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The Impact of Health on Individual Retirement Plans: a Panel Analysis comparing Self-reported versus Diagnostic Measures

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The Impact of Health on Individual Retirement Plans: a Panel Analysis comparing Self-reported versus Diagnostic Measures[†]

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and

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Abstract

Earlier studies have concluded that the use of self-reported health in retirement models is likely to yield an unreliable impact of health on retirement due to "justification bias". A few recent studies based on younger cohorts approaching retirement age have found little support for this hypothesis. This paper adds fresh evidence to this debate by considering the effect of health on retirement plans in samples of older workers and retirees drawn from a Danish panel survey from 1997-2002 merged to longitudinal register data. Using a wide array of alternative health measures, we compare the role of subjectively versus objectively measured health as a determinant of retirement planning. We control for unobserved heterogeneity as well as account for endogeneity and measurement error of health in retirement, and estimate separate models for women as well as men. As in the more studies, justification bias turns out not to be important. Self-rated physical and mental health are important predictors of retirement planning, in fact more important than economic factors, both among men as well as women. At a disaggregated level, back problems and myalgia significantly hasten male retirement, while back problems, osteoporosis and depression are conditions that significantly affect retirement among women. Retirement planning is in general unaffected by being hospitalised for a serious condition. Looking at health changes strengthens the conclusion that health is an important factor in retirement planning. In fact, health shocks seem to increase the propensity to retire earlier. However, health seems to be less important for retirement planning in Denmark compared to the US.

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1. Introduction

The future demographic changes that many countries around the world expect to face imply that it becomes increasingly important to add to our knowledge about the factors that affect the retirement decision. A number of previous studies have shown that health is an important determinant of preferences for retirement. Much of the available empirical evidence in this area suggests that poor health causes workers to retire earlier (Bound, 1991; Anderson and Burkhauser, 1985, Bazzoli, 1985; Dwyer and Mitchell, 1999; McGarry, 2002). Yet, from a theoretical perspective, poor health actually has an ambiguous effect on retirement (Sammartino, 1987). In part, developing a health problem can reduce productivity at work by affecting work capacity. In addition, workers may have to reduce hours or take sick days to attend to their health condition, which increases the value of leisure time relative to consumption. On the other hand, poor health can increase the value of consumption relative to leisure at the margin if developing an acute condition means that the expected work life is shortened, so that the worker now has fewer years to allocate between retirement and work (Grossman, 1972). While most previous studies have found that the former effects dominate the latter so that poor health brings on retirement, there is much disagreement as to the precise effects of health on retirement. This is because various econometric issues arise when health is proxied by way of survey-based self-reports or even by more objectively measured indicators. These issues have been detailed in a number of previous studies and therefore they are mentioned only briefly below (see for example, Benitez-Silva et al., 2000, Bound, 1991, Dwyer and Mitchell, 1999, and McGarry, 2002).

Subjective reports of health made by those already retired may lead to potential "justification bias". That is, failing health is used as a socially acceptable excuse for retirement, rather than an accurate description of the reason why individuals leave the labour market. This likely biases the estimated impact of health on labour market outcomes and introduces a bias in the coefficients of any variables correlated with health too. Another consideration is that health may be endogenous to labour market outcomes. This might lead to mis-estimation of the effect of health if, for instance, withdrawal from the labour market improves or worsens health. This is a direct effect leading to overestimation of the effect of health. An indirect effect is generated if unobserved differences across individuals correlate with both health and retirement behaviour, for example, differences in workers' time rate of preference. The inability to control for these variables could lead to omitted variable bias. There may also be correlation between health status and financial aspects. Since

disability pension is only available for those who suffer from loss of working capability, some people will have a financial incentive to identify themselves as disabled, leading to a correlation between subjective health measures and financial variables. Thus, although the impact of health itself is correctly measured, the estimates of the impact of economic variables may be biased. Use of objective health measures might correct for this problem but objective health measures themselves may suffer from other problems, namely, that such health indicators need not necessarily measure the individual's reduced ability to perform work, the relevant measure in any labour study. In fact, in most cases, objective measures are proxies for general health or presence of health conditions rather than work capacity. For example, a measure such as subsequent mortality typically suffers from this measurement error problem, particularly as mortality often occurs abruptly or following a short-lived serious illness and is therefore not a good measure of current work capacity. Conversely, many chronic conditions such as arthritis may severely limit one's ability to work, but have less of an effect on life expectancy, which may be important if workers form expectations taking into account their expected remaining time horizon. Finally, there need not be any relationship between the level of current health and retirement probabilities, if individuals and jobs are generally well matched so that employers tend to accommodate worker's health problems at the workplace, or workers themselves undergo neutralizing treatment or lifestyle changes. Rather, it might be the onset of diseases or conditions, or sudden or gradual changes in health that likely influence retirement decisions. Therefore, in addition to analysing the effect of the level of health, the role of health changes is also examined.

These considerations pose a considerable challenge to empirical economists interested in quantifying the impact of health on retirement and other labour market outcomes. Our main purpose is to assess the importance of precisely measured health relative to economic factors in particular, on planned retirement behaviour in Denmark taking careful account of the problems inherent in obtaining a precise estimate of health impacts outlined above. By combining a repeated survey of elderly individuals to longitudinal register data on labour market information, we are able to create a panel sample of older individuals for whom we have data on planned retirement age, health, income, job characteristics, labour market and background measures. This gives us a unique opportunity to quantify for the first time the effect of subjective as well as objective (including diagnostic-based) measures of health on retirement in Denmark. In doing so, we attempt to build upon the work in previous studies by taking into account various issues that arise in the

measurement of health that were discussed above. For instance, similar to McGarry (2002), by using repeated observations on planned retirement age we are able to control for unobserved heterogeneity across individuals that may be correlated with both health and retirement and thereby cause omitted variable bias. However, going beyond McGarry, we also account for the endogeneity of health and measurement error as in Dwyer and Mitchell (1999), but within a framework of a panel model instead of the static model used in that study, allowing us to simultaneously account for both unobserved effects and endogeneity. Further, we employ a wide array of health measures in this study, both subjective and objective, including information of actual diagnoses made at the time of hospitalisation extracted from the Danish National Patient Registry (LPR, *Landspatientregister*). By employing a wide array of health measures, including self-rated physical and mental health, health compared to others, work capacity, work and functional limitations, presence of diseases conditions and episodes of hospitalisation caused by a serious condition, we are able to provide outer bounds on the "true" effect of health on retirement spanned by subjective and objective measures. This method has been suggested by Bound (1991) and has been implemented by Dwyer and Mitchell (1999) and Kreider and Pepper (2001, 2002). In addition, one methodological improvement on previous studies is that in some specifications we experiment with a ordered probit panel model which allows for discontinuities in planned retirement age that may arise if the data are bunched around the early and normal retirement ages (see for example Figure 2 below). Thus, we do not necessarily assume like previous studies (Dwyer (2001), Dwyer & Mitchell (1999) and Dwyer & Hu (1998)) that planned retirement age is a smoothly distributed variable. Finally, and importantly, while most previous studies have concentrated on the impact of health on retirement behaviour of men, we conduct separate but symmetric analyses on samples of men as well as women, providing for the first time, precise estimates of the effects of health on female retirement.

The focus in this study is to estimate the effect of health status on planned retirement age in Denmark, cf. above. Denmark is interesting in this context because unlike for instance health care arrangements in the US, under the Danish welfare system, health insurance is universal and access to most health services is free for all regardless of economic situation. In addition, health-related exit from the labour market is possible in Denmark through Social Disability Pension (SDP, *førtidspension*).[1] These differences between the two countries imply that we expect that health is a

[1] SDP is residence based. Former work or contribution record is not required. To be awarded SDP, recipients must be 18 to 66 years of age (18 to 64 from 2004). The basic pension is differentiated according to marital status and is means

less important factor in retirement planning in Denmark compared to the US. First, the universal system in Denmark might imply that older Danes in the labour force are healthier than similar American due to easier access to preventive and neutralizing health care services. Second, as a consequence of the existence of SDP, older Danes in the labour force probably constitute a more selected group than comparable Americans since older Danes with very poor health have already withdrawn themselves from the labour market.

While earlier U.S. studies based on Retirement History Longitudinal Survey (RHS) data have concluded that the use of self-reported health in retirement models is likely to yield an unreliable impact of health on retirement due to the presence of "justification bias", we find little support for the justification hypothesis in these data. Our findings are therefore more in line with the recent U.S. studies based on younger cohorts approaching retirement age drawn from the U.S. Health and Retirement Study (HRS) data (Benitez-Silva et al., 2000, Dwyer and Mitchell, 1999, McGarry 2002). We also find that self-rated physical and mental health are important predictors of retirement planning, in fact as important as economic factors, both among men as well as women. Again, these results confirm recent studies from the U.S. that find that health problems influence retirement plans more strongly than economic variables. For instance, Dwyer (2001) finds that economic factors such as net worth, pensions, and social security do not play a big role in retirement outcomes conditional on plans and McGarry (2002) finds that self-rated health in particular is a powerful predictor of retirement behaviour. Finally, as expected health seems to be a less important factor in retirement planning in Denmark than in the US.

The rest of the paper is organized as follows: Section 2 gives some descriptive evidence and institutional background on health and retirement in Denmark. Section 3 presents our empirical model, Section 4 the data and Section 5 the results of the estimation. Section 6 offers some concluding remarks.

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tested against a wider range of other income sources. Conversely, the pension is complete independent of former work and income. In 2003, a reform of SDP was conducted with big simplification of the benefit structure. Before 2003, the pension was graduated according to loss of working capability and varied according to the age of the first time recipient.

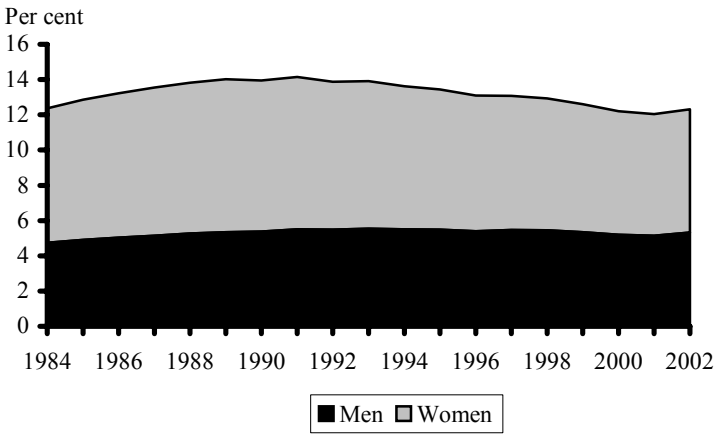
2. Health and retirement in Denmark

In Denmark, as in most other OECD countries, the ageing of the population implies that the elderly will constitute an increasing share of the population in the coming decades. The projection for Denmark for the next 35 years is that there will be a decline in the number of people in the active population relative to the number aged 65 and above, from a ratio of 4.5 to l to a ratio of 3 to 1 (see Schaumann (2001)). In a scenario of smaller entering birth cohorts and larger cohorts exiting to retirement, precise estimates of the effect of health on retirement become increasingly necessary in order for governments and policy planners to plan the right amount and types of investments in healthcare that would support an aging workforce.

One important health-care systemic difference compared to for instance the U.S. is that health care services in Denmark are publicly financed through general income taxes and for most of the services, offered directly by the public authorities. Thus, unlike in the U.S. where availability of insurance is an important predictor of retirement, health insurance is as mentioned above universal and access to most health services is free for all regardless of economic situation.

Health-related exit from the labour market is possible through SDP, cf. Section 1. At the end of 2002, 7 per cent of people aged 18-66 years received SDP. Among the 50-59-year-olds, the share was 12 per cent. This share was about the same in the middle of the 1980's, cf. Figure 1 below.

Figure 1. 50-59-year-olds on SDP, men and women, 1984-2002. Per cent of 50-59-year-olds in the population.



Early retirement though SDP is most prevalent among women in this age group. As SDP in Denmark in the decades of the 1980s incorporated as well retirement for individuals who fulfilled certain social criteria, the share of men and the share of women increased in the eighties. For women, the cancellation of the widow's pension in 1984 contributed to a corresponding take-up of SDP, particularly among widowed women. However, in the nineties, the share of women in disability decreased much more than the share of men. That is, the share of women decreased 8 per cent from 1984 to 2002, while the share of men increased 12 per cent. Part of the explanation of this gender difference might be the prevalence of the Transitional Benefit Program (TBP, *overgangsydelse*) in the mid-nineties that was available for people aged 55-59 years (from 1994 also 50-54-year-olds) who were members of an unemployment insurance fund and who had been unemployed for at least 12 out of the last 15 months. The existence of this scheme probably contributed to the reduction in the inflow of people in to SDP. In particular, the inflow of women was reduced since two out of three individuals who received TBP benefits were women. During the 1990s, changes made to improve work-disabled peoples' attachment to work evolved around the idea of 'activation'. Thus, by emphasizing active measures such as vocational rehabilitation, the dependency on social security benefits was reduced, cf. Høgelund (2003). Furthermore, subsidized jobs on special terms were introduced in the late nineties as a means of reducing the inflow to SDP of people of working age (*fleksjob*) and to increase the labour force by enabling SDP pensioners to re-enter the labour force at the same time as they maintain their SDP benefits (*skånejob*). These policy changes also contributed to the decrease until 2001 in the share of men and women that received SDP benefits. However, these shares increased from 2001-2002. This trend, which was seen across age groups, seems to be due to an effort by the municipalities directed towards closing as many cases as possible before a reform of the SDP came into force 1 January 2003. Comparable trends are seen in connection with an earlier reform within this area, cf. National Social Appeals Board (2003). SDP is relatively expensive for the government. Thus, the cost of this program amounted to 2.2 per thousand relative to GNP in 2002. SDP benefits to people aged 50 or above amounted to 1.4 per thousand. By way of comparison, it is worth mentioning that the cost of Old Age Pension (OAP, *folkepension*) and early retirement schemes[2] amounted to 4.2 and 1.6 per thousand, respectively.

[2] In this context, early retirement schemes include TBP and Post Employment Wage (PEW, *efterløn*), cf. the description of the latter in Section 4.

A few previous Danish studies have also estimated the effect of health on retirement, employing either duration or option-value models of retirement. The general finding seems to be that bad health affects early retirement positively. However, while Christensen & Datta Gupta (2000) and Pedersen & Smith (1996) show that bad health has a positive impact on early retirement for both men and women, Danø et al. (1998, 2000) find that bad health seems to hasten retirement for men, while the effect is insignificant for women. The first two studies define their health measure on a single index, which is based on whether or not the worker qualifies for sickness insurance, typically granted after a sickness spell of a minimum of 13 weeks**.** The study by Danø et al. base health on the number of physician visits in a year, not accounting for the reason for visit. None of these studies however takes into account the issues of endogeneity and measurement error of health.

3. Empirical model

Following Bound (1991), Dywer and Mitchell (1999) and other previous studies, we consider a model of the retirement decision of individuals approaching retirement age, in which the (continuous) planned retirement age of individual *i* at time *t*, R_{it}, depends on economic factors, health status and demographic variables:

$$R_{it} = \beta w_{it} + \gamma H^*_{it} + \lambda Z_{it} + \varepsilon_{it} .$$

H^* is unobserved health status, *w* are economic incentive variables, *Z* are demographic factors and ε is a random disturbance term. Although H^* is unknown, we observe alternative proxies of underlying health, a subjective measure, H^s, and an objective measure, H^o. The subjective measure depends both on underlying health status H^* and on economic incentive measures *w* such that:

$$H^s_{it} = \delta w_{it} + \theta^s H^*_{it} + \mu^s_{it}$$

The latent objective measure on the other hand, does not depend on *w*.

$$H^o_{it} = \theta^o H^*_{it} + \mu^o_{it}$$

Assume that H^* is orthogonal to ε, μ^s and μ^o. If "justification bias" is present, then ε and μ^s are correlated. For example, an individual planning to retire earlier than average may try to justify this by reporting themselves to be in worse than average health, leading to simultaneity bias. Another problem is that as H^s is not a perfect predictor of H^*, measurement error will bias the coefficient to

H^*, γ. Bound (1991) shows that as long as the correlation between ε and μ^s is positive, it will tend to bias the coefficient to H^*, γ, upwards, while variance in μ^s leads to the classic errors-in-variables problem and will tend to bias it downwards. The net effect on γ depends on the relative magnitudes of these two biases, but even if on balance they cancel out, there will in general still exist a downward bias on β arising from the dependence of H^s on w i.e. δ. This means, that while the coefficient to the subjective proxy despite the rationalization problem may end up in practice close to the true effect of health on retirement, the coefficients to the economic variables will tend to be smaller than they should be.

There are problems inherent in using the objective measures as well. Here, justification bias is not present, μ^o is uncorrelated with ε, and further, H^o is not dependent on w, but as long as it is not a perfect predictor of underlying health, the use of it will tend to underestimate the effect of health and overestimate the effects of economic variables. Solutions to identification may lie in finding instruments for the subjective and objective measure (Dwyer and Mitchell, 1999). Or, in limiting the analysis to a sample of workers only (McGarry (2002)). Other solutions could be to find exogenous sources of variation in w or changes in the structure of retirement benefits that could identify the underlying parameters, or even in using information on the reliability of self-reports. In this paper, we employ the instrumental variables (IV) method to solve the identification issues discussed above.

More recently, as subsequent waves of the HRS have become available, some authors have applied longitudinal data to the question of the effect of health on retirement plans. McGarry (2002) estimates a fixed effects model of the subjective probability of continued work on workers only and finds strong effects of subjective measures of health even on a sample for which justification bias is purportedly low. While the use of longitudinal data in itself does not solve the identification issues that arise in the cross section, it does allow purging the data of unobserved individual effects, which may be correlated with health and retirement. Examples of such effects mentioned by McGarry (2002) may be individual's time-rate of discount, tastes for work or even time-constant measurement error in health. The fixed effects model allows for individual effects to be correlated with the included variable. However, the effects are estimated as strict parametric shifts of the outcome function. Thus, the model is more appropriately applied to settings in which the sample constitutes the population under study, for example, an inter-country comparison which includes the

full set of countries, cf. Greene (2003, p. 293). As most labour studies are based on smaller samples drawn from a large population, a more appropriate econometric specification models the error term as randomly distributed across individuals i.e. the random effects model, and therefore this model is the chosen statistical framework.[3] Pooled OLS and random effects models are tested against each other by way of Breusch-Pagan LM and likelihood ratio tests, which are based on OLS and random effects residuals respectively, as tests of the random effects.

The econometric model is specified as follows. In the case of subjective health measures, we have the following system of equations:

$$R_{it} = \beta^s w_{it} + \gamma^s H_{it}^s + \lambda^s Z_{it} + \eta_i^s + \varepsilon_{it}^s$$
$$H_{it}^s = \pi^s Y_{it} + \mu_{it}^s$$

In the case of the objective measures, the model is given by the system

$$R_{it} = \beta^o w_{it} + \gamma^o H_{it}^o + \lambda^o Z_{it} + \eta_i^o + \varepsilon_{it}^o$$
$$H_{it}^o = \pi^o Y_{it} + \mu_{it}^o .$$

The error components each are assumed to be mean-zero with covariance matrix

$$E\begin{pmatrix}\eta\\ \varepsilon\\ \mu\end{pmatrix}(\eta', \varepsilon', \mu') = \begin{bmatrix}\sigma_\eta^2 I_N & 0 & 0\\ 0 & \sigma_\varepsilon^2 I_{NT} & 0\\ 0 & 0 & \sigma_\mu^2 I_{NT}\end{bmatrix}.$$

[3] However, the random effects model is restrictive in that the unobserved individual effect is assumed to be uncorrelated with the included regressors, and in fact, a Hausman specification test shows that this assumption is only fulfilled in the case of men. However, the fixed effects approach which allows correlation between the unobserved component and the observed variables, is costly in terms of degrees of freedom lost which is particular problematic in our case since our sample is small and since T is equal to 2. Consequently, using fixed effects in this case corresponds to throwing away half of the observations. The problem is illustrated by the fact that although Hausman specification test suggests that both the fixed and the random effects approach are consistent in the case of men, results based on these two approaches differ considerably. In fact, very few of the estimates based on the fixed effects approach are significant, while several of the estimates from the random effects specification are significant and have the expected signs. The results for women based on the fixed effects approach suffer from similar problems (see footnote 11).

Note that as true health status H^* is unobserved, the subjective and objective health measures are used alternatively as proxies for it. However, to account for the endogeneity and measurement error, we employ an instrumental variables estimation approach where Y are a set of exogenous instruments spanning the relevant health measure. The parameters of this random effects IV model are derived by way of the full-information G2SLS estimator developed by Balestra and Varadharajan-Krishnakumar (1987).

If justification bias is present, then subjective health measures should have a big impact and economic variables a small impact on planned retirement age. In that case, instrumentation should reduce the impact of the subjective variables and increase the relative importance of the economic variables. On the other hand, if measurement error is a problem with respect to the objective measures, then the impact of health will be small and economic effects big, and instrumentation should increase health effects and reduce effects of economic variables on planned retirement.

4. Data and descriptives

The primary data used in this study are obtained from a longitudinal database of elderly people (*Ældredatabasen*), a survey which was fielded and collected by the Danish National Institute of Social Research. The database consists of two waves of survey data from 1997 and 2002. Thus, repeated observations over time enable us to obtain knowledge about how individuals update their retirement plans when new information arrives, particularly with respect to the role of health on planned retirement age. The survey data are merged with longitudinal register data from 1993 to 2001, in order to supplement the database with information on individual's labour market characteristics (the economic variables).

The first survey was conducted in 1997 face-to-face in the homes of a representative sample of individuals born every fifth year from 1920 to 1945. 5,864 individuals from the six cohorts were interviewed. The response rate was 70 per cent. The second survey was conducted primarily by phone. The same respondents were contacted for a second interview.[4] 79 per cent of the first wave respondents participated in the second wave. Thus, 4,634 individuals form part of both waves.

[4] In addition, a representative sample of individuals born in 1950 and new respondents born every fifth year from 1920 to 1945 to replace the attrition in the first wave were contacted for an interview.

In order to minimize sample selection due to retirement, the sample used in this paper is limited to individuals born in 1940 and 1945. That is, people aged approximately 52 and 57 years in 1997, which corresponds to 2,259 individuals, who are observed again in 2002. The sample is restricted to individuals that were in the labour force in the first wave. Thus, one source of potential sample selection is that we omit individuals who were already retired in 1997. This exclusion of individuals outside the labour force in Wave 1 can be problematic if transition to SDP and early retirement schemes are self-chosen. However, we lack key information on some health measures and many relevant economic characteristics (see Appendix A3, Table A1), which therefore does not allow the possibility of including these individuals in the analysis. Instead, a full comparison of means is made of those in the labour force in Wave 1 to those out of the labour force in Wave 1. Note that we do include individuals who retired between the two waves in our sample, for purposes of maximizing sample size, as we have full information on all covariates on these individuals.[5] These restrictions leave us with a sample of 1,834 individuals. Finally, since we compare retirement plans in 1997 and 2002 we are only able to include individuals that report a given age in both years when asked about planned retirement age, see below. Unfortunately, a large share of individuals does not meet this demand[6] and therefore, we end up with a sample that consists of 1,103 individuals. That is, 49 per cent of the original sample.

Planned retirement age is the dependent variable in our analyses. We treat this generally as a continuously distributed variable, but we do sensitivity analysis in which this variable is grouped to account for the concentrations of responses at age 60, 62 and 65, cf. Figure 2 below, which in turn reflect pension policy rules and eligibility criteria. Thus, we distinguish between six categories of planned retirement age: below 60, 60-61, 62, 63-64, 65-66 and 67 and above. Ages 60 and 67 were the early and the normal retirement ages in 1997, respectively. Furthermore, if people waited until the age of 63 to take up PEW, benefits were increased. In 2002, the incentives to retire at age 62

[5] Planned retirement age is set equal to the actual retirement age (reported in the survey) for these individuals.
[6] Instead, their answer was "don't know" or "as long as possible". It is of course feasible to set "as long as possible" to a maximum of 75 or 85 years, for instance, as in some previous studies (Dwyer and Mitchell, 1999). However, we hesitate to do so, as this latter group of individuals turns out to be a very heterogeneous group whose characteristics do not in general resemble those who cite a high retirement age when queried. Nevertheless, as a check of the robustness of the results, "as long as possible" is tentatively set equal to 75, on the assumption that that people enjoy working and want to maintain a relationship to the labour market as long as possible, and in an alternative experiment, to 67, which might apply if people are financially constrainted and would therefore need to continue working until the normal retirement age. By including individuals that answer "as long as possible", the sample size increases from 1103 to 1331 individuals. However, including these individuals does not change the estimates of any of the health coefficients significantly using either definition.

were strengthened. Thus, changes in PEW, which is the most popular early retirement scheme in Denmark, were put in effect in 1999. Among other changes, means testing of benefits against income from labour market pension and lump sum retirement income payment for people aged 60 and 61 were introduced. A tax premium was introduced as well for people that were entitled to PEW benefits at age 60 but who continued working until at least the age of 62. At the same time, it was decided that the official age of retirement would be lowered from 67 to 65 years of age from 2004. Thus, in 2002 the normal retirement age was 65 for the individuals in our survey.

A large shift in planned retirement age took place from 1997 to 2002 among the individuals in our sample, cf. Figure 2. In 1997, retirement around the early retirement age was more or less the norm among women in particular but also among men born in 1945. However, from 1997 to 2002 the shares of individuals that planned to retire at age 60 and to a minor degree at age 67 decreased, while the shares that planned to retire at age 62 and 65 respectively increased. The shift to planned retirement at age 65 was most pronounced among people born in 1940, while the shift to planned retirement at age 62 first took place among people born in 1945. In general, the changes were most pronounced for men. Part of the changes in planned retirement is probably due to the upward adjustment that normally takes place, when people approach retirement age, cf. e.g. Dwyer & Hu (1999). However, it also seems reasonable to believe that these changes at least to some extent reflect the policy changes described above.

Figure 2. Planned retirement age 1997 and actual and planned retirement age 1998-2002, per cent, (a) men born in 1940; (b) women born in 1940; (c) men born in 1945; (d) women born in 1945.

Figure 2a)

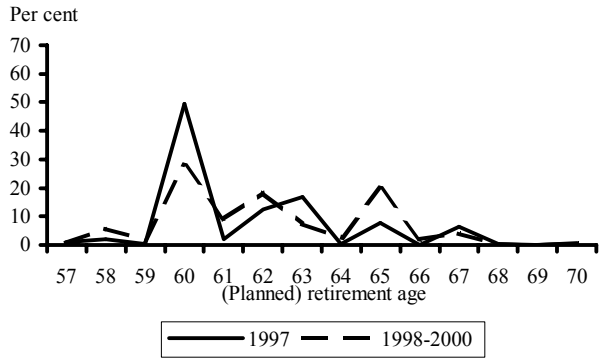


Figure 2b)

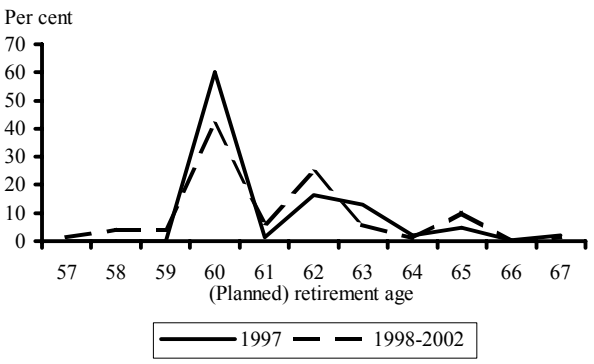


Figure 2c)

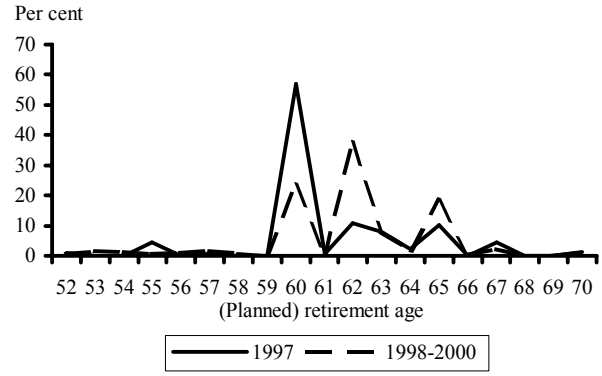
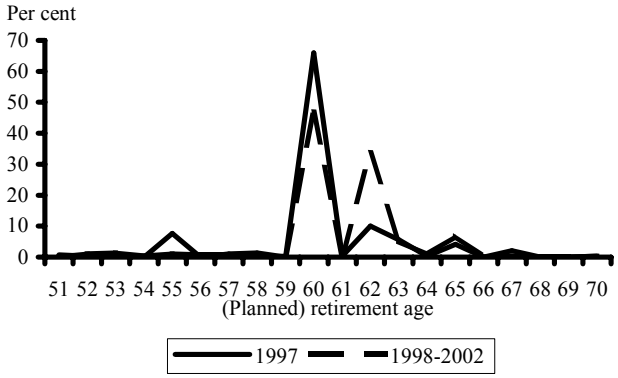


Figure 2d)



It is potentially difficult to isolate the effect of health on retirement plans in an environment in which changes in pension policy are taking place simultaneously. However, as the pension wealth accrual variable is updated to reflect the expected value of the pension policy change and given that the correlation between changes in pension policy and health is small, we are able to identify the effects of health in a period that spans the changes in PEW eligibility and generosity described above.[7]

Definitions of the explanatory variables included in the analyses are provided in Table A1 in Appendix A3. Poor health is proxied alternatively by 8 separate measures, 4 subjective and 4 objective. The subjective variables are self-reported general health, self-reported mental health, self-rated health compared to others and self-rated work capacity. Among the objective measures, we have the presence of work limitations, the presence of functional limitations, the presence of a disease condition and the most objective measure of all, presence of a (serious) condition diagnosed at the time of hospitalisation, based on information obtained from LPR records and merged to the panel sample.[8] A detailed description of health measures can be found in Appendix A3, Table A1. Other key explanatory variables include individual labour market earnings and other income, wealth and a variable capturing pension wealth accrual measured as a replacement rate, the compensation rate (see Appendix A2 for a description of how the compensation rate is calculated). Additional

[7] One source of correlation between health and pension policy reform could be if individuals are more likely to report themselves in poor health following a pension reform that increases eligibility age in an attempt to justify early exit. However, the PEW reform of 1999 kept the first available age of early retirement at 60 but simply increased (the already present) financial incentives of later retirement at age 62 or later. Thus, retirement at 60 is still a legally available and much used option and there are no social stigma attached to retiring at 60. The reform merely makes it more financially attractive for individual to defer retirement age to 62 or later.

[8] Instead of 0-1 dummies, counts of disease conditions, diagnoses and work limitations have been tried and results remain robust to these alternative specifications.

controls include birth cohort (1940 or 1945), vocational education, cohabitation status, age difference between partners, experience, occupation, sector, tenure, hours of work, whether the job is physical demanding, level of job satisfaction and a dummy variable for missing compensation rate.

Descriptive statistics for these variables are also included in Table A1. Looking at gender differences among the individuals in the labour force in Wave 1 (the estimation sample), planned retirement age is significantly higher for men (61.68) than women (60.86) in our sample, but for both groups, on average, individuals in the labour force plan to retire through some form of an early retirement program. The mean values for general health are similar by gender with 17% of women and 18% of men reporting themselves to be in poor health and 5% of each gender group rating their health to be worse than others. However, women report having significantly worse mental health than men, and a higher share of women report having functional limitations that bother them in their daily life. Also, more women than men are bothered by at least one disease condition, particularly, osteoarthritis, myalgia, osteoporosis and depression. Conversely, men to a larger extent are hospitalised with a serious condition and are more likely to be diagnosed with heart diseases, diabetes and high blood pressure than women. As regards the remainder variables in our model, more men than women are vocationally trained, and more women than men live alone, reflecting in part gender mortality differences. Turning to financial and job characteristics, men have higher earnings and other income and higher average wealth, although the dispersion in the wealth variable within the group of men is much larger. Conversely, the compensation rate from pensions is on average expected to be higher for women than for men when withdrawal takes place, indicating that women's labour market earnings and other income is typically lower. Unsurprisingly, men have higher experience, tenure and a longer working week than women on average. In terms of occupation of the job with the longest tenure, the average male in our sample to a greater extent has been self-employed/assisting spouse or a skilled/unskilled worker, while the typical women has been a salaried worker or a public servant.

Turning next to in-out of-labour force differences, we see that both men and women outside the labour force have significantly worse health as measured by all the self-reported subjective proxies, as well as in terms of having any functional limitation, disease or diagnosed condition (including heart conditions, strokes, lung diseases for men, and heart conditions, lung diseases, diabetes and

arthritis for women). The finding of poorer self-reported health among the individuals outside the labour force supports the justification bias hypothesis. On the other hand, that fact that individuals outside the labour force tend to suffer more from underlying diseases and diagnosed conditions, imply that they are to some extent probably in worse health than individuals in the labour force. Mean age is also higher in this group than corresponding men and women in the labour force. In addition, men outside the labour force have considerably less higher education, are more likely to live alone, have lower income on average, considerably less wealth and less labour market experience than men in the labour force. Similarly, women outside the labour force have less vocational training, and a significantly lower fraction of them have higher education. They are also more likely to be living alone or have a partner who is the same age or younger (baseline is having an older partner), have lower average income and wealth and less experience than their counterparts in the labour force. In sum, there are sufficiently many differences between the two groups, indicating that our findings should be appropriately applied to individuals approaching retirement age rather than those who have already withdrawn themselves from the labour market. On the other hand, the descriptive evidence also indicates that by excluding the already retired in Wave 1, the estimated impact of health on retirement is less likely to reflect justification bias.

Correlations between health measures are shown in Appendix A3, Table A2 for men, and A3 for women. In general, correlations between measures are not high except for a few notable exceptions. The correlations between self-reported measures appear higher (upper left quadrant), for instance for men (women), the correlation between general health and mental health is 0.32 (0.24) and between general health and health compared to others is 0.38 (0.41) which suggests that these should be considered as alternative ways of measuring individuals' underlying health. On the other hand, correlations between the (self-reported) diseases conditions appear small except for conditions that affect the same part of body or system or share the same pathological causes for example, between back problems and myalgia or back problems and osteoarthritis. There appears to be no correlation between individual diagnosed conditions. However, both for diseases conditions as well as diagnosed conditions, the aggregated variable that is defined to be the presence or absence of any condition, is correlated with the separate components. Overall, these considerations point to treating the various available measures as alternative proxies for underlying health.

5. Results of estimation

Results of the analysis of the factors that affect retirement planning are presented in Tables 1-20. In particular, we focus on the role of health compared to economic factors, and therefore report only the relevant coefficients.[9]

5.1. Pooled OLS analysis

To examine the role of health in retirement planning, pooled OLS models are estimated for men and women separately, as a benchmark case against a more general model that accounts for unobserved heterogeneity in Section 5.2. The findings from this simple specification in which the various health measures (subjective and objective) are treated as alternative proxies for underlying health H^*, show that being in poor health in general reduces planned retirement age for men and women as almost all measures of poor health are estimated to have negative impacts on retirement age, cf. Table 1 and 2 below. In contrast, as may be expected, higher income increases planned retirement age for both men and women while greater wealth and a higher compensation rate of pensions reduce it for men.[10] That is, individuals that were wealthy in the year prior to the survey year are more inclined to precipitate retirement than others. However, this result only applies to men. For women, while wealth in most cases has the usual negative effect, the compensation rate has unexpectedly positive effects on planned retirement age, but in general, neither of these effects is significant. Interestingly, for both men and women, economic factors are highly stable and are estimated to have the same impacts irrespective of the health measure being considered, indicating an absence of correlation between health and these factors.

The subjective health measures are in general highly significant, while the objective measures not, and this holds for both men and women. The only objective measures that are significant are

[9] Estimated coefficients on the other explanatory variables are available and can be provided on request.

[10] Other factors also affect planned retirement age. In this case, the results are very similar for men and women. As expected, adjustment in an upward direction takes place, when people approach retirement age. Unsurprisingly, people with higher education are more inclined to increase their planned retirement age than people without any qualifying education. Further, an increase in job satisfaction increases the planned retirement age as expected while an increase in the physical job demands decreases this age. Women living alone are more inclined to increase their planned retirement age than partnered women. This result probably reflects that single women have a greater preference for work than married women, see also Larsen (2004). Finally, planned retirement age is lower for men with a partner about the same age or younger. A potential explanation is that the desire to retire is stronger when one's partner is expected to retire at the same time or before oneself.

having a disease condition for men, and the presence of work limitations for women. On the face of it, this result could match the predictions by Bound (1991) that subjective measures tend to be inflated in the presence of justification bias while objective measures are weakened by measurement error. A formal test of this hypothesis is carried out in Section 5.3 where endogeneity and/or measurement error in health is corrected for by way of IV analysis.

Table 1. Pooled OLS estimates of the effect of health and economic factors on men's retirement age.

	Subjective health				Objective health			
	General health	**Mental health**	**Health compared to others**	**Working capacity**	**Work limitations**	**Functional limitations**	**Disease conditions**	**Diagnoses**
Poor health	-1.384***	-1.260***	-1.318***	-0.125*	0.198	-0.409	-0.715***	-0.410
	(0.189)	(0.378)	(0.335)	(0.050)	(0.188)	(0.421)	(0.173)	(0.281)
Individual income	0.603***	0.625***	0.645***	0.605***	0.635***	0.637***	0.640***	0.634***
	(0.143)	(0.145)	(0.145)	(0.146)	(0.146)	(0.146)	(0.145)	(0.146)
Wealth	-0.129*	-0.130*	-0.116	-0.133*	-0.140*	-0.137*	-0.124	-0.130*
	(0.063)	(0.064)	(0.064)	(0.064)	(0.064)	(0.064)	(0.064)	(0.064)
Compensation rate	-0.372	-0.549	-0.543	-0.466	-0.600	-0.563	-0.568	-0.581
	(0.386)	(0.392)	(0.391)	(0.395)	(0.394)	(0.394)	(0.391)	(0.393)
Adjusted R^2	16.1	13.1	13.4	12.8	12.4	12.4	13.6	12.5
Number of obs.	1224							

Note: Additional controls include birth cohort, education, cohabitation status, age differences between partners, experience, occupation, sector, tenure, hours of work, whether job is physical demanding, job satisfaction level and dummy variable for missing compensation rate. * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

Table 2. Pooled OLS estimates of the effect of health and economic factors on women's retirement age.

	Subjective health				Objective health			
	General health	**Mental health**	**Health compared to others**	**Working capacity**	**Work limitations**	**Functional limitations**	**Disease conditions**	**Diagnoses**
Poor health	-0.720***	-1.073***	-0.642*	-0.180***	-0.364*	-0.510	-0.112	-0.175
	(0.178)	(0.330)	(0.319)	(0.043)	(0.167)	(0.305)	(0.144)	(0.374)
Individual income	0.518**	0.564**	0.550**	0.486*	0.573**	0.540**	0.558**	0.561**
	(0.196)	(0.196)	(0.197)	(0.196)	(0.197)	(0.197)	(0.197)	(0.197)
Wealth	-0.003	-0.004	0.005	0.015	-0.015	0.000	-0.016	-0.008
	(0.166)	(0.166)	(0.167)	(0.166)	(0.167)	(0.167)	(0.167)	(0.167)
Compensation rate	0.572	0.561	0.628	0.616	0.638	0.597	0.637	0.633
	(0.401)	(0.402)	(0.403)	(0.400)	(0.403)	(0.404)	(0.404)	(0.404)
Adjusted R^2	16.0	15.5	14.9	16.1	15.0	14.8	14.6	14.6
Number of obs.	982							

See Table 1 for notes. * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

How does health compare to economic factors? To be able to compare the predicted estimates, we standardize changes in the continuous explanatory variables by computing the estimated impacts on planned retirement age of a 1 standard deviation change in each explanatory variable. We find for men, focusing only on the significant variables, a one standard deviation increase in (log) income increases planned retirement age by 0.33-0.35 years, while a one standard deviation increase in

wealth reduces it by 0.14-0.16 years. Looking next at the estimated coefficients on the health measures that are significant, being in poor general health reduces men's planned retirement age by 1.4 years, while a one-unit worsening in mental health or being in worse health than others reduces planned retirement age by 1.3 years. A one-point decrease in working capacity (10-point scale) reduces planned retirement age by 0.13 years while being hospitalised for a serious condition reduces planned retirement age by 0.72 years. Thus, except for the work capacity, health seems to have a larger impact than wealth or income. Dwyer and Mitchell (1999) also find that health effects are larger than economic incentive effects in a similar analysis based on cross-sectional HRS data. In their study, those in poor health plan to retire about 2 years earlier than those in better health. Thus, (general) health effects are about half as strong in Denmark. In other words, our expectation that health is a less important factor in Denmark compared to the US seems to be confirmed.

For women, a one standard deviation increase in income increases planned retirement age by between 0.20-0.24 years, while wealth and compensation effects are not significant. Being in poor general health reduces female retirement age by about 8 months, a one point increase in the (poor) mental health index reduces it by 1.07 years, while being in worse health than others reduces planned retirement age by two-thirds of a year. A one-point increase in working incapacity reduces planned retirement age by 0.18 years while having at least one limitation that affects work reduces retirement age by little more than 1/3 of a year. Having a disease condition or being hospitalised for a serious condition does not significantly impact women's planned retirement age. Here again, the significant health effects are stronger than income effects on retirement. However, health effects are not as strong as those for men.

5.2 Unobserved heterogeneity

In this section, results from the random effects specification are reported and compared to the simple pooled OLS model in Section 5.1 by way of Breusch-Pagan LM and likelihood ratio tests. In all models considered, for both men and women, the Breusch-Pagan LM and the likelihood ratio test statistics reported in Tables 3 and 4 below clearly indicate that the null hypothesis of no unobserved heterogeneity is strongly rejected. Results from the random effects specification on the health variables are qualitatively similar to those derived from a pooled OLS model, indicating that unobserved heterogeneity, although present, is not large in the case of the health variables. For men, one difference seems to be that working incapacity is no longer a significant determinant of

retirement planning. Accounting for unobserved heterogeneity seems to be more important in the case of the economic variables. For example, for men, wealth and the compensation rate are now estimated to have smaller impacts than before, roughly half the magnitude of the OLS effects. The relative importance of health to income is unchanged, while health becomes even more important compared to wealth and the compensation rate. The precise effects of health can be summarized as follows: For men, being in poor general health reduces planned retirement age by 1.3 years, while a one-point increase in the (poor) mental health index reduces planned retirement age by 1.2 years. Having health worse than others decreases planned age of retirement by 1.2 years while having a diseases condition means that males adjust their planned retirement age down by about ½ a year. In comparison, a one standard deviation increase in (log) income increases planned retirement age by 0.33-0.35 years.

Table 3. Random effects estimates of the effect of health and economic factors on men's retirement age.

	Subjective health				**Objective health**			
	General health	**Mental health**	**Health compared to others**	**Working capacity**	**Work limitations**	**Functional limitations**	**Disease conditions**	**Diagnoses**
Poor health	-1.266***	-1.219**	-1.221***	-0.067	0.172	-0.428	-0.546**	-0.463
	(0.198)	(0.406)	(0.348)	(0.053)	(0.186)	(0.431)	(0.177)	(0.257)
Individual income	0.604***	0.617***	0.638***	0.615***	0.627***	0.631***	0.643***	0.624***
	(0.146)	(0.148)	(0.148)	(0.149)	(0.149)	(0.149)	(0.148)	(0.148)
Wealth	-0.092	-0.091	-0.084	-0.092	-0.095	-0.094	-0.087	-0.088
	(0.068)	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)
Compensation rate	-0.144	-0.238	-0.254	-0.207	-0.274	-0.247	-0.258	-0.256
	(0.358)	(0.361)	(0.361)	(0.364)	(0.363)	(0.362)	(0.361)	(0.361)
R^2 (overall)	16.8	13.9	14.2	13.4	13.2	13.2	14.3	13.2
Breusch-Pagan χ^2	101.6***	109.8***	109.0***	106.5***	110.8***	111.2***	104.6***	111.9***
Likelihood ratio test	116.7***	126.8***	125.8***	124.3***	128.6***	128.9***	121.4***	130.0***
Number of obs.	1224							

The likelihood ratio tests are obtained from the maximum-likelihood random-effects estimator, which produce estimates that are very nearly the same as those produced by the full-information G2SLS estimator. See also Table 1 for notes.
* Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

Table 4. Random effects estimates of the effect of health and economic factors on women's retirement age.

	Subjective health				Objective health			
	General health	**Mental health**	**Health compared to others**	**Working capacity**	**Work limitations**	**Functional limitations**	**Diseases conditions**	**Diagnoses**
Poor health	-0.659***	-0.961**	-0.573	-0.155***	-0.275	-0.419	-0.124	-0.214
	(0.180)	(0.356)	(0.324)	(0.044)	(0.170)	(0.328)	(0.150)	(0.346)
Individual income	0.424*	0.457*	0.444*	0.414*	0.460*	0.437*	0.447*	0.451*
	(0.201)	(0.202)	(0.202)	(0.201)	(0.202)	(0.203)	(0.202)	(0.202)
Wealth	-0.066	-0.060	-0.055	-0.043	-0.069	-0.061	-0.075	-0.068
	(0.171)	(0.172)	(0.172)	(0.171)	(0.172)	(0.172)	(0.173)	(0.173)
Compensation rate	0.692	0.667	0.735	0.701	0.733	0.707	0.729	0.732
	(0.379)	(0.381)	(0.381)	(0.379)	(0.381)	(0.381)	(0.381)	(0.381)
R^2 (overall)	17.4	16.9	16.4	17.5	16.4	16.3	16.1	16.1
Breusch-Pagan χ^2	66.0***	65.6***	67.6***	63.3***	66.4***	67.4***	68.5***	68.5***
Likelihood ratio test	71.8***	71.4***	73.7***	68.9***	72.5***	73.5***	74.7***	74.8***
Number of obs.	982							

See Table 3 for notes. * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

For women, purging the effects of unobserved heterogeneity, make wealth effects considerably larger and of the right sign (negative). Income effects are slightly smaller and the compensation rate is about the same magnitude as before and remains positive but insignificant. Health effects remain roughly the same as before, except that having health worse than others and work limitations are no longer significant at the 5% level, so that only subjective health measures impact retirement planning. The precise impacts are as follows: Being in bad health leads to a decrease in the planned retirement age by about 8 months. A one-point increase in the (poor) mental health index reduces planned retirement age by little short of a year while a one-point increase in working incapacity reduces the planned age by about 2 months. On the other hand, a one standard deviation increase in (log) income increases planned retirement age by between 0.17-0.19 years. As before, poor health affects men's retirement planning more strongly than it does women's.[11]

[11] A fixed effects estimation is also tried as explained in footnote 4, and a Hausman specification test fails to reject the hypothesis that the individual effects are uncorrelated with the other regressors for women, but not for men. Based on the fixed effects IV results for women, we find that neither endogeneity nor measurement error is of obvious importance. Results derived from simple fixed effects estimation suggest that only poor general health has a significant effect on retirement plans for women but this result is only marginally significant (10% level). Poor general health is found to lower women's planned retirement age by 8 months. In addition, diseases conditions such as osteoporosis and being hospitalised for heart conditions are both found to hasten retirement by more than 2 years. However, the effect of heart conditions is only marginally significant.

Table 5. Random effects estimates of the effect of health and economic factors on men's retirement age. Working sample only.

	Subjective health				Objective health			
	General health	**Mental health**	**Health compared to others**	**Working capacity**	**Work limitations**	**Functional limitations**	**Diseases conditions**	**Diagnoses**
Poor health	-1.261***	-1.211**	-1.221**	-0.052	-0.025	-0.033	-0.511**	-0.476
	(0.223)	(0.450)	(0.396)	(0.059)	(0.196)	(0.492)	(0.191)	(0.295)
Individual income	0.570***	0.568***	0.587***	0.572***	0.584***	0.583***	0.592***	0.576***
	(0.144)	(0.146)	(0.146)	(0.147)	(0.147)	(0.147)	(0.146)	(0.147)
Wealth	-0.127	-0.122	-0.119	-0.124	-0.124	-0.125	-0.117	-0.117
	(0.066)	(0.068)	(0.068)	(0.068)	(0.068)	(0.068)	(0.068)	(0.068)
Compensation rate	-0.533	-0.623	-0.623	-0.598	-0.628	-0.632	-0.635	-0.641
	(0.368)	(0.372)	(0.371)	(0.375)	(0.374)	(0.373)	(0.372)	(0.372)
R^2 (overall)	23.3	20.5	20.7	20.0	19.7	19.7	20.8	19.8
Breusch-Pagan χ^2	48***	54***	54***	51***	54***	54***	51***	55***
Likelihood ratio test	61***	68***	68***	66***	68***	69***	64***	70***
Number of obs.	884							

See Table 3 for notes. * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

Table 6. Random effects estimates of the effect of health and economic factors on women's retirement age. Working sample only.

	Subjective health				Objective health			
	General health	**Mental health**	**Health compared to others**	**Working capacity**	**Work limitations**	**Functional limitations**	**Diseases conditions**	**Diagnoses**
Poor health	-0.573**	-0.741	-0.543	-0.119*	-0.280	-0.137	0.094	-0.647
	(0.210)	(0.434)	(0.370)	(0.055)	(0.194)	(0.459)	(0.176)	(0.468)
Individual income	0.480*	0.492*	0.492*	0.464*	0.507*	0.500*	0.507*	0.504*
	(0.223)	(0.223)	(0.224)	(0.224)	(0.223)	(0.224)	(0.224)	(0.223)
Wealth	0.146	0.151	0.164	0.183	0.154	0.152	0.159	0.153
	(0.202)	(0.203)	(0.203)	(0.203)	(0.203)	(0.203)	(0.204)	(0.203)
Compensation rate	0.081	0.074	0.108	0.049	0.097	0.096	0.099	0.114
	(0.435)	(0.437)	(0.437)	(0.437)	(0.437)	(0.437)	(0.437)	(0.437)
R^2 (overall)	23.1	22.6	22.4	22.9	22.6	22.2	22.2	22.3
Breusch-Pagan χ^2	27***	27***	27***	26***	26***	28***	27***	28***
Likelihood ratio test	30***	30***	30***	29***	28***	30***	30***	31***
Number of obs.	652							

See Table 3 for notes. * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

5.3 Workers only

Although the sample from the start is restricted to those individuals who were in the labour force in the first survey year (1997), the preceding analysis also includes those individuals who retired between the two survey years. One way to minimize justification bias would be to restrict the analysis to individuals who remain in the workforce in both years, as retired individuals are more likely to cite failing health as a reason for quitting work. McGarry (2002) uses this strategy and argues that the estimates of the impact of subjective health measures on the probability of continued work cannot be attributed to justification bias when the focus is exclusively on workers. To test this hypothesis, in Tables 5 and 6 above we re-estimate the random effects model on workers only and compare it to the previous findings in Tables 3 and 4. Focusing only on the subjective health

measures in these tables, as expected, coefficients are slightly smaller in magnitude when non-workers are excluded, particularly for females, indicating that there may exist some potential justification bias in the self-reported health measures. However, not all economic variables are estimated to be larger here, only wealth and compensation rate for men, and income and wealth for women.

Table 7. Random effects IV estimates of the effect of health and economic factors on men's retirement age.

	Subjective health				Objective health			
	General health	**Mental health**	**Health compared to others**	**Working capacity**	**Work limitations**	**Functional limitations**	**Diseases conditions**	**Diagnoses**
Poor health	-1.892*	-5.186	-3.049*	-0.754	-2.656	-3.896	-1.847*	-1.344
	(0.857)	(2.708)	(1.553)	(0.498)	(1.660)	(2.650)	(0.735)	(0.811)
Individual income	0.590***	0.572***	0.647***	0.454*	0.680***	0.631***	0.669***	0.612***
	(0.148)	(0.157)	(0.150)	(0.197)	(0.165)	(0.152)	(0.152)	(0.150)
Wealth	-0.091	-0.080	-0.068	-0.075	-0.068	-0.093	-0.068	-0.077
	(0.068)	(0.072)	(0.071)	(0.075)	(0.077)	(0.071)	(0.071)	(0.070)
Compensation rate	-0.088	-0.181	-0.253	0.261	0.121	-0.225	-0.263	-0.269
	(0.368)	(0.374)	(0.364)	(0.511)	(0.459)	(0.372)	(0.369)	(0.363)
R^2 (overall)	16.6	10.2	13.0	8.7	5.3	9.9	12.5	12.6
Hausman test of exogeneity	0.63	2.51	1.57	1.94	2.94	1.79	3.32	1.32
Number of obs.	1224							

See Table 1 for notes. * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

Table 8. Random effects IV estimates of the effect of health and economic factors on women's retirement age.

	Subjective health				Objective health			
	General health	**Mental health**	**Health compared to others**	**Working capacity**	**Work limitations**	**Functional limitations**	**Diseases Conditions**	**Diagnoses**
Poor health	-1.866	-2.760	-1.216	-0.249	-1.348	-3.937	-0.854	-0.193
	(1.090)	(1.655)	(1.538)	(0.219)	(1.253)	(2.489)	(0.585)	(0.829)
Individual income	0.362	0.468*	0.471*	0.383	0.501*	0.336	0.473*	0.451*
	(0.211)	(0.204)	(0.201)	(0.209)	(0.210)	(0.229)	(0.203)	(0.202)
Wealth	-0.074	-0.047	-0.021	-0.035	-0.076	0.002	-0.096	-0.068
	(0.176)	(0.174)	(0.174)	(0.175)	(0.176)	(0.185)	(0.176)	(0.173)
Compensation rate	0.643	0.552	0.705	0.691	0.752	0.500	0.705	0.731
	(0.389)	(0.399)	(0.388)	(0.381)	(0.390)	(0.429)	(0.393)	(0.381)
R^2 (overall)	15.3	15.3	16.2	17.4	14.2	10.5	14.2	16.1
Hausman test of exogeneity	1.48	1.25	n.a.	0.59	0.79	2.28	n.a.	n.a.
Number of obs.	982							

See Table 1 for notes. * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

5.4 Endogeneity and measurement error

A more fundamental statistical method of correction for justification bias is to account for the endogeneity of health in retirement. Tables 7 and 8 above report panel IV estimates of the effect of health and economic variables on retirement. The advantage of the IV approach is that problems of

endogeneity (affecting the subjective measures) and measurement error in health (affecting mainly the objective measures) are rectified once health is instrumented for.[12] In terms of appropriate instruments that could be correlated with health but uncorrelated with the disturbance term in the retirement equation, we use parental mortality status, number of discharges, number of doctor visits per year, assistance with home work, assistance with transportation and unique information on accidents as well as a variable denoting the amount of exercise the individual gets.[13] A detailed description of the instruments is provided in Appendix A1. First-stage results can be seen in Appendix A3, Tables A4 (men) and A5 (women). For each of the health measures considered, we perform chi-squared tests of the power of the instruments and in every case we are able to reject the null hypothesis of joint insignificance of the instruments at the 0.1-5% level (see Tables A4 and A5). Further, the instruments affect health in the expected directions in the majority of cases: having a parent alive is associated with better health, while the greater the number of discharges and doctors' visits, the poorer is health. Individuals requiring assistance with homework or transportation in general have poorer health as do individuals who experience accidents. The result on the no exercise variable is consistent with poor health for men, although yields mixed results for women.

The results of the panel IV estimation are shown in Tables 7 and 8 and can be compared to the panel model without endogeneity in Tables 3 and 4. If justification bias is present, then IV estimates of the subjective health measures that are corrected for this type of endogeneity should be smaller than those from the model which treats health as exogenous. This is apparently not the case as in each gender group, the panel IV estimates on the subjective measures are larger in magnitude than those obtained from simple random effects estimations. On the other hand, if measurement error is present, then the random effects IV estimates of the objective measures that are corrected for this type of error should be larger than those from the simple random effects. This is evidenced in Tables 7 and 8, where for almost all objective measures, for both men and women, random effects IV estimates are indeed larger. Fewer health measures are significant in the random effects IV

[12] This approach is used by Dwyer and Mitchell (1999) but in a static model.
[13] One might argue that the number of physician visits is not exogenous. First, frequent visits at a doctor might be one way of justifying early retirement. Second, if the process of applying for SDP involves one or more doctor visits, planned retirement and doctor visits might be correlated. Therefore, as a check of robustness of the results the number of doctor visits is eliminated as an instrument. However, the only change is that the chi-squared test of the power of the instruments fails to reject the null hypothesis of joint insignificance of the instruments in 1 out of the 8 health outcome equations (the work limitation regression) for women.

compared to the simple random effects estimates. However, and more fundamentally, Hausman tests of exogeneity fail to reject the null hypothesis in the case of each health measure considered (see bottom rows in Tables 7 and 8), that both the simple random effects and the random effects IV estimators are consistent.

In order to check the robustness of the IV estimates, tests of overidentifying restrictions are conducted, see Table A6 for men and Table A7 for women in Appendix A3. For each of the health measures considered, we estimate specifications in which one instrument or group of instruments is eliminated in turn and compare these results to the estimates obtained when all instruments are included. In case of men as well as women, the parameter estimates are remarkably stable. The estimate for each of the health measures is found to be negative and similar in magnitudes in almost all specifications. Further, in all cases Hausman test of exogeneity fail to reject the null hypothesis that both the simple random effects and the random effects IV estimates are consistent.

The results indicate that issues of correlation between health and the disturbance term in the retirement equation or measurement error in health are not of obvious importance here and that therefore the ordinary random effects estimates are preferable on grounds of efficiency.[14] This model (Tables 3 and 4) is retained as the preferred specification in the following analysis.

5.5 Cohort differences

So far, we have pooled together two age cohorts in the analysis, primarily to obtain a larger sample and sufficient variation in program rules. However, health effects may become increasingly important as individuals age and the horizon approaches. To test this hypothesis, in Tables 9-12 below individuals born in 1940 and 1945 are analysed separately. Treating the sub-samples as independent, t-tests of equality of health coefficients across cohorts are performed. The results reveal that in no case are health coefficients different across cohorts, either for men or for women. However, the impact of economic variables could differ across cohorts but all these variables, annual income, wealth and the compensation rate, are estimated to be of the same magnitudes across cohorts for both men and women, except in the case of wealth for men. Still, as health effects

[14]The same result is obtained in a static context by Dwyer and Mitchell (1999) who are unable to reject the consistency of the least square estimator.

are of equal importance to retirement planning to the two cohorts, we do not lose relevant information by pooling across cohorts for the purposes of this study.

Table 9. Random effects estimates of the effect of health and economic factors on retirement age. Men born in 1940.

	Subjective health				Objective health			
	General health	**Mental health**	**Health compared to others**	**Working capacity**	**Work limitations**	**Functional limitations**	**Diseases**	**Diagnoses**
Poor health	-0.883**	-1.160(*)	-1.158(*)	-0.079	0.665**	-0.473	-0.464(*)	-0.172
	(0.284)	(0.594)	(0.603)	(0.075)	(0.260)	(0.751)	(0.273)	(0.332)
Individual income	0.874**	0.866*	0.928**	0.882*	0.913**	0.928**	0.936**	0.913**
	(0.340)	(0.344)	(0.342)	(0.345)	(0.341)	(0.344)	(0.343)	(0.344)
Wealth	0.224(*)	0.218(*)	0.237*	0.222(*)	0.199(*)	0.221(*)	0.217(*)	0.217(*)
	(0.115)	(0.116)	(0.116)	(0.116)	(0.115)	(0.116)	(0.116)	(0.116)
Compensation rate	-0.899(*)	-0.961(*)	-0.961(*)	-0.904(*)	-1.082*	-0.937(*)	-1.003(*)	-0.951(*)
	(0.533)	(0.534)	(0.537)	(0.540)	(0.537)	(0.538)	(0.537)	(0.537)
R^2 (overall)	14.9	13.2	14.4	13.8	14.5	13.3	13.7	13.1
Breusch-Pagan χ^2	79***	81***	78***	76***	79***	79***	79***	79***
Likelihood ratio test	101***	104***	98***	97***	100***	101***	101***	102***
Number of obs.	512							

Note: Additional controls include education, cohabitation including age differences between partners, experience, occupation, sector, tenure, hours of work, physical demanding job, job satisfaction and a dummy variable for missing values for compensation rate. The likelihood ratio tests are obtained from the maximum-likelihood random-effects estimator, which produce estimates that are very nearly the same as those produced by the full-information G2SLS estimator. See also Table 1 for notes. (*) Significant at a 10% level, * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

Table 10. Random effects estimates of the effect of health and economic factors on retirement age. Men born in 1945.

	Subjective health				Objective health			
	General health	**Mental health**	**Health compared to others**	**Working capacity**	**Work limitations**	**Functional limitations**	**Diseases**	**Diagnoses**
Poor health	-1.746***	-1.503**	-1.439***	-0.068	-0.299	-0.498	-0.746**	-0.710(*)
	(0.272)	(0.556)	(0.446)	(0.077)	(0.262)	(0.552)	(0.237)	(0.367)
Individual income	0.604***	0.618***	0.643***	0.622***	0.641***	0.630***	0.641***	0.629***
	(0.168)	(0.173)	(0.173)	(0.174)	(0.174)	(0.174)	(0.173)	(0.174)
Wealth	-0.208*	-0.200*	-0.190*	-0.201*	-0.202*	-0.205*	-0.184*	-0.190*
	(0.082)	(0.085)	(0.085)	(0.086)	(0.086)	(0.086)	(0.085)	(0.086)
Compensation rate	0.146	0.013	0.002	0.037	0.021	-0.015	0.029	-0.020
	(0.478)	(0.485)	(0.483)	(0.490)	(0.487)	(0.486)	(0.485)	(0.485)
R^2 (overall)	22.7	17.8	17.9	16.7	16.7	16.5	18.4	16.9
Breusch-Pagan χ^2	27***	36***	38***	38***	39***	39***	33***	39***
Likelihood ratio test	30***	39***	42***	42***	43***	44***	37***	43***
Number of obs.	712							

See Table 9 for notes. Significant at a 10% level, * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

Table 11. Random effects estimates of the effect of health and economic factors on retirement age. Women born in 1940.

	Subjective health				Objective health			
	General health	Mental health	Health compared to others	Working capacity	Work limitations	Functional limitations	Diseases	Diagnoses
Poor health	-0.602*	-1.692***	-0.335	-0.116(*)	-0.323	-0.435	-0.208	0.016
	(0.283)	(0.506)	(0.527)	(0.061)	(0.266)	(0.392)	(0.218)	(0.407)
Individual income	0.273	0.306	0.275	0.265	0.296	0.271	0.272	0.279
	(0.225)	(0.224)	(0.227)	(0.226)	(0.227)	(0.226)	(0.226)	(0.227)
Wealth	0.047	0.099	0.077	0.071	0.053	0.079	0.063	0.076
	(0.220)	(0.218)	(0.221)	(0.220)	(0.221)	(0.220)	(0.220)	(0.221)
Compensation rate	-0.641	-0.760	-0.583	-0.574	-0.568	-0.626	-0.566	-0.580
	(0.587)	(0.584)	(0.590)	(0.588)	(0.589)	(0.591)	(0.589)	(0.590)
R^2 (overall)	22.7	25.0	22.0	23.4	22.2	22.2	21.8	21.9
Breusch-Pagan χ^2	25***	21***	25***	21***	25***	25***	25***	24***
Likelihood ratio test	28***	24***	28***	24***	28***	28***	29***	28***
Number of obs.	406							

See Table 9 for notes. (*) Significant at a 10% level, * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

Table 12. Random effects estimates of the effect of health and economic factors on retirement age. Women born in 1945.

	Subjective health				Objective health			
	General health	Mental health	Health compared to others	Working capacity	Work limitations	Functional limitations	Diseases	Diagnoses
Poor health	-0.610**	-0.455	-0.569	-0.159**	-0.234	-0.361	0.013	-0.356
	(0.237)	(0.491)	(0.418)	(0.062)	(0.223)	(0.505)	(0.204)	(0.535)
Individual income	0.773*	0.811*	0.815*	0.745*	0.829*	0.808*	0.825*	0.826*
	(0.332)	(0.333)	(0.333)	(0.333)	(0.333)	(0.334)	(0.333)	(0.333)
Wealth	-0.261	-0.271	-0.257	-0.211	-0.267	-0.271	-0.273	-0.269
	(0.252)	(0.254)	(0.254)	(0.254)	(0.254)	(0.254)	(0.255)	(0.254)
Compensation rate	1.165*	1.168*	1.201*	1.123*	1.189*	1.181*	1.188*	1.192*
	(0.503)	(0.506)	(0.505)	(0.504)	(0.506)	(0.506)	(0.506)	(0.506)
R^2 (overall)	17.1	16.1	16.2	17.0	16.2	16.1	15.9	16.0
Breusch-Pagan χ^2	33***	34***	34***	34***	33***	34***	34***	34***
Likelihood ratio test	36***	37***	37***	36***	36***	37***	37***	37***
Number of obs.	576							

See Table 9 for notes. (*) Significant at a 10% level, * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

5.6 Discontinuities in planned retirement age

In previous studies, planned retirement age has been treated as a continuously distributed variable in econometric analyses, where researchers typically employ ordinary least squares methods in the analysis of its determinants. However, the descriptive evidence in most countries indicates that the distribution of planned retirement age peaks around the early and normal ages of retirement, or in the European context, is bunched around the ages of first eligibility of various labour market related exit programs. In Denmark for example, several different regimes could be identified, consistent with the clustering at ages 60, 62 and 65, cf. Figure 2 above, which in turn reflect pension policy rules and eligibility criteria. Ages 60 and 67 are the early and the normal retirement ages in 1997,

respectively, while in 2002 the normal retirement age is 65, following the 1999 reform. Several waiting incentives in the PEW program also make retirement at 60-61, 62 and 63-64 typical options. We distinguish therefore between six categories of planned retirement age: below 60, 60-61, 62, 63-64, 65-66 and 67 and above. This allows us to adopt a random effects ordered probit model specification of the dependent variable, planned retirement age.

Results of this estimation are shown in Tables 13 and 14 below. Although we cannot formally test this model versus the ordinary random effects model, all estimated cut parameters are significant in these tables confirming the usefulness of this approach in the context of modelling retirement planning. A further advantage, other than exploiting the clustering in the observed distribution of planned retirement age, is that adopting such an approach allows for impacts of health to vary by regime, reflecting pension policy reform that affects program age of eligibility or age-based incentives cf. Section 4. Therefore, we report marginal effects of health coefficients on retirement in these tables. For purposes of compactness, we report aggregated marginal effects of the category 62 and above for each significant health coefficient.[15] As is evident, results from the random effects ordered probit specification on both the health and the financial variables are qualitatively similar to those derived from the random effects specification (Tables 3 and 4). However, worse relative health for women and being hospitalised for a serious condition for men are only significant in the random effects ordered probit specification.

Focusing on the significant health variables for men, quite large marginal effects are found for the subjective health measures. In fact, the probability of planning to retire at age 62 or later is reduced by 26-28 percentage points for poor general health, worse mental health and worse relative health, while having a disease condition or being hospitalised for a serious condition only reduces this probability by 13 percentage points. For comparison, a one-point increase in (log) individual income increases the probability by 20-22 percentage points. Since the impact of the broad subjective health measures again is found to be larger than the impact of income, the assessment of the relative importance of health is unchanged compared to what was derived from the random effects specification.

[15] This is possible because marginal effects sum to zero as the probabilities sum to one. The dividing line is set between the categories 60-61 and 62 because for all variables in the tables the marginal effects change signs between these two categories. Separate marginal effects for each age category are available on request.

Table 13. Random effects ordered probit estimates of the effect of health and economic factors on men's retirement age.

	Subjective health							Objective health					
	General health		Mental health		Health compared to others		Working capacity	Work limitations	Functional limitations	Diseases conditions		Diagnoses	
	β	ME	β	ME	β	ME	B	β	β	β	ME	β	ME
Poor health	-0.679***	-0.263	-0.803***	-0.256	-0.748***	-0.282	-0.057	0.120	-0.263	-0.334**	-0.133	-0.321*	-0.127
	(0.123)		(0.250)		(0.213)		(0.032)	(0.112)	(0.261)	(0.107)		(0.158)	
Individual income	0.502***	0.200	0.509***	0.202	0.544***	0.217	0.517***	0.536***	0.540***	0.532***	0.212	0.532***	0.212
	(0.134)		(0.135)		(0.135)		(0.136)	(0.136)	(0.136)	(0.135)		(0.136)	
Wealth	-0.047	-0.019	-0.046	-0.018	-0.041	-0.016	-0.046	-0.050	-0.048	-0.044	-0.017	-0.045	-0.018
	(0.043)		(0.043)		(0.043)		(0.043)	(0.043)	(0.043)	(0.043)		(0.043)	
Compensation rate	-0.116	-0.046	-0.160	-0.064	-0.170	-0.068	-0.127	-0.179	-0.161	-0.168	-0.067	-0.169	-0.067
	(0.218)		(0.218)		(0.218)		(0.219)	(0.219)	(0.219)	(0.218)		(0.219)	
Cut 1	5.462***		4.680**		6.065***		5.727***	6.123***	6.130***	6.007***		5.996***	
	(1.679)		(1.745)		(1.693)		(1.706)	(1.700)	(1.702)	(1.689)		(1.703)	
Cut 2	7.755***		6.966***		8.352***		7.999***	8.398***	8.409***	8.285***		8.278***	
	(1.693)		(1.757)		(1.708)		(1.721)	(1.715)	(1.717)	(1.704)		(1.718)	
Cut 3	8.586***		7.801***		9.184***		8.827***	9.229***	9.240***	9.113***		9.111***	
	(1.700)		(1.763)		(1.715)		(1.727)	(1.722)	(1.724)	(1.711)		(1.725)	
Cut 4	9.151***		8.365***		9.749***		9.388***	9.792***	9.804***	9.674***		9.676***	
	(1.704)		(1.766)		(1.719)		(1.731)	(1.726)	(1.728)	(1.715)		(1.728)	
Cut 5	10.341***		9.549***		10.936***		10.569***	10.980***	10.992***	10.859***		10.867***	
	(1.711)		(1.773)		(1.727)		(1.739)	(1.733)	(1.735)	(1.722)		(1.736)	
Rho	0.500***		0.512***		0.510***		0.509***	0.515***	0.516***	0.507***		0.517***	
	(0.036)		(0.035)		(0.036)		(0.036)	(0.035)	(0.035)	(0.036)		(0.035)	
Log likelihood	-1724		-1734		-1733		-1738	-1739	-1739	-1734		-1737	
Number of obs.							1224						

Note: Marginal effects (ME) are calculated only for models in which the β estimate of the health measure is significant. In this case, ME refers to the change in the probability of having reported a retirement age at or above 62. ME are based on the linear prediction from the estimated coefficients and are calculated at the mean values of the explanatory variables, while the two components of the error term ε_{it} (v_{it} and u_i) are set equal to zero. See also Table 1 for notes. * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

Table 14. Random effects ordered probit estimates of the effect of health and economic factors on women's retirement age.

	Subjective health								Objective health			
	General health		Mental health		Health compared to others		Working capacity		Work limitations	Functional limitations	Disease conditions	Diagnoses
	β	ME	β	ME	β	ME	β	ME	β	β	β	β
Poor health	-0.416***	-0.138	-0.649**	-0.254	-0.495*	-0.155	-0.118***	-0.046	-0.203	-0.448	-0.047	-0.122
	(0.131)		(0.248)		(0.234)		(0.032)		(0.121)	(0.233)	(0.105)	(0.248)
Individual income	0.313*	0.112	0.333*	0.120	0.323*	0.116	0.301*	0.108	0.335*	0.315*	0.327*	0.329*
	(0.139)		(0.138)		(0.139)		(0.137)		(0.139)	(0.139)	(0.139)	(0.139)
Wealth	-0.003	-0.001	0.001	0.000	0.007	0.003	0.015	0.005	-0.004	0.003	-0.005	-0.003
	(0.118)		(0.117)		(0.118)		(0.116)		(0.117)	(0.118)	(0.118)	(0.118)
Compensation rate	0.289	0.103	0.264	0.095	0.316	0.113	0.281	0.101	0.305	0.282	0.307	0.309
	(0.269)		(0.269)		(0.270)		(0.267)		(0.269)	(0.269)	(0.270)	(0.270)
Cut 1	3.340*		2.761		3.496*		2.864		3.630*	3.427*	3.576*	3.615*
	(1.644)		(1.664)		(1.643)		(1.634)		(1.637)	(1.642)	(1.647)	(1.646)
Cut 2	5.941***		5.340***		6.087***		5.442***		6.208***	6.012***	6.162***	6.201***
	(1.654)		(1.673)		(1.653)		(1.645)		(1.647)	(1.652)	(1.657)	(1.656)
Cut 3	6.913***		6.306***		7.058***		6.407***		7.176***	6.982***	7.135***	7.173***
	(1.659)		(1.678)		(1.658)		(1.650)		(1.652)	(1.657)	(1.662)	(1.661)
Cut 4	7.501***		6.893***		7.644***		6.990***		7.762***	7.568***	7.722***	7.761***
	(1.662)		(1.681)		(1.661)		(1.653)		(1.655)	(1.660)	(1.665)	(1.664)
Cut 5	8.566***		7.956***		8.705***		8.042***		8.821***	8.625***	8.786***	8.825***
	(1.669)		(1.687)		(1.668)		(1.660)		(1.662)	(1.667)	(1.672)	(1.671)
Rho	0.405***		0.399***		0.407***		0.388***		0.402***	0.404***	0.411***	0.410***
	(0.047)		(0.048)		(0.047)		(0.048)		(0.048)	(0.047)	(0.047)	(0.047)
Log likelihood	-1141		-1142		-1144		-1139		-1144	-1144	-1146	-1146
Number of obs.	982											

See Table 13 for notes. * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

For women, the income effect is only half the size of the effect for men. In fact, a one-point increase in (log) individual income only increases the probability to plan to retire at age 62 or later by 11-12 percentage points. The effect of the significant health measures differs considerably ranging from a 5 percentage points decrease if working incapacity is increased one point to a 25 percentage points reduction for worse mental health. The figures for poor general health and worse relative health are 14 and 16 percentage points respectively. Here again, the relative importance of health to income is unchanged. Further, this analysis also suggests that health effects are not as strong as for men. The only exception is the effect of mental health.

5.7 Disaggregated disease conditions and diagnoses

The random effects ordered probit specification is useful in capturing discontinuities in planned retirement age, particularly in an environment of changing pension program eligibility criteria. However, in order to compare our findings to previous studies, we return to the random effects models in Tables 3 and 4 and disaggregate to the level of specific conditions and diagnosed diseases in order to obtain information about which particular illnesses can affect retirement plans. The results of these analyses are given in Tables 15-18 below. For men, myalgia and back problems significantly lowers planned retirement age by respectively 7 months and little more than a year, while for women, diseases conditions such as back problems, osteoporosis, and depression significantly hasten retirement, particularly the two latter conditions, by 6 months, 2 years and nearly a year respectively. Being hospitalised for a serious condition does not appear to exert any appreciable effect, except in the case of heart diseases, which is marginally significant (10% level) for both men and women and lowers planned retirement age by 8 months and a year and 8 months respectively.[16] The limited effect of diagnoses might be due to the fact that individuals who have been hospitalised receive neutralizing treatment and therefore are able to continue to work. Another potential explanation is that people who suffer from a serious condition may in fact be advised by their doctors (or choose themselves) to continue working because of the potential therapeutic effects of work on health through engagement in a challenging and rewarding activity, the social contact with colleagues etc. Finally, a third explanation might be that these individuals' retirement plans are

[16] In comparison, McGarry (2002) does not find that specific conditions are significantly related to the probability of working beyond the age of 62, while Dywer and Mitchell (1999) find that limitations of daily living, back problems, head injuries and circulatory problems lower planned retirement age. Mental health (which is broader than depression) does not have a significant effect in their study and conditions such as osteoporosis and myalgia are not defined in their data. Thus, in part differences in findings are due to differences in data definitions and availability but back problems appear important in both their study and ours.

affected but we do not capture this effect because of small sample size as the incidence of diagnoses is in general quite low.

Table 15. Random effects estimates of the effect of disaggregated diseases conditions and economic factors on men's retirement age.

	Diseases							
	High blood pressure	**Diabetes**	**Bronchitis/ asthma**	**Osteoarthritis**	**Myalgia**	**Osteoporosis/ decalcification of bones**	**Back problems**	**Depression**
Poor health	-0.828	1.287	-0.268	-0.328	-0.592*	-2.058	-1.056***	-0.285
	(0.545)	(0.917)	(0.515)	(0.248)	(0.267)	(2.175)	(0.255)	(0.602)
Individual income	0.646***	0.635***	0.632***	0.631***	0.628***	0.631***	0.638***	0.633***
	(0.149)	(0.148)	(0.149)	(0.148)	(0.148)	(0.149)	(0.147)	(0.149)
Wealth	-0.091	-0.094	-0.094	-0.091	-0.097	-0.093	-0.072	-0.096
	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)
Compensation rate	-0.263	-0.236	-0.250	-0.253	-0.243	-0.262	-0.248	-0.248
	(0.362)	(0.362)	(0.362)	(0.362)	(0.362)	(0.362)	(0.360)	(0.362)
R^2 (overall)	13.4	13.3	13.1	13.4	13.9	13.2	14.7	13.1
Breusch-Pagan χ^2	109***	110***	111***	108***	105***	110***	107***	110***
Likelihood ratio test	126***	128***	129***	126***	122***	128***	124***	128***
Number of obs.	1224							

See Table 3 for notes. * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

Table 16. Random effects estimates of the effect of disaggregated diseases conditions and economic factors on women's retirement age.

	Diseases							
	High blood pressure	**Diabetes**	**Bronchitis/ asthma**	**Osteoarthritis**	**Myalgia**	**Osteoporosis/ decalcification of bones**	**Back problems**	**Depression**
Poor health	-0.199	0.488	-0.194	-0.040	-0.021	-2.211*	-0.506*	-0.973*
	(0.442)	(1.977)	(0.433)	(0.197)	(0.186)	(0.552)	(0.223)	(0.414)
Individual income	0.448*	0.454*	0.451*	0.449*	0.450*	0.448*	0.470*	0.436*
	(0.202)	(0.203)	(0.202)	(0.202)	(0.202)	(0.201)	(0.202)	(0.202)
Wealth	-0.066	-0.067	-0.068	-0.067	-0.068	-0.091	-0.074	-0.061
	(0.173)	(0.173)	(0.173)	(0.173)	(0.173)	(0.171)	(0.172)	(0.172)
Compensation rate	0.730	0.727	0.729	0.727	0.729	0.685	0.671	0.747*
	(0.381)	(0.381)	(0.381)	(0.381)	(0.381)	(0.378)	(0.381)	(0.380)
R^2 (overall)	16.1	16.0	16.0	16.0	16.0	17.4	16.7	16.7
Breusch-Pagan χ^2	67***	68***	68***	68*	68***	68***	66***	66***
Likelihood ratio test	74***	75***	75***	75***	75***	74***	72***	72***
Number of obs.	982							

See Table 3 for notes. * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

Table 17. Random effects estimates of the effect of disaggregated diagnoses and economic factors on men's retirement age.

	Diagnoses						
	Heart conditions	**Strokes**	**Cancers**	**Lung diseases**	**Diabetes**	**High blood pressure**	**Arthritis**
Poor health	-0.700	0.188	-0.163	0.477	-0.862	-0.855	-0.513
	(0.377)	(1.124)	(0.679)	(0.795)	(1.008)	(0.749)	(0.625)
Individual income	0.632***	0.631***	0.630***	0.631***	0.628***	0.628***	0.627***
	(0.148)	(0.149)	(0.149)	(0.149)	(0.149)	(0.149)	(0.149)
Wealth	-0.086	-0.094	-0.094	-0.094	-0.095	-0.094	-0.093
	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)
Compensation rate	-0.246	-0.248	-0.248	-0.246	-0.253	-0.256	-0.249
	(0.362)	(0.362)	(0.362)	(0.362)	(0.362)	(0.362)	(0.362)
R^2 (overall)	13.3	13.1	13.1	13.1	13.1	13.1	13.1
Breusch-Pagan χ^2	111***	111***	111***	111***	111***	111***	111***
Likelihood ratio test	129***	129***	129***	129***	130***	129***	129***
Number of obs.				1224			

See Table 3 for notes. * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

Table 18. Random effects estimates of the effect of disaggregated diagnoses and economic factors on women's retirement age.

	Diagnoses				
	Heart conditions	**Strokes**	**Cancers**	**Lung diseases**	**Arthritis**
Poor health	-1.723	-0.768	-0.610	-0.323	0.944
	(0.954)	(1.354)	(0.553)	(0.722)	(0.667)
Individual income	0.442*	0.453*	0.458*	0.449*	0.453*
	(0.202)	(0.202)	(0.202)	(0.202)	(0.202)
Wealth	-0.078	-0.069	-0.065	-0.070	-0.070
	(0.172)	(0.173)	(0.173)	(0.173)	(0.172)
Compensation rate	0.750*	0.728	0.731	0.732	0.737
	(0.380)	(0.381)	(0.381)	(0.381)	(0.381)
R^2 (overall)	16.1	16.0	16.1	16.1	16.2
Breusch-Pagan χ^2	70***	69***	69***	67***	68***
Likelihood ratio test	76***	75***	75***	74***	74***
Number of obs.			892		

See Table 3 for notes. * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

5.8 Health changes

So far, we have focused on the effect of the level of health on retirement planning. However, it might be that the effect of sudden or gradual *changes* in health is even larger than the effect of health status. Means for poor health and worsened health by changes in retirement plans is reported for men and women respectively in Table A8 and A9 in Appendix A3. For men as well as women, the share of individuals that plan to postpone retirement between the two waves is larger than the share that plan to retire earlier than originally planned and in general, the expected correlation between worsened health and hastened retirement is not found. Only the share of individuals that has been hospitalised for a serious condition is larger among individuals that bring retirement forward. This result indicates that diagnoses to a greater extent than the other health measures reflect health shocks.

To examine these effects more closely, health changes occurring between the 1st and 2nd waves are included in the random effects estimations while still controlling for health status in wave 1, cf. Table 19 and 20 below. The results obtained from these analyses are not directly comparable to those derived from the analyses of the effect of health status (Tables 3 and 4) since these models are not nested. However, health changes seem to be important in particular in the case of men. Both worsened general and mental health hasten men's planned retirement, while development of functional limitations lower women's planned retirement age. Looking directly at the estimated coefficients for health changes, worsened general and mental health reduces men's planned retirement age by 9 months and more than 2 years respectively, while development of functional limitations reduce this age by 1 year and 3 months for women. These results suggest that health shocks increase the propensity to hasten retirement.

Table 19. Random effects estimates of the effect of health status, health changes and economic factors on men's retirement age.

	Subjective health				Objective health			
	General health	**Mental health**	**Health compared to others**	**Working capacity**	**Work limitations**	**Functional limitations**	**Disease conditions**	**Diagnoses**
Poor health wave 1	-1.610***	-1.509**	-1.567***	-0.218***	0.139	-0.694	-1.003***	-0.377
	(0.256)	(0.500)	(0.460)	(0.067)	(0.271)	(0.602)	(0.239)	(0.463)
Health change	-0.760**	-2.132***	-0.435	-0.114	0.182	-0.917	-0.166	-0.348
	(0.287)	(0.660)	(0.489)	(0.076)	(0.250)	(0.676)	(0.241)	(0.345)
Individual income	0.599***	0.614***	0.639***	0.587***	0.631***	0.629***	0.635***	0.630***
	(0.146)	(0.148)	(0.148)	(0.149)	(0.149)	(0.149)	(0.148)	(0.149)
Wealth	-0.090	-0.084	-0.077	-0.090	-0.098	-0.091	-0.082	-0.087
	(0.068)	(0.069)	(0.069)	(0.069)	(0.069)	(0.069)	(0.068)	(0.069)
Compensation rate	-0.130	-0.244	-0.216	-0.168	-0.264	-0.237	-0.247	-0.255
	(0.359)	(0.361)	(0.361)	(0.362)	(0.363)	(0.362)	(0.360)	(0.362)
R^2 (overall)	16.9	14.4	14.3	14.1	13.1	13.2	15.0	13.2
Breusch-Pagan χ^2	101.1***	107.8***	108.2***	109.4***	110.5***	111.1***	106.1***	110.9***
Likelihood ratio test	115.6***	124.5***	124.9***	126.2***	128.3***	128.8***	122.2***	128.7***
Number of obs.	1224							

Note: Health changes are defined as the differences between the values for health status in wave 1 and 2. See also Table 3 for notes. * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

Table 20. Random effects estimates of the effect of health status, health changes and economic factors on women's retirement age.

	Subjective health				Objective health			
	General health	**Mental health**	**Health compared to others**	**Working capacity**	**Work limitations**	**Functional limitations**	**Diseases conditions**	**Diagnoses**
Poor health wave 1	-0.838***	-1.153**	-0.816	-0.231***	-0.496*	-0.786	-0.110	-0.193
	(0.249)	(0.424)	(0.446)	(0.057)	(0.232)	(0.402)	(0.192)	(0.631)
Health change	-0.119	-0.682	-0.117	-0.043	-0.290	-1.214*	-0.241	0.170
	(0.229)	(0.527)	(0.399)	(0.059)	(0.221)	(0.535)	(0.207)	(0.411)
Individual income	0.429*	0.459*	0.436*	0.376	0.465*	0.414*	0.450*	0.443*
	(0.201)	(0.202)	(0.202)	(0.202)	(0.202)	(0.202)	(0.202)	(0.203)
Wealth	-0.055	-0.062	-0.060	-0.055	-0.077	-0.050	-0.082	-0.063
	(0.171)	(0.172)	(0.172)	(0.171)	(0.172)	(0.172)	(0.173)	0.173
Compensation rate	0.685	0.697	0.710	0.736	0.725	0.692	0.751*	0.730
	(0.380)	(0.380)	(0.381)	(0.379)	(0.381)	(0.381)	(0.381)	(0.381)
R^2 (overall)	17.6	17.0	16.5	18.0	16.6	16.7	16.2	16.1
Breusch-Pagan χ^2	64.1***	65.6***	67.3***	63.6***	66.9***	66.7***	68.1***	68.2***
Likelihood ratio test	69.6***	71.4***	73.4***	68.8***	72.9***	72.6***	74.3***	74.4***
Number of obs.	982							

See Table 19 for notes. * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

As is evident, results on both health status and financial variables are qualitatively similar to those derived from the analyses of the effect of health status. However, working capacity for men and work limitations for women are only significant when health changes are included. Similarly, inclusion of health changes in general increases the effect of health status while the effect of income remains unchanged. That is, including health changes does not change the assessment of the relative importance of health compared to income. Further, this analysis also suggests that health effects are stronger for men than for women. In general, these results strengthen the conclusion that health is important when retirement age is planned.

6. Conclusions

Using a wide array of alternative health measures including both self-reported and diagnostic measures extracted from LPR records, we compare the role of subjectively versus objectively measured health as a determinant of retirement planning, after controlling for income, labour market, job and background characteristics. The sample consists of older workers and retirees drawn from a Danish panel survey from 1997-2002 that is merged to longitudinal register data. Extending the existing literature, we estimate a panel model of retirement planning that controls both for unobserved heterogeneity as well as accounts for endogeneity and measurement error of health in retirement, and estimate separate models for men as well as women. We find that self-rated health is both an important predictor of retirement as well as a valid measure of health. Our analysis therefore brings fresh evidence to the debate initiated by earlier U.S. studies based on the

older Retirement History Longitudinal Survey (RHS) data. These studies concluded that the use of self-reported health in retirement models was likely to yield an unreliable impact of health on retirement due to "justification bias". However, our study, like more recent U.S. studies based on the newer HRS data find little support for this hypothesis and neither endogeneity nor measurement error turn out to be important sources of concern in the Danish data.

Unobserved heterogeneity however, turns out to be important and estimates from random effects models show that self-rated physical and mental health are important predictors of retirement planning, in fact at least as important as economic factors, both among men as well as among women. However, health seems to be relatively more influential in men's retirement planning. Being in poor general health or poor mental health significantly reduces planned retirement age for both men and women. Other health measures, in particular having health worse than others or having a disease for men and a reduction in working capacity for women, also lower planned retirement age significantly. At a disaggregated level, back problems and myalgia significantly hasten male retirement, while back problems and particularly osteoporosis and depression are significant factors triggering retirement among women. Retirement planning is in general unaffected by being hospitalised for a serious condition, except in the case of hospitalisation for heart diseases, which reduces planned retirement age for both men and women, but only marginally so. Looking at health changes strengthens the conclusion that health is an important factor in retirement planning. In fact, health shocks seem to increase the propensity to retire earlier. However, as expected, health seems to be less important for retirement planning in Denmark compared to the US due to the subsidized and fully-covered health care system and the easier access to health-related exit.

As stated above, results suggest that health has the strongest effect on men's retirement planning. According to Danø et al. (1999) one possible explanation of this gender difference is that men to a greater extent than women are employed in jobs that are inconsistent with poor health.[17] Another explanation might be that the gender difference is due to sample selection. That is, women outside the labour force in wave 1 suffered from poor health to a greater extent than similar men. However, this hypothesis is not confirmed when looking at the means for the health measures for these two

[17] Tentatively, we have tested this hypothesis by interacting each of the eight health measures with dummy variables for private sector and physical demanding job respectively. However, no systematic difference between men and women appeared.

groups, cf. Table A1 in Appendix A3. In fact, women outside the labour seem to be at least as healthy as similar men. However, this might be due to the fact that a relatively large share of women retired from the labour market through TBP in the mid-nineties, cf. Section 2. Since access to this program did not depend on health criteria, retirement through this program probably implied that the average level of health among women outside the labour force was higher than it would otherwise have been. In other words, the sample selection problem might be hidden due to the high take-up rate of a particular early retirement program in the mid-nineties among relatively healthy women.

If the identified effect of health on retirement planning in Denmark reflected an exploitation of the Danish welfare system by individuals in the labour force using failing health as an excuse for early retirement, our conclusions would lead to the policy recommendation of a less generous welfare system as a way of postponing retirement among older workers in the labour force. However, the identified effect of health seems to be real since justification bias does not appear to be a problem. Further, the fact that only selected, and not all health measures are found to have a significant effects confirms this interpretation. Therefore, on the basis of our findings, the policy recommendation would be to expand preventive and neutralizing health care services. A particular effort should be directed toward preventing diseases such as osteoporosis, depression, back problems and myalgia.

All in all, our results confirm that health is an important determinant of preferences for retirement and that poor health causes workers to retire earlier. Finally, by estimating separate models for women as well as men, we add to the existing knowledge about the impact of health on retirement behaviour of older workers in the population.

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Appendix A1. Health measures

Both survey and register based health measures are included in our data. Subjective health measures are obtained from the survey while more objective health measures are obtained from both surveys and registers.

The *subjective* health measures from the survey are self-rated. These are:

- General health: "All in all, how would you assess you current health? This variable is equal to one, if the answer is "very poor", "poor" or "somewhat poor" and zero otherwise ("good" or "very good").
- Mental health: An index for health is created by counting the number of mental problems/conditions present such as memory loss, fear, anxiety, depression and loneliness.
- Health compared to others: "How do you think your health is relative to others at your age?" This variable is equal to one, if the answer is "worse than others" and zero otherwise ("better than others" or "like others").
- Working capacity: "If we say that your working capacity was given 10 points when it was at its highest level, how many points would you give your working capacity today?" This scale has been inverted. Consequently, one point is the maximum, while ten points is the minimum.

The *objective* health measures obtained from survey and registers are split into four categories: work limitations, functional limitations, doctor diagnosed diseases and hospitalisation due to specific diseases:

- Work limitations: "Do you find it difficult to do your job due to impairment of memory or concentration, reduced sight or hearing, tiredness, low spirits or lack of sleep?" A dummy variable for work limitations is set equal to one, if the individual suffers from at least one of these problems.
- Functional limitations: A dummy variable is set equal to one if the individual normally has difficulties cutting toe nails, climbing stairs, walking around outdoors or inside the home, getting washed or putting on clothes or shoes.

- Diseases: “Has a doctor told you that you have – or within the last year have had – high blood pressure, diabetes, bronchitis/asthma, osteoarthritis, myalgia, osteoporosis/ decalcification of bones, back problems or depression?” If yes: “Does this disease bother you in normal everyday life?” A dummy for diseases is set equal to one if at least one of these diseases bothers the individual in normal everyday life.
- Diagnoses: Information about diagnoses is obtained from registers. A dummy variable for diagnoses is set equal to one if the individual has been hospitalised for either heart conditions, stroke, cancer, lung disease, diabetes, high blood pressure or arthritis.[18]

The instruments for health are:

- Discharges: Number of discharges.
- Physician visits: Number of physician visits.
- Accident etc.: Hospitalisation due to accident, attack or self-inflicted injury.
- Parent alive: At least one of the parents alive
- Assistance with work at home: Have received assistance from children, family or friends (not cohabitants) with cleaning, washing, shopping, cooking or keeping up the house or the garden.
- Assistance with transportation etc.: Have received assistance from children, family or friends (not cohabitants) with money affairs, contact to authorities, getting to examinations, treatment etc. or going outside, going on a visit or getting to leisure activities.
- No exercise: Exercise includes walking or cycling at least half an hour, doing gymnastics, doing any sport or taking dancing lessons. On a scale from 1 to 5 (1 = daily, 5 = never).

The instruments discharges, physician visits, accidents etc. are based on information from registers, while parent alive, assistance with work at home, assistance with transportation etc. and exercise are survey-based. [19]

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[18] For the first survey year, which is 1997, diagnoses are recorded on the basis of information for the period 1993 to 1996, while in the case of the second survey year, which is 2002, diagnoses are recorded for the years 1998-2001. If retirement takes place between to two survey years, diagnoses are recorded based on information for the years between the first survey year and the retirement year.

[19] The number of discharges and physician visits are measured in year $t-1$, where year t is the survey year, or alternatively the retirement year if the respondent retires between the two survey years. Recording of accidents is carried out as diagnoses, cf. above. The survey-based instruments are measured in the two survey years. However, we do not know whether the answer given in 2002 by individuals that retire between the two survey years is related to the situation before or after the actual retirement year. We assume that this information is related to the before situation.

Appendix A2. Compensation rate

The compensation rate is estimated as the ratio of (potential) disposable income as a pensioner in year *t* to disposable income as a participant in year *t-1*:

$$Compensation\ rate_t = \frac{(potential)\ disposable\ income\ as\ a\ pensioner_t}{disposable\ income\ as\ a\ participant_{t-1}}$$

Year *t* is the survey year except when retirement takes place between two survey years. In these cases, year *t* is the actual retirement year (reported in the survey). The calculation is based on the first year as pensioner and is calculated as the sum of the two sources: The estimated amount of (potential) private pension and income from what respondents state as their expected most important income source when retired.

To estimate potential disposable income as a pensioner, the amount of private pension, which is a lump-sum retirement income payment, is equally distributed over the years from the planned or actual retirement age until the mean life expectancy for the age and gender group in question. Unfortunately, some people are not aware of the payable amount. Namely, 3 out of 4 in the sample reported that they could receive a private pension when they stop working. However, only 66 per cent of this group reported the expected payable amount although a ball park figure was acceptable.

The information about the expected most important income source when retired is based on the survey question: "What do you think is your most important income source at the time, when you stop working?" The possible answers are[20]:

- Post Employment Wage (PEW, *efterløn*),
- Social Disability Pension (SDP, *førtidspension*),
- National Old Age Pension (OAP, *folkepension*),
- Labour market pension,
- Private pension,
- Private savings,
- Income of the spouse,

[20] For more information about these schemes, see Larsen (2004).

- Own earnings and
- Other sorts of income.

In case of planned retirement, these answers are applied directly in the calculation, while in case of actual retirement these answers only are applied directly if they are consistent with the retirement age. An example of inconsistent information is retirement at age 58 and PEW as the most important income source when retired. In cases of planned or actual retirement where the answers are labour market pension, private pension, private savings or other sorts of income, no information about income is available.[21] If information is inconsistent or no information is available, we assume that SDP is the retirement scheme for individuals that plan to or actually retire before the age of 60, PEW is assumed to be the retirement scheme for individuals that plan to or actually retire at age 60-66, while OAP is assumed to be the retirement scheme for individuals that plan to retire at age 67 or later. This corresponds to the approach applied in Pedersen & Smith (1996).

The income for potential recipients of PEW benefits is calculated as 90 per cent of earnings in year *t-1* subject to a ceiling, which differs depending on whether unemployment insurance is on a full-time or a part-time basis. For some of the self-employed, the registered income in year *t-1* is negative. In these cases, benefits are set equal to the ceiling. For retirement after 1999, income is calculated as 91 per cent of full benefits for individuals that plan to or actual retire at age 60 or 61.[22]

Estimation of income for recipients of SDP benefits is more complicated. First of all, different levels of SDP are taken into consideration: highest level, intermediate level, increased ordinary level and ordinary level. In addition, we distinguish between men and women and between singles and partnered individuals. For recipients of SDP in our sample, information about the level of SDP is unknown. Therefore, the distribution on the four levels of SDP for each year for men and women respectively is obtained from Statistics Denmark (1997-2002), which includes yearly information about award of SDP. Since the distribution on the four levels of SDP found in Statistics Denmark (1997-2002) is not broken down by family type, an assumption has to be made. We assume that the

[21] An exception is private pension, cf. above. However, as mentioned above, information about the payable amount is sometimes missing. Further, in many cases the payable amount is too small to be the only source of income. Therefore, if seems reasonable to add a second income source to individuals in this group.
[22] These changes were part of the PEW reform that was conducted in the middle of 1999, see Larsen (2004). Due to the age composition of our sample, these changes are not taken into account until 2000.

distribution on these four levels is the same for singles and partnered individuals. These distributions are used as weights to calculate yearly average SDP benefit for each of the four groups.

To estimate an average measure for income as a pensioner for people in the category OAP, three types of OAP benefits are taken into account: Base amount, supplementary amount and special supplementary amount. In addition, distinctions are made between singles and married individuals and between men and women. For each of these four groups, the composition of OAP benefits for each year for an average recipient is identified on the basis of yearly information about receipts of OAP obtained from Statbank Denmark. Some recipients receive a reduced supplementary amount. The rate of reduction is unknown but we assume that it is 50 per cent on average.

Yearly information about benefit levels and ceilings for PEW, SDP and OAP is found in Lausten (2001) and Danish Insurance Information Service (2001, 2002).

If the expected most important income source is income of the spouse, the (potential) income is estimated as half of the spouse's earnings in year *t*. If own earnings is the expected most income source, the income is set equal to the respondent's earnings in year *t*.

The estimate of the denominator, disposable income as a participant, which is based on earnings in year *t-1*, is described in Pedersen & Smith (1996).

A variable for missing compensation rate is added. That is, compensation rate is set equal to missing, if the estimated rate is equal to or below 0 because a negative compensation rate is assumed to be invalid. In addition, the compensation rate is set equal to missing if this rate is in excess of 1.5. Since all individuals in the sample are in the labour force before retirement, it seems reasonable to assume that the disposable income as a pensioner in year *t* at its highest is 50 per cent higher than the disposable income as a participant in year *t-1*. The missing compensation rate variable is set equal to 1, if the compensation rate is missing and 0 otherwise.

Appendix A3. Tables

Table A1.
Means of variables by labour force (LF) status, men and women (standard deviations in parentheses).

	In LF Wave 1				Out of LF Wave 1			
	Men		Women		Men		Women	
Planned Retirement Age	61.68	(2.67)	60.86	(2.22)	-	-	-	-
Poor health								
General health	0.18[e]	(0.38)	0.17[e]	(0.37)	0.64	(0.48)	0.55	(0.50)
Mental health	1.21[ge]	(0.20)	1.24[e]	(0.20)	1.43	(0.39)	1.37	(0.33)
Health compared to others	0.05[e]	(0.22)	0.05[e]	(0.21)	0.47	(0.50)	0.35	(0.48)
Working capacity	2.35	(1.51)	2.28	(1.59)	-	-	-	-
Work limitations	0.19	(0.39)	0.20	(0.40)	-	-	-	-
Functional limitations	0.03[ge]	(0.17)	0.05[e]	(0.22)	0.35	(0.48)	0.32	(0.47)
Diseases Conditions	0.22[ge]	(0.42)	0.32[e]	(0.47)	0.50	(0.50)	0.55	(0.50)
- High blood pressure	0.02[e]	(0.14)	0.02[e]	(0.15)	0.10	(0.29)	0.06	(0.23)
- Diabetes	0.01[e]	(0.08)	0.00[e]	(0.03)	0.03	(0.18)	0.02	(0.14)
- Bronchitis/asthma	0.02[e]	(0.14)	0.03[e]	(0.16)	0.06	(0.24)	0.11	(0.32)
- Osteoarthritis	0.11[ge]	(0.31)	0.15[e]	(0.36)	0.29	(0.45)	0.35	(0.48)
- Myalgia	0.09[ge]	(0.28)	0.17[e]	(0.37)	0.21	(0.41)	0.26	(0.44)
- Osteoporosis/ decalcification of bones	0.00[ge]	(0.04)	0.02[e]	(0.12)	0.01	(0.11)	0.07	(0.26)
- Back problems	0.10[e]	(0.30)	0.12[e]	(0.32)	0.30	(0.46)	0.29	(0.45)
- Depression	0.02[ge]	(0.12)	0.03[e]	(0.17)	0.14	(0.35)	0.10	(0.30)
Diagnoses	0.07[ge]	(0.26)	0.03[e]	(0.18)	0.17	(0.38)	0.11	(0.31)
- Heart conditions	0.03[ge]	(0.18)	0.00[e]	(0.06)	0.09	(0.29)	0.03	(0.16)
- Strokes	0.00[e]	(0.06)	0.00	(0.05)	0.03	(0.17)	0.01	(0.07)
- Cancers	0.01	(0.09)	0.01	(0.11)	0.01	(0.11)	0.02	(0.13)
- Lung diseases	0.01[e]	(0.08)	0.01[e]	(0.08)	0.03	(0.18)	0.02	(0.14)
- Diabetes	0.00[g]	(0.06)	0.00[e]	(0.00)	0.00	(0.07)	0.01	(0.11)
- High blood pressure	0.01[g]	(0.09)	0.00	(0.00)	0.01	(0.11)	0.00	(0.04)
- Arthritis	0.01	(0.10)	0.01[e]	(0.10)	0.01	(0.11)	0.03	(0.16)
Demographic characteristics								
Born in 1940	0.42[e]	(0.49)	0.41[e]	(0.49)	0.57	(0.50)	0.52	(0.50)
Vocational training	0.48[g]	(0.50)	0.39[e]	(0.49)	0.41	(0.49)	0.30	(0.46)
Higher education	0.23[e]	(0.42)	0.26[e]	(0.44)	0.10	(0.31)	0.07	(0.25)
Living alone	0.10[ge]	(0.31)	0.20[e]	(0.40)	0.38	(0.49)	0.25	(0.43)
Partner at the same age[a)] or older	0.48[e]	(0.50)	-	-	0.31	(0.46)	-	-
Partner at the same age [a)] or younger	-	-	0.46[e]	(0.50)	-	-	0.40	(0.49)
Financial and job characteristics								
Log income, average of year *t-1* and *t-2*[b)]	12.4[ge]	(0.54)	12.1[e]	(0.41)	12.0	(0.61)	11.1	(2.88)
Wealth in year *t-1* in 1,000,000 d.kr.	0.51[ge]	(1.17)	0.20[e]	(0.41)	0.22	(0.56)	0.13	(0.43)
Compensation rate in year *t*	0.46[c)g]	(0.20)	0.57[d)]	(0.19)	-	-	-	-
Compensation rate is missing	0.11[g]	(0.31)	0.18	(0.38)	-	-	-	-
Experience	38.6[ge]	(5.55)	34.5[e]	(6.38)	33.2	(8.10)	29.3	(8.25)
Self-employed, assisting spouses etc.	0.13[g]	(0.34)	0.10	(0.29)	-	-	-	-
Skilled, unskilled workers	0.34[g]	(0.47)	0.15	(0.36)	-	-	-	-
Private sector	0.64[g]	(0.48)	0.32	(0.47)	-	-	-	-
Tenure	17.5[g]	(11.7)	16.5	(10.5)	-	-	-	-
Hours of work	40.7[g]	(8.58)	34.3	(8.44)	-	-	-	-
Physical demanding job	0.49[g]	(0.50)	0.57	(0.49)	-	-	-	-
Job satisfaction[e)]	3.59	(1.46)	3.60	(1.44)	-	-	-	-
Number of observations	1224		982		230[f)]		548 [f)]	

Notes: a) "Same age": +/- two years; baseline in each case is the most usual pattern b) In cases where earnings is less than zero, this information is replaced by information about surplus of own firm; c) 1093 observations; d) 808 observations; e) "Would choose the current job again": 1= yes, quite sure; 5 = no, certainly not; f) Number of observations differ for some variables due to missing values. [g]Significant gender difference, $p<0.05$. [e]Significant employed-not-employed difference, $p>0.05$.

Table A2.
Correlation between health measures, men.

	General health	Mental health	Health compared to others	Working capacity	Work limitations	Functional limitations	Diseases Conditions	High blood pressure	Diabetes	Bronchitis/ asthma	Osteoarthritis	Myalgia	Osteoporosis etc.	Back problems	Depression	Diagnoses	Heart conditions	Strokes	Cancers	Lung diseases	Diabetes	High blood pressure	Arthritis
General health	1.00																						
Mental health	0.32	1.00																					
Health compared to others	0.38	0.17	1.00																				
Working capacity	0.28	0.32	0.24	1.00																			
Work limitations	0.19	0.28	0.16	0.24	1.00																		
Functional limitations	0.26	0.11	0.29	0.12	0.07	1.00																	
Diseases Conditions	0.30	0.20	0.29	0.24	0.15	0.09	1.00																
High blood pressure	0.06	0.08	0.13	0.05	0.02	-0.03	0.26	1.00															
Diabetes	0.02	-0.02	0.08	0.03	0.05	0.05	0.14	0.15	1.00														
Bronchitis/asthma	0.05	0.07	0.02	0.06	0.07	0.01	0.26	-0.02	-0.01	1.00													
Osteoarthritis	0.29	0.19	0.27	0.21	0.12	0.11	0.64	0.05	-0.03	0.01	1.00												
Myalgia	0.22	0.20	0.23	0.22	0.19	0.08	0.57	0.04	0.02	-0.02	0.31	1.00											
Osteoporosis etc.	-0.02	0.00	-0.01	-0.04	-0.02	-0.01	0.08	-0.01	0.00	-0.01	0.12	0.13	1.00										
Back problems	0.29	0.16	0.28	0.22	0.12	0.12	0.61	0.01	-0.02	0.04	0.46	0.31	0.12	1.00									
Depression	0.06	0.27	0.00	0.09	0.04	-0.02	0.23	0.13	-0.01	0.08	0.06	0.15	-0.01	0.09	1.00								
Diagnoses	0.14	0.06	0.14	0.08	0.02	0.08	0.07	0.01	0.02	-0.01	0.07	0.05	-0.01	0.06	0.07	1.00							
Heart conditions	0.12	0.04	0.13	0.03	0.05	0.02	0.06	0.04	-0.01	0.01	0.02	0.06	-0.01	0.06	0.12	0.68	1.00						
Strokes	0.01	-0.01	0.05	0.02	0.01	0.07	0.00	-0.01	0.00	-0.01	-0.02	0.03	0.00	-0.02	-0.01	0.21	-0.01	1.00					
Cancers	0.00	0.01	-0.02	-0.02	0.00	0.03	-0.03	-0.01	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01	0.35	-0.02	-0.01	1.00				
Lung diseases	0.04	0.00	0.03	0.09	0.01	0.04	0.01	-0.01	-0.01	-0.01	0.01	0.01	0.00	0.01	-0.01	0.30	0.04	0.00	-0.01	1.00			
Diabetes	0.00	0.04	-0.01	-0.02	-0.03	-0.01	0.00	-0.01	0.17	-0.01	-0.02	-0.02	0.00	-0.02	-0.01	0.23	0.06	0.00	-0.01	-0.01	1.00		
High blood pressure	-0.01	-0.04	-0.02	0.02	-0.04	0.04	-0.02	0.06	-0.01	-0.01	-0.03	-0.03	0.00	-0.03	-0.01	0.31	0.09	0.16	-0.01	-0.01	-0.01	1.00	
Arthritis	0.12	0.05	0.12	0.09	0.01	0.03	0.10	-0.01	-0.01	-0.01	0.17	0.02	0.00	0.07	-0.01	0.38	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	1.00

Number of observations: 1224.

Table A3.
Correlation between health measures, women.

	General health	Mental health	Health compared to others	Working capacity	Work limitations	Functional limitations	Diseases Conditions	High blood pressure	Diabetes	Bronchitis/ asthma	Osteoarthritis	Myalgia	Osteoporosis etc.	Back problems	Depression	Diagnoses	Heart conditions	Strokes	Cancers	Lung diseases	Diabetes	High blood pressure	Arthritis
General health	1.00																						
Mental health	0.24	1.00																					
Health compared to others	0.41	0.16	1.00																				
Working capacity	0.32	0.19	0.34	1.00																			
Work limitations	0.19	0.32	0.17	0.23	1.00																		
Functional limitations	0.26	0.18	0.31	0.17	0.16	1.00																	
Diseases Conditions	0.36	0.21	0.24	0.22	0.21	0.14	1.00																
High blood pressure	0.12	0.05	0.13	0.07	0.05	0.09	0.22	1.00															
Diabetes	0.07	-0.04	-0.01	0.07	0.06	0.14	0.05	0.00	1.00														
Bronchitis/asthma	0.09	0.00	0.20	0.00	0.06	0.10	0.25	-0.03	-0.01	1.00													
Osteoarthritis	0.29	0.16	0.20	0.17	0.15	0.19	0.63	0.05	0.08	0.05	1.00												
Myalgia	0.26	0.15	0.09	0.14	0.13	0.04	0.66	0.06	-0.01	0.01	0.34	1.00											
Osteoporosis etc.	0.12	0.10	0.25	0.12	0.00	0.01	0.18	-0.02	0.00	0.03	0.04	0.08	1.00										
Back problems	0.34	0.19	0.18	0.19	0.14	0.15	0.53	0.05	-0.01	-0.06	0.39	0.36	0.16	1.00									
Depression	0.22	0.30	0.14	0.18	0.19	0.05	0.25	0.02	-0.01	-0.03	0.06	0.15	0.08	0.15	1.00								
Diagnoses	0.18	0.02	0.32	0.12	0.08	0.25	0.10	0.01	-0.01	0.14	0.07	0.03	0.02	0.06	0.04	1.00							
Heart conditions	0.10	-0.03	0.14	0.10	0.01	0.06	-0.01	-0.01	0.00	0.09	-0.03	0.01	0.12	-0.02	-0.01	0.35	1.00						
Strokes	0.04	0.02	0.10	0.05	0.03	0.09	0.02	0.15	0.00	-0.01	-0.02	-0.02	-0.01	-0.02	-0.01	0.25	0.00	1.00					
Cancers	0.05	0.02	0.11	0.03	-0.01	0.06	0.04	-0.02	0.00	-0.02	0.03	0.05	-0.01	0.02	0.04	0.61	-0.01	-0.01	1.00				
Lung diseases	0.06	-0.05	0.10	0.05	0.02	0.04	0.02	-0.01	0.00	0.21	-0.04	-0.01	0.09	-0.03	-0.01	0.46	0.18	0.00	0.10	1.00			
Diabetes	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		
High blood pressure	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
Arthritis	0.16	0.06	0.29	0.08	0.11	0.27	0.12	-0.01	0.00	0.11	0.14	0.01	-0.01	0.13	0.05	0.52	-0.01	0.00	-0.01	-0.01	.	.	1.00

Number of observations: 982.

Note: All the values for the diagnoses diabetes and high blood pressure are missing because none of the women in the sample have been hospitalised due to these diseases.

Table A4.
First-stage random effects IV estimates of health equations, men.

	Subjective health				Objective health			
	General health	**Mental health**	**Health compared to others**	**Working capacity**	**Work limitations**	**Functional limitations**	**Diseases Conditions**	**Diagnoses**
Parent alive	-0.018	0.007	-0.007	-0.004	-0.008	-0.005	0.004	-0.014
	(0.022)	(0.011)	(0.013)	(0.087)	(0.025)	(0.011)	(0.025)	(0.017)
Number of discharges	0.004	0.000	0.007***	-0.011	-0.005	0.005***	0.005	0.026***
	(0.003)	(0.002)	(0.002)	(0.012)	(0.003)	(0.001)	(0.004)	(0.002)
Physician visits 4-10	0.011	0.015	0.019	-0.010	0.034	-0.018	0.072**	0.015
	(0.021)	(0.011)	(0.012)	(0.085)	(0.024)	(0.010)	(0.025)	(0.017)
Physician visits 11-20	0.126***	0.049***	0.056***	0.196	0.073*	0.002	0.211***	0.046*
	(0.027)	(0.014)	(0.016)	(0.108)	(0.031)	(0.013)	(0.032)	(0.021)
Physician visits > 20	0.172***	0.065***	0.095***	0.462**	0.136**	0.013	0.268***	0.053
	(0.038)	(0.019)	(0.022)	(0.151)	(0.043)	(0.019)	(0.044)	(0.030)
Home work assistance	0.034	-0.001	0.033*	-0.004	0.025	0.019	-0.006	-0.013
	(0.024)	(0.012)	(0.014)	(0.095)	(0.027)	(0.012)	(0.028)	(0.019)
Transportation	0.079	0.046	-0.005	0.249	-0.067	0.013	-0.048	-0.017
assistance etc.	(0.078)	(0.041)	(0.045)	(0.318)	(0.091)	(0.039)	(0.093)	(0.063)
Accident etc.	0.056	-0.060	0.031	0.154	-0.139	-0.053	-0.147	0.004
	(0.066)	(0.034)	(0.038)	(0.266)	(0.076)	(0.033)	(0.078)	(0.053)
No exercise	0.037***	0.013**	0.014**	0.061	0.010	0.012**	0.018	0.005
	(0.009)	(0.005)	(0.005)	(0.037)	(0.011)	(0.005)	(0.011)	(0.007)
χ^2 test for power of instruments	125***	129***	93***	138***	70***	48**	103***	145***
Number of obs.	1224							

Note: Additional controls include individual earnings, wealth, compensation rate and a dummy variable for missing values for compensation rate, birth cohort, education, cohabitation including age differences between partners, experience, occupation, sector, tenure, hours of work, physical demanding job and job satisfaction.
* Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

Table A5.
First-stage random effects IV estimates of health equations, women.

	Subjective health				Objective health			
	General health	**Mental health**	**Health compared to others**	**Working capacity**	**Work limitations**	**Functional limitations**	**Diseases Conditions**	**Diagnoses**
Parent alive	-0.038	-0.025	-0.019	-0.303**	-0.026	-0.005	-0.019	-0.023
	(0.025)	(0.013)	(0.014)	(0.103)	(0.027)	(0.014)	(0.030)	(0.012)
Number of discharges	0.001	-0.003	0.013***	0.030	-0.002	0.010**	0.003	0.041***
	(0.006)	(0.003)	(0.003)	(0.025)	(0.007)	(0.004)	(0.008)	(0.003)
Physician visits 4-10	0.000	-0.013	-0.006	0.032	0.018	0.015	0.087*	-0.026
	(0.028)	(0.014)	(0.016)	(0.115)	(0.031)	(0.016)	(0.035)	(0.014)
Physician visits 11-20	0.063	0.044*	-0.007	0.055	0.046	0.024	0.179***	-0.009
	(0.034)	(0.017)	(0.019)	(0.139)	(0.037)	(0.020)	(0.042)	(0.017)
Physician visits > 20	0.132***	0.079***	0.036	0.500**	0.151***	0.052**	0.347***	-0.043*
	(0.040)	(0.020)	(0.022)	(0.161)	(0.043)	(0.023)	(0.049)	(0.019)
Home work assistance	0.070*	0.005	-0.004	-0.081	0.006	0.001	0.022	-0.005
	(0.029)	(0.015)	(0.016)	(0.119)	(0.032)	(0.017)	(0.037)	(0.014)
Transportation	-0.013	0.066	0.126**	0.843**	0.112	0.037	0.199*	0.084*
assistance etc.	(0.073)	(0.037)	(0.041)	(0.297)	(0.080)	(0.042)	(0.092)	(0.036)
Accident etc.	0.029	0.018	0.018	0.763	-0.017	0.040	-0.009	0.005
	(0.096)	(0.049)	(0.054)	(0.391)	(0.105)	(0.056)	(0.121)	(0.047)
No exercise	-0.020	0.018**	-0.014*	-0.123*	-0.013	0.006	-0.016	-0.005
	(0.013)	(0.006)	(0.007)	(0.052)	(0.014)	(0.007)	(0.016)	(0.006)
χ^2 test for power of instruments	63***	103***	81***	115***	42*	48**	100**	224***
Number of obs.	982							

See Table A4 for notes. * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

Table A6. Test of overidentifying restrictions, men (standard error in parentheses).

	Subjective health				Objective health			
	General health	**Mental health**	**Health compared to others**	**Working capacity**	**Work limitations**	**Functional limitations**	**Diseases conditions**	**Diagnoses**
RE								
$b_{poor\ health}$	-1.266***	-1.219**	-1.221***	-0.067	0.172	-0.428	-0.546**	-0.463
	(0.198)	(0.406)	(0.348)	(0.053)	(0.186)	(0.431)	(0.177)	(0.257)
REIV								
All instruments								
$b_{poor\ health}$	-1.892*	-5.186	-3.049*	-0.754	-2.656	-3.896	-1.847*	-1.344
	(0.857)	(2.708)	(1.553)	(0.498)	(1.660)	(2.650)	(0.735)	(0.811)
Exogeneity test	0.63	2.51	1.57	1.94	2.94	1.79	3.32	1.32
Minus parent alive								
$b_{poor\ health}$	-1.902*	-5.242	-3.066*	-0.737	-2.663	-3.944	-1.847*	-1.353
	(0.860)	(2.750)	(1.555)	(0.505)	(1.661)	(2.665)	(0.733)	(0.814)
Exogeneity test	0.58	2.89	1.53	2.21	2.95	1.79	3.40	1.34
Minus number of discharges								
$b_{poor\ health}$	-1.817*	-5.099	-3.118	-0.879	-3.346	-4.047	-1.791*	-4.368*
	(0.867)	(2.710)	(1.781)	(0.528)	(1.801)	(3.390)	(0.745)	(2.147)
Exogeneity test	0.55	2.49	1.61	2.54	3.93	1.16	2.97	5.80
Minus number of physician visits								
$b_{poor\ health}$	-0.814	-2.241	-1.698	0.454	-0.667	-2.736	-2.423	-1.021
	(1.416)	(4.177)	(2.006)	(0.962)	(2.037)	(2.847)	(1.770)	(0.828)
Exogeneity test	0.25	0.12	0.22	10.71	16.47	0.71	4.44	0.55
Minus home work assistance								
$b_{poor\ health}$	-2.036*	-5.174	-3.471*	-0.749	-2.868	-4.420	-1.844*	-1.336
	(0.880)	(2.712)	(1.634)	(0.500)	(1.720)	(2.781)	(0.735)	(0.813)
Exogeneity test	0.81	2.55	2.01	1.95	3.16	2.13	3.31	1.29
Minus transportation assistance etc.								
$b_{poor\ health}$	-1.963*	-5.798*	-3.009	-0.841	-2.543	-4.020	-1.823*	-1.331
	(0.858)	(2.743)	(1.553)	(0.522)	(1.674)	(2.660)	(0.735)	(0.812)
Exogeneity test	0.97	2.86	1.49	2.40	2.67	1.89	3.20	1.30
Minus accident etc.								
$b_{poor\ health}$	-1.843*	-5.104	-3.174*	-0.823	-2.655	-3.582	-1.811*	-1.348
	(0.860)	(2.788)	(1.561)	(0.510)	(1.835)	(2.713)	(0.747)	(0.812)
Exogeneity test	0.86	2.01	1.74	2.23	2.40	2.47	3.17	1.32
Minus no exercise								
$b_{poor\ health}$	-2.380*	-6.386*	-3.330*	-0.868	-2.684	-4.654	-1.890*	-1.339
	(0.981)	(3.216)	(1.665)	(0.558)	(1.693)	(3.026)	(0.746)	(0.813)
Exogeneity test	1.90	3.30	2.33	2.08	2.90	2.00	3.55	1.30

(*) Significant at a 10% level, * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

Table A7. Test of overidentifying restrictions, women (standard error in parentheses).

	Subjective health				Objective health			
	General health	Mental health	Health compared to others	Working capacity	Work limitations	Functional limitations	Diseases conditions	Diagnoses
RE								
$b_{poor\ health}$	-0.659***	-0.961**	-0.573	-0.155***	-0.275	-0.419	-0.124	-0.214
	(0.180)	(0.356)	(0.324)	(0.044)	(0.170)	(0.328)	(0.150)	(0.346)
REIV								
All instruments								
$b_{poor\ health}$	-1.866	-2.760	-1.216	-0.249	-1.348	-3.937	-0.854	-0.193
	(1.090)	(1.655)	(1.538)	(0.219)	(1.253)	(2.489)	(0.585)	(0.829)
Exogeneity test	1.48	1.25	n.a.	0.59	0.79	2.28	n.a.	n.a.
Minus parent alive								
$b_{poor\ health}$	-1.606***	-2.313	-0.775	-0.164	-1.059	-3.662	-0.827	-0.048
	(1.142)	(1.707)	(1.558)	(0.244)	(1.259)	(2.381)	(0.555)	(0.837)
Exogeneity test	0.87	0.74	n.a.	0.09	0.65	2.30	n.a.	n.a.
Minus number of discharges								
$b_{poor\ health}$	-1.861	-2.875	-1.804	-0.251	-1.366	-6.820	-0.854	0.858
	(1.091)	(1.679)	(2.044)	(0.223)	(1.259)	(3.895)	(0.583)	(2.680)
Exogeneity test	1.47	1.37	n.a.	0.57	0.80	2.75	n.a.	3.30
Minus number of physician visits								
$b_{poor\ health}$	-1.530	-3.943	-0.735	-0.190	0.975	-3.052	-0.740	-0.360
	(1.489)	(2.872)	(1.678)	(0.255)	(2.444)	(2.871)	(1.344)	(0.843)
Exogeneity test	4.62	1.10	n.a.	n.a.	0.90	1.44	n.a.	0.06
Minus home work assistance								
$b_{poor\ health}$	-1.615	-2.670	-1.308	-0.281	-1.359	-3.905	-0.824	-0.219
	(1.191)	(1.643)	(1.544)	(0.220)	(1.232)	(2.494)	(0.569)	(0.829)
Exogeneity test	0.91	1.22	n.a.	0.62	0.76	2.22	n.a.	0.00
Minus transportation assistance etc.								
$b_{poor\ health}$	-1.852	-3.218	-2.032	-0.379	-1.773	-4.514	-0.996	-0.298
	(1.089)	(1.685)	(1.795)	(0.249)	(1.419)	(2.691)	(0.646)	(0.840)
Exogeneity test	1.39	2.10	3.69	1.54	1.24	2.38	2.37	0.03
Minus accident etc.								
$b_{poor\ health}$	-1.777	-2.657	-0.939	-0.156	-1.410	-3.421	-0.842	-0.181
	(1.087)	(1.534)	(1.555)	(0.228)	(1.264)	(2.666)	(0.607)	(0.829)
Exogeneity test	1.29	5.65	n.a.	0.11	0.84	1.30	1.80	0.00
Minus no exercise								
$b_{poor\ health}$	-2.341*	-2.453	-1.647	-0.383	-1.665	-3.583	-0.920	-0.246
	(1.151)	(1.820)	(1.590)	(0.239)	(1.327)	(2.146)	(0.612)	(0.831)
Exogeneity test	2.28	0.72	n.a.	1.29	1.12	7.72	2.25	0.01

(*) Significant at a 10% level, * Significant at a 5% level, ** significant at a 1% level, *** significant at a 0.1% level.

Table A8. Means for health variables by changes in (planned) retirement age, men (standard deviations in parentheses).

			Changes in (planned) retirement age					
	All		Wave 1_R > Wave 2_R		Wave 1_R = Wave 2_R		Wave 1_R < Wave 2_R	
Poor general health								
Both waves	0.12	(0.32)	0.18	(0.39)	0.15	(0.35)	0.06	(0.25)
Wave 2 Only	0.05	(0.22)	0.03	(0.17)	0.08	(0.27)	0.05	(0.21)
Worsened mental health								
Wave 1 to wave 2	0.24	(0.43)	0.16	(0.37)	0.23	(0.42)	0.30	(0.46)
Worse health than others								
Both waves	0.03	(0.17)	0.06	(0.24)	0.04	(0.19)	0.01	(0.09)
Wave 2 Only	0.02	(0.15)	0.02	(0.15)	0.03	(0.17)	0.02	(0.14)
Reduced working capacity								
Wave 1 to wave 2	0.24	(0.42)	0.19	(0.39)	0.19	(0.40)	0.29	(0.45)
Work limitations								
Both waves	0.10	(0.30)	0.12	(0.32)	0.13	(0.34)	0.06	(0.25)
Wave 2 Only	0.09	(0.28)	0.07	(0.25)	0.05	(0.22)	0.13	(0.34)
Functional limitations								
Both waves	0.02	(0.13)	0.02	(0.15)	0.02	(0.15)	0.01	(0.09)
Wave 2 Only	0.01	(0.09)	0.01	(0.09)	0.00	(0.07)	0.01	(0.11)
Diseases conditions								
Both waves	0.14	(0.35)	0.24	(0.43)	0.14	(0.35)	0.09	(0.29)
Wave 2 Only	0.09	(0.29)	0.07	(0.26)	0.08	(0.27)	0.11	(0.32)
Diagnoses								
Both waves	0.01	(0.11)	0.00	(0.00)	0.02	(0.14)	0.01	(0.11)
Wave 2 Only	0.06	(0.24)	0.09	(0.28)	0.07	(0.26)	0.03	(0.18)
Number of observations	612		136		211		265	

Table A9. Means for health variables by changes in (planned) retirement age, women (standard deviations in parentheses).

	Changes in (planned) retirement age							
	All		Wave 1_R > Wave 2_R		Wave 1_R = Wave 2_R		Wave 1_R < Wave 2_R	
Poor general health								
Both waves	0.09	(0.29)	0.18	(0.38)	0.06	(0.23)	0.07	(0.26)
Wave 2 Only	0.09	(0.29)	0.05	(0.21)	0.11	(0.31)	0.10	(0.30)
Worsened mental health								
Wave 1 to wave 2	0.27	(0.44)	0.19	(0.39)	0.27	(0.45)	0.31	(0.46)
Worse health than others								
Both waves	0.02	(0.15)	0.06	(0.23)	0.01	(0.12)	0.01	(0.11)
Wave 2 Only	0.03	(0.17)	0.02	(0.14)	0.04	(0.19)	0.03	(0.17)
Reduced working capacity								
Wave 1 to wave 2	0.27	(0.45)	0.15	(0.36)	0.31	(0.46)	0.30	(0.46)
Work limitations								
Both waves	0.11	(0.32)	0.19	(0.39)	0.11	(0.31)	0.07	(0.26)
Wave 2 Only	0.09	(0.29)	0.01	(0.10)	0.10	(0.30)	0.13	(0.33)
Functional limitations								
Both waves	0.03	(0.18)	0.08	(0.28)	0.03	(0.18)	0.01	(0.08)
Wave 2 Only	0.01	(0.09)	0.00	(0.00)	0.01	(0.10)	0.01	(0.11)
Diseases conditions								
Both waves	0.22	(0.42)	0.33	(0.47)	0.22	(0.41)	0.17	(0.38)
Wave 2 Only	0.10	(0.31)	0.06	(0.23)	0.12	(0.33)	0.11	(0.32)
Diagnoses								
Both waves	0.00	(0.05)	0.01	(0.10)	0.00	(0.00)	0.00	(0.00)
Wave 2 Only	0.04	(0.19)	0.06	(0.23)	0.04	(0.20)	0.02	(0.13)
Number of observations	491		107		208		176	

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