terms of health and health behaviors. The British sample is much less likely to report being in fair/poor health. The continental European sample is the most likely to be currently smoking and a heavy drinker, which could be one explanation for the high prevalence of bad health reported.

3.2 Instrument validity

In order for statutory retirement ages to be valid instruments, they must be related to actual retirement behavior. Earlier work on the causal effect of retirement on health has shown that these proposed instruments are very strong predictors of retirement behavior (see e.g. Charles 2004, Neuman 2008, Bound and Waidmann 2007, Coe and Zamarro 2011). The first stage regression indicates that retirement ages are important predictors for retirement behavior in all countries in our analysis, as shown in Table 4.[9] As we can see in this table, our instruments are significant predictors of retirement in all datasets. Interestingly, our instruments have a differential effect on the retirement probability of men working in physically-demanding jobs in the US only. Identification

[8] See Appendix A for a detailed description of how these variables are constructed.
[9] See Appendix B for detailed results of the first stage regressions.

requires that there not be an independent, discontinuous change in health behaviors, activities and health care measures at the particular statutory retirement ages in place in each country. Therefore we only use the eligibility for early retirement in the U.S. in order to avoid identifying the effect of the Medicare eligibility age (age 65) on health. Therefore our model is only just identified, and we only present the F-statistic for significance of the instrument.

For the case of SHARE and ELSA where instruments based on both early and full retirement ages are used, the model is overidentified. We present results of F-tests of joint significance of the instruments in the first stage and Hansen J tests of overidentification testing the joint validity of our instruments. For all cases F-tests show that our instruments were jointly significant. We also pass Hansen J tests for all cases at the 95% significant level, although only marginally for the case of SHARE when the specification includes interactions with type of work. The instruments seem to be weaker in this case and this is something that should be kept in mind when interpreting the results.

3.3 Effect of retirement on self-reported health

This research was motivated by disparate findings in the relationship between health and retirement in different countries. Thus our first task is to replicate these original findings, but using consistent methods and variable definitions across the countries to facilitate comparison. Table 5 presents the results for self-reported bad health for the

HRS (Panel A), SHARE (Panel B), and ELSA (Panel C) samples.[10] Each row in the tables presents the coefficients and standard errors of the variables of interest, each column represents a different regression of interest. The first column presents the OLS results, the second the instrumental variable estimation to address the endogeneity of retirement, the third adds individual fixed-effects, and finally the fourth column includes both instrumental variables and individual fixed effects (our preferred specification). [11]

Table 5 also presents two specifications. The first estimates the effect of retirement on the entire male population. The second specifications follows Zheng et al. (2008) to look for differential effects of retirement on health based on the amount of physical activity the individual experienced while on the job.[12]

The OLS regressions in all three country settings show that retirement is negatively correlated with health. The OLS regression highlights the endogeneity problem; retirement is negatively correlated with health. Once we instrument for retirement, we find that retirement leads to better health, as measured with a lower propensity to report fair/poor health. The size of the effect varies considerably across countries. The greatest effect is found in continental Europe (SHARE), where retirement leads to a 22 percentage point drop in the likelihood of reporting fair or poor health, followed by England (ELSA: 14 ppt drop), and the smallest effect in the US (HRS: 7 ppt drop).

[10] See Appendix C for the full baseline results.

[11] As mentioned earlier, for SHARE there are only 2 consecutive waves of data available and thus we do not estimate the specifications with individual fixed effects. These specifications are also omitted for ELSA in the case of regressions about being overweight, as BMI information is only available in one wave.

[12] The sample size drops slightly in the second specification due to missing responses concerning the physicality of the last job.

These findings confirm Coe and Zamarro (2011)'s findings for continental Europe, and are slightly bigger for England compared to Bound and Waidmann (2007).

We then test to see if there are differential effects of retirement on health based on the physical activity of the job one retires from. The patterns of the effects are similar in the US and England, although the differences in the effect of retirement on health based on the physicality of the job are only statistically significant in the US. There we find that the retirement effect is driven by individuals retiring from non-physical jobs. Retiring from a physical job in the US leads to a 2 percent decrease in the probability of reporting bad health; retiring from a non-physically demanding job decreases the probability of reporting bad health by 7 percentage points.

The different models provide interesting insight into why the literature has previously estimated such different effects using different models and data sets. For the HRS, it is clear that the heterogeneity of the relationship between retirement and health is important. We find that retirement improves health the most for those retiring from non-physical jobs, while having more modest improvements for those retiring from physically-intensive jobs. The story seems to be a little different in continental Europe. Individuals in physical jobs are actually in worse health overall, and retirement leads to better health, with a stronger effect for individuals retiring from physical jobs (although the limited sample size leads to insignificant coefficients at traditional levels).

3.4 Health Behaviors

In order to see why retirement has different effects on health in these different country settings, we explore how health behaviors (Table 6) are impacted by retirement. Each panel presents the results from both models estimated for one of three health behaviors: exercise, drinking, and smoking. Each set of columns refers to the different models (OLS, IV, FE, IV FE) and each data set (HRS, SHARE, ELSA) respectively.

HRS: In the US, we find that retirement leads to an increase in the probability individuals report partaking in vigorous exercise. This increase is not only statistically significant, but sizable as well, with retirement leading to a 13 percentage point increase in the probability of reporting vigorous exercise off a base of 32 percent. This finding is consistent with the idea of retirement decreasing the opportunity cost of making time-intensive investments in one's health. Consistent with the earlier results for the effect of retirement on overall health, the effect of retirement on exercise for individuals who work in physically demanding jobs is only about one-third of the overall increase in exercise due to retirement (5 percent increase vs. 15.7 percent increase). While retiring from physically demanding jobs leads to a smaller impact on exercise, it also leads to a 4 percentage point decrease in the likelihood of drinking heavily.

SHARE: While the overall impact of retirement on health in continental Europe is large, we do not find an overall impact of retirement on these three health behaviors. Instead, retirement impacts health behaviors differently depending on what type of job you retire from in Europe. Retirement from non-physically demanding jobs leads to an 18 percentage point increase in the likelihood of exercising, however, they are also 15 percentage points more likely to smoke after retirement. Retirement from physically-

demanding jobs leads to almost no change in exercise, but a 9 percentage point increase in drinking and a 5 percentage point increase in smoking. This suggests that the health gain in retirement, particularly from those retiring from physically-demanding jobs, is not coming through one of these health behavior channels.

ELSA: In Britain, the pattern and magnitude of the effects is very similar to that of the US. Overall there is a 18 percentage point increase in the likelihood of participating in vigorous exercise after retirement, and this effect is driven by men retiring from non-physical jobs. Men retiring from physical jobs, however, decrease their smoking (17 ppt) due to retirement.

4. DISCUSSION

A growing body of literature has focused on measuring the causal relationship between retirement and health. A consensus has not been reached yet, largely due to different data sets and methodological approaches. The first goal of this paper was to harmonize the data sources and methods as much as possible to estimate this causal relationship consistently across the different country settings. We find that retirement is good for men's health in all three study settings: US, England, and Europe. The positive relationship between retirement and health is driven by men retiring from non-physically demanding jobs in both the US. While the direction of the effect is constant, the size of the effect varies; the largest effect is for men retiring in continental Europe (22 ppt), then England (14 ppt), and finally the US (7 ppt for men in non-physical jobs, 2 ppt for men in physically-demanding jobs).

The second goal of this paper was to peer into the black box of the health production function to see if we can find out why retirement impacts health in order to make better retirement and public health policy prescriptions. In the US, Europe, and England, we find that men retiring from non-physically demanding jobs increase their exercise dramatically upon retirement. The increase in exercise is much less pronounced for men retiring from physically demanding jobs, consistent with the men getting most of their physical activity at work. These findings suggest programs that are effective at encouraging exercise among men while they remain working may allow men to achieve the health gains without having to actually leave the labor force.

We also find mixed evidence about the effect of retirement on smoking and drinking. In the US and England, retirement leads to decreases in these bad health behaviors, while we find evidence of increases in these behaviors in continental Europe. Further work exploring how these relationships are also linked with the social behavior of these men would be of interest.

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APPENDIX A: Definition of Key Variables

-Retirement: There are two common ways of defining retirement: self-reported retirement status, or anyone who is not in the paid labor force. Often individuals report that they are retired even when working full- or part-time, simply because they have left their "career" job. Since we want to determine the effect of work status on health behaviors and investments, we employ the latter definition. We consider this a cleaner measure of retirement behavior than the self-reported measure. Thus, while we limit our sample to those who are working in the paid labor market at the age of 50, we consider individuals that report themselves to be retired, a homemaker, sick and disabled, separated from the labor force (not temporarily), and unemployed (not temporarily) as retired.

-Physical job: For HRS this is a dummy variable that takes value one if the respondent reported that his/her current job in the interview year involves a lot of physical effort most of the time. If the respondent is not working in the current wave then this variable indicates whether the last job of the respondent was a physical job. For ELSA, this is a dummy variable that takes value one if the respondent reports having a physical work or heavy manual work as the level of activity in his/ her main job, for those not working it takes value one if the last job was physically demanding. For SHARE, this variable takes value one if the respondent agrees or strongly agrees to the statement that his/ her job is physically demanding or if the respondent stops working from a job that was physically demanding.

-***Bad Health:*** Dummy variable that takes value one if the respondent reports being in fair or poor health.

-***Vigorous Exercise:*** Dummy variable that takes value one if the respondent reports doing vigorous exercise activities more than once per week.

-***Heavy drinking:*** For SHARE, this is a dummy variable that takes value one if the respondent reports having alcoholic beverages like beer, cider, wine, spirits or cocktails almost every day, during the last 6 months. For ELSA, this is a dummy variable that takes value one if the respondent reports having alcoholic beverages almost every day, during the last 12 months. This information is available in ELSA only for waves 2 and 3 of our data set. For HRS, this variable takes value one if the respondent reports drinking alcoholic drinks more than four days per week in the previous two years from the date of interview.

-***Current smoking:*** For SHARE, this is a dummy variable that takes value one if the respondent reports smoking cigarettes at the present time and reports having ever smoked daily. In HRS, this is a dummy variable that takes value one if the individual reports smoking cigarettes at the present time and reports having ever smoked, regardless of whether the smoking was daily. Finally, for ELSA like HRS this is a dummy variable that indicates whether the respondent reports smoking at all nowadays and reports ever smoking.

-Household income: It is the sum of all income of the respondent and the spouse in the household. Differences in the components of total household income among HRS, ELSA and SHARE are document in https://mmicdata.rand.org/meta/codebooks/RH_SHARE_Codebook.pdf and https://mmicdata.rand.org/megametadata/codebooks/RH_ELSA_Codebook.pdf.

-Net worth: It is the net value of total wealth, which is calculated as the sum of all wealth (excluding second home, if applicable) less all debt of the household. Differences in the components of net worth among HRS, ELSA and SHARE are document in https://mmicdata.rand.org/meta/codebooks/RH_SHARE_Codebook.pdf and https://mmicdata.rand.org/megametadata/codebooks/RH_ELSA_Codebook.pdf.

-Years of education: In HRS this variable collects the number of years of education and it takes a maximum value 17 for post college education. In SHARE the maximum value of years of education is 21 for wave1 and 25 for wave 2. Unlike the HRS and SHARE, ELSA does not survey respondents as to the number of years of education. Instead, ELSA survey respondents as to their educational qualification. The value of years of education has been imputed from highest education qualification following the conversion table described in https://mmicdata.rand.org/megametadata/codebooks/RH_ELSA_Codebook.pdf. Unlike the RAND HRS, years of education in ELSA range from 0, which indicates no years of education, to 16, which indicates 16 or more years of education.

APPENDIX B: FIRST STAGE REGRESSIONS

Appendix Table B1: First Stage Results: HRS

	HRS	
	Baseline	*interaction with physical*
Early Retirement Age	0.299***	0.301***
	(0.008)	(0.009)
Early Retirement Age * physical job		0.0481***
		(0.008)
physical job		-0.0370***
		(0.006)
age	0.0791***	0.0477***
	(0.003)	(0.003)
Age squared	-0.000448***	-0.000215***
	(0.000)	(0.000)
Log household income	-0.109***	-0.108***
	(0.003)	(0.003)
log household net worth	0.0271***	0.0365***
	(0.001)	(0.002)
Years of Education	0.00162***	0.00298***
	(0.001)	(0.001)
married	0.0349***	0.0363***
	(0.004)	(0.006)
African American	0.0133**	0.0149**
	(0.005)	(0.007)
Other race	-0.0257***	-0.0254**
	(0.009)	(0.011)
Hispanic ethnicity	-0.0578***	-0.0470***
	(0.007)	(0.009)
Constant	-2.030***	-1.188***
	(0.100)	(0.115)
N	51110	34622

Note: all regressions also include Region (HRS)

Appendix Table B2: First Stage Results: SHARE

	SHARE	
	Baseline	*interaction with physical*
Full Retirement Age	0.1763***	0.3544***
	(0.0106)	(0.0306)
Full Retirement Age *physical job		0.0508
		(0.0360)
Early Retirement Age	0.2147***	0.0877***
	(0.0123)	(0.0171)
Early Retirement Age * physical job		-0.0225
		(0.0206)
physical job		-.0040
		(0.0058)
age	0.1350***	0.0045
	(0.0044)	(0.0111)
age squared	-0.0009***	0.0001
	(0.00003)	(0.0001)
Log household income	-0.0333***	-0.0212***
	(0.0034)	(0.0036)
Log household wealth	-0.0068***	-0.0020
	(0.0015)	(0.0021)
education years	-0.0040***	-0.0030***
	(0.0006)	(0.0009)
married	0.0281***	-0.0685***
	(0.0038)	(0.0060)
Constant	-4.1218***	-0.0933
	(0.1534)	(0.3217)
N	22056	9081

Note: all regressions also include Country (SHARE) dummy variables.

Appendix Table B3: First Stage Results: ELSA

	ELSA	
	Baseline	*interaction with physical*
Full Retirement Age	0.3449***	0.3542***
	(0.0172)	(0.0355)
Full Retirement Age *physical job		-0.0232
		(0.0456)
Early Retirement Age	0.1851***	0.0846***
	(0.0165)	(0.0194)
Early Retirement Age * physical job		-0.0396
		(0.0254)
physical job		-.0203***
		(0.0984)
age	0.0602***	0.0279**
	(0.0046)	(0.0122)
age squared	-0.0003***	-0.0002
	(0.0000)	(0.0001)
Log household income	-0.0913***	-0.0854***
	(0.0061)	(0.0084)
Log household wealth	0.0045***	0.0097**
	(0.0024)	(0.0045)
education years	0.0024***	0.0035***
	(0.0007)	(0.0009)
married	0.0104	0.0158
	(0.0097)	(0.0143)
White	0.0125	0.0607***
	(0.0140)	(0.0187)
Constant	-1.6712***	-0.6711**
	(0.1678)	(0.3532)
N	11545	5607

Appendix C: Full Baseline results
Appendix Table C1: Baseline Health Results: HRS

	Bad Health			
	OLS	*IV*	*FE*	*IV FE*
retired	**0.111*** **	**-0.0309**	**0.0287*** **	**-0.0738*** **
	(0.005)	**(0.021)**	**(0.005)**	**(0.025)**
age	-0.00951***	0.0116***	-0.0252***	-0.00674
	(0.002)	(0.004)	(0.003)	(0.006)
age squared	0.0000944***	-2.96E-05	0.000280***	0.000172***
	(0.000)	(0.000)	(0.000)	(0.000)
Log household income	-0.0222***	-0.0379***	-0.00502*	-0.0131***
	(0.002)	(0.003)	(0.003)	(0.003)
Log household wealth	-0.0286***	-0.0245***	-0.0114***	-0.0103***
	(0.001)	(0.002)	(0.002)	(0.002)
Years of education	-0.0181***	-0.0179***		
	(0.001)	(0.001)		
Married	0.00587	0.0114**	0.0332***	0.0357***
	(0.005)	(0.005)	(0.008)	(0.009)
African American	0.0350***	0.0371***		
	(0.007)	(0.007)		
Other race	0.0422***	0.0388***		
	(0.011)	(0.011)		
Hispanic Ethnicity	0.0371***	0.0298***		
	(0.009)	(0.009)		
Constant	1.145***	0.498***	0.804***	
	(0.077)	(0.119)	(0.107)	
N	51110	51110	51110	49320
adj. R-square	0.113			

Note: all regressions also include Region dummy variables.

Appendix Table C2: Baseline Health Results: SHARE

	Bad Health	
	OLS	*IV*
retired	**0.1000*** **	**-0.2392*** **
	(0.0095)	**(0.0405)**
age	-0.0265***	0.0499***
	(0.0046)	(0.0097)
age squared	0.0002***	-0.0002***
	(0.0000)	(0.0001)
Log household income	-0.0161***	-0.0282***
	(0.0037)	(0.0043)
Log household wealth	-0.0171***	-0.0198***
	(0.0021)	(0.0023)
Years of education	-0.0104***	-0.0118***
	(0.0008)	(0.0008)
Married	-0.0162**	-0.0047
	(0.0054)	(0.0057)
Austria	-0.1504***	-0.1252***
	(0.0183)	(0.0191)
Belgium	-0.1250***	-0.1074***
	(0.0141)	(0.0147)
Denmark	-0.0522**	-0.0419*
	(0.0178)	(0.0185)
France	-0.0545***	-0.0386*
	(0.0148)	(0.0153)
Greece	-0.1705***	-0.1990***
	(0.0147)	(0.0157)
Italy	-0.0625***	-0.0559***
	(0.0158)	(0.0163)
Netherlands	-0.1174***	-0.1182***
	(0.0144)	(0.0148)
Spain	-0.0651***	-0.0865***
	(0.0170)	(0.0178)
Sweden	-0.1314***	-0.1246***
	(0.0168)	(0.0177)
Switzerland	-0.1722***	-0.2005***
	(0.0166)	(0.0178)
Constant	1.4818***	-1.0097**
	(0.1571)	(0.3172)
N	22056	22056
adj. R-square	0.112	0.054

Note: The reference country is Germany

Appendix Table C3: Baseline Health Results: ELSA

	Bad Health			
	OLS	*IV*	*FE*	*IV FE*
retired	**0.0977*** **	**-0.0047**	**0.0294***	**-0.1644****
	(0.0103)	**(0.0420)**	**(0.0173)**	**(0.0825)**
age	-0.0003	0.0172**	-0.0101	0.0066
	(0.0043)	(0.0077)	(0.0106)	(0.0127)
age squared	0.0000	-0.0001**	-0.0002***	-0.0003***
	(0.0000)	(0.0000)	(0.0001)	(0.0001)
Log household income	-0.0202***	-0.0294***	-0.0012	-0.0112
	(0.0052)	(0.0064)	(0.0069)	(0.0081)
Log household wealth	-0.0271***	-0.0267***	-0.0001	0.0018
	(0.0027)	(0.0028)	(0.0062)	(0.0063)
years of education	-0.0050***	-0.0048***		
	(0.0006)	(0.0007)		
married	0.0267***	0.0282***	-0.0231	-0.0204
	(0.0093)	(0.0095)	(0.0295)	(0.0298)
white	-0.1214***	-0.1206***		
	(0.0171)	(0.0171)		
Constant	0.6900***	0.1011	1.7319***	1.1771***
	(0.1470)	(0.2575)	(0.3649)	(0.4349)
N	11545	11545	11545	11545
adj. R-square	0.077	0.069	0.070	0.079

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Table 1: Information in the HRS, SHARE, and ELSA

	HRS	SHARE	ELSA
Dependent Variables			
Activities and Health Risk Behavior			
Physical Activity	Yes (frequency of vigorous, moderate, and light exercise)	Yes (frequency of vigorous exercise, moderate exercise)	Yes (frequency of vigorous exercise, moderate exercise)
Obesity	Yes (BMI)	Yes (BMI)	Only one wave (BMI)
Drinking	Yes (drinking history, drinks per day, drink days per week, binge drinking)	Yes (amount last 6 months, how often 2 beers in a day, 2 glasses of wine in a day and 2 glasses of liquor in a day)	Yes (whether took alcoholic drink last week, how often last week, type of drinks they had the day they drunk most last week)
Smoking	Yes (ever smoked, age when started smoking, still smoking, amount, age stopped smoking)	Yes (ever smoked daily, still smoking, time smoking, age when stopped)	Yes (whether stopped smoking since last interview, reason to stop, date start smoking)
Consumption of food	Yes, household spending on food at home and eating out.	Yes, household spending on food at home and eating out.	Yes, household spending on food at home and eating out.
Type of job			
Physical Job	Yes	Yes	Yes
Retirement information	Yes	Yes	Yes
Panel data structure	1992-2008 (9 waves)	2004-2006 (2 waves)	2002-2006 (3 waves)

Table 2: Statutory Retirement Ages

Official Retirement Ages (Men)

	Early	**Normal**
Austria	60	65
Belgium	60	65
Denmark	N/A	65
France	57	60
Germany	63	65
Greece	57	65
Italy	57	65
Netherlands	60	65
Spain	60	65
Sweden	61	65
Switzerland	63	65
U.S.	62	***65***
U.K	60	65

Source: Natali (2004), but was supplemented with information from OECD (2003), the Bartelsmann Foundation, Sundén (2004), Preesman (2006), and OECD (2005). Slight differences can be found between our retirement ages and those from other OECD publications (for example, OECD, 2005), due to the differences between current law and the law that was in place when these individuals were facing the retirement decision.

Table 3: Descriptive Statistics

		HRS	SHARE	ELSA
Demographics				
	retired	60.2%	61.9%	60.6%
	age	66.4	64.5	65.3
	years of education	12.4	10.7	7.5
	married	68.5%	49.8%	67.5%
	White	82.0%	N.A	93.7%
	African American	14.2%	N.A	N.A.
	Other race	3.8%	N.A	N.A.
	Hispanic ethnicity	7.4%	N.A	N.A.
	physical job	43.2%	46.8%	29.8%
Wealth				
	HH income	28,787	42,057	14,855
	HH net worth	106,357	209,059	118,229
Health				
	Bad health	25.0%	27.8%	17.1%
Health Behaviors				
	vigorous exercise	32.2%	37.2%	19.3%
	smoke now	16.0%	19.9%	15.4%
	heavy drinker	9.9%	24.7%	15.1%

Table 4: First Stage Results

Outcome: Retirement		**HRS**	
	Baseline	*interaction with physical*	
		Main effect	*interaction with physical*
Early retirement age	0.299***	0.301***	0.0481***
	(0.008)	(0.009)	(0.008)
F-statistic (p-value)	2673.551 (0.000)	1074.609 (0.000)	
N	51110	34622	
		SHARE	
Full retirement age	0.1763***	0.3544***	0.0508
	(0.0106)	(0.0306)	(0.0360)
Early retirement age	0.2147***	0.0877***	-0.0225
	(0.0123)	(0.0171)	(0.0206)
F-statistic (p-value)	300.68 (0.000)	75.04 (0.000)	323.53 (0.000)
Hansen J-Test p-value	0.9928	0.0629	
N	22056	9081	
		ELSA	
Full retirement age	0.3332***	0.3630***	-0.0306
	(0.0117)	(0.0218)	(0.0241)
Early retirement age	0.1851***	0.0846***	-0.0396
	(0.0165)	(0.0194)	(0.0254)
F-statistic (p-value)	342.44 (0.000)	39.89 (0.000)	69.06 (0.000)
Hansen J-Test p-value	0.9346	0.1355	
N	11545	5607	

Table 5: Baseline Health Results with Specification Tests

		Bad Health			
Specification		*OLS*	*IV*	*FE*	*IV FE*
Panel A: HRS					
Baseline:	retired	0.111***	-0.0309	0.0287***	-0.0738***
		(0.005)	(0.021)	(0.005)	(0.025)
Physical Job					
Interaction	retired	0.0594***	0.0052	0.0161**	-0.0719***
		(0.006)	(0.022)	(0.006)	(0.027)
	retired*physical	.0299***	0.0328**	-0.0179**	0.0509***
		(0.009)	(0.014)	(0.008)	(0.017)
	physical	-0.00822	-0.0102	0.0308***	-0.0266***
		(0.006)	(0.007)	(0.009)	(0.009)
Panel B: SHARE					
Baseline:	retired	0.0931***	-0.2157***		
		(00939)	(0.0437)		
Physical Job					
Interaction	retired	0.03495*	-0.0733		
		(0.0183)	(0.0503)		
	retired*physical	0.0079	-0.0149		
		(0.0252)	(0.0401)		
	physical	0.0349***	0.0370***		
		(0.0089)	(0.0101)		
Panel C: ELSA					
Baseline:	retired	0.0978***	-0.0063	0.02940	-0.14053*
		(0.0103)	(0.0367)	(0.0173)	(0.0774)
Physical Job					
Interaction	retired	0.2029	-0.1006**	0.0004	-0.1047
		(0.0146)	(0.0453)	(0.0203)	(0.0867)
	retired*physical	0.0436*	-0.0056	-0.0189	0.0454
		(0.0246)	(0.0458)	(0.0310)	(0.0893)
	physical	-0.0011	0.0019	-0.0077	-0.01010
		(0.0146)	(0.0122)	(0.0196)	(0.0110)

Note: all regressions also include all covariates indicated in Appendix Tables C1(HRS), C2(SHARE), and C3 (ELSA).

Table 6: Health Behaviors

		HRS				SHARE	
Specification		*OLS*	*IV*	*FE*	*IV FE*	*OLS*	*IV*
Panel A: Vigorous Exercise							
Baseline:	retired	-0.0163***	0.141***	0.0217***	0.128***	-0.0733***	0.0320
		(0.006)	(0.028)	(0.007)	(0.030)	(0.0112)	(0.0513)
Physical Job	retired	0.0479***	0.145***	0.0715***	0.157***	0.0942***	0.1758**
Interaction		(0.008)	(0.031)	(0.009)	(0.043)	(0.0236)	(0.0699)
	retired*physical	-0.0924***	-.0801***	-0.0938***	-0.106***	-0.2168***	-0.1536***
		(0.011)	(0.018)	(0.013)	(0.025)	(0.0309)	(0.0530)
	physical	0.129***	0.125***	0.831***	0.0888***	0.2735***	0.2655***
		(0.008)	(0.100)	(0.011)	(0.015)	(0.0124)	(0.0139)
Panel B: Heavy Drinking							
Baseline:	retired	0.0241***	0.0462**	-0.004	-0.012	0.0215**	-0.0033
		(0.005)	(0.021)	(0.005)	(0.024)	(0.0104)	(0.0475)
Physical Job	retired	0.0427***	0.0736***	0.002	-1E-04	-0.0232	0.0739
Interaction		(0.006)	(0.024)	(0.006)	(0.027)	(0.0209)	(0.0638)
	retired*physical	-0.0377***	-0.0608***	-0.012	-0.0373**	0.0533	0.0873*
		(0.008)	(0.013)	(0.008)	(0.015)	(0.0116)	(0.0497)
	physical	-2.8E-05	0.0119	0.0231***	0.0330***	-0.0090	-0.0129
		(0.006)	(0.008)	(0.007)	(0.009)	(0.0282)	(0.0129)
Panel C: Current Smoking							
Baseline:	retired	0.0056	0.0282	-0.0086***	0.021	-0.0037	-0.0608
		(0.005)	(0.022)	(0.003)	(0.017)	(0.0106)	(0.0461)
Physical Job	retired	0.0133**	0.0325	-0.007	0.026	-0.0150	0.1458**
Interaction		(0.006)	(0.024)	(0.004)	(0.019)	(0.0201)	(0.0612)
	retired*physical	-0.0363***	-0.0717***	-0.0110*	-0.017	-0.0526**	-0.0957**
		(0.008)	(0.014)	(0.006)	(0.012)	(0.0126)	(0.0478)
	physical	0.0359***	0.0521***	-3E-04	0.002	0.0505***	0.0578***
		(0.006)	(0.009)	(0.005)	(0.007)	(0.0126)	(0.0140)

Note: all regressions also include all covariates indicated in Appendix Tables C1 (HRS) and C2 (SHARE).

Table 6: Health Behaviors (Continuation)

		ELSA			
Specification		*OLS*	*IV*	*FE*	*IV FE*
Panel A: Vigorous Exercise					
Baseline:	retired	-0.0242	0.1148**	0.0098	0.1761**
		(0.0151)	(0.0473)	(0.0183)	(0.0820)
Physical Job Interaction	retired	-0.0218	-0.0109	0.0201	0.1997
		(0.0221)	(0.0815)	(0.0285)	(0.1222)
	retired *physical	-0.0634	-0.0072	-0.0821	-0.2089*
		(0.0356)	(0.0761)	(0.0437)	(0.1259)
	physical	0.1098***	0.1020***	0.0437	0.0499*
		(0.0167)	(0.0202)	(0.0276)	(0.0281)
Panel B: Heavy Drinking					
Baseline:	retired	0.0223	-0.0971*	-0.0172	-0.1960
		(0.0175)	(0.0580)	(0.0245)	(0.1346)
Physical Job Interaction	retired	0.0386	-0.1439	0.0178	0.1089
		(0.0275)	(0.1009)	(0.1857)	(0.1924)
	retired*physical	-0.0862**	-0.1224*	-0.1794	-0.2587
		(0.0371)	(0.0736)	(0.1938)	(0.1993)
	physical	-0.0041	-0.0009	0.0352	0.0365
		(0.0177)	(0.0225)	(0.0299)	(0.0301)
Panel C: Current Smoking					
Baseline:	retired	0.0066	0.0516	-0.0271***	-0.0719*
		(0.0126)	(0.0414)	(0.0084)	(0.0377)
Physical Job Interaction	retired	-0.0231	0.0087	-0.0191	0.0286
		(0.0259)	(0.0134)	(0.0208)	(0.0578)
	retired*physical	0.0467	-0.0226	-0.0232	-0.1652**
		(0.0431)	(0.0206)	(0.0308)	(0.0595)
	physical	0.0183	0.0013	0.0003	0.0059
		(0.0206)	(0.0130)	(0.0193)	(0.0133)

Note: all regressions also include all covariates indicated in Table C3 (ELSA).