The Geneva Papers, **2010**, **35**, (644 – 667)

www.genevaassociation.org

Early Retirement Among Men in Britain and Germany: How Important is Health?*

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Britain and Germany, like much of the Western world have concerns about the ageing of the population and early exit of older workers from the labour market. Policy debates have focused on direct changes to retirement ages and incentives to encourage greater pension saving. Less attention has been paid to the role of health. We use hazard models applied to longitudinal data from Britain and Germany to estimate the effect of health on early retirement among men. Our results show that health is a key determinant, and its effect is large compared to that of other variables, including the type of pension an individual has access to.
The Geneva Papers (2010) **35,** 644–667. doi:10.1057/gpp.2010.24

Keywords: health; early retirement; hazard models

Introduction

Much of the Western world has concerns about the ageing of the population and the level of finance needed to support the elderly. Britain and Germany are no exception, and the problem in these two countries is exacerbated by early exit of older workers from the labour market. The policy debate has focused on direct changes to statutory retirement ages and incentives designed to encourage greater pension saving. Less attention has been paid to the role of health as an important determinant of whether or not older workers remain in the labour market. A recent review of policies for the "greying labour market" in both Britain and Germany found no policies that specifically targeted older workers with health problems.[1]

Potential explanations for the trend towards a decreasing retirement age include more generous social security systems and increases in wealth compared with some decades ago. It is likely that these incentives will differ in importance between the two

* This paper derives from the work of two projects: 'Health, Retirement and Inequality: Can Germany and the U.K. learn from each other?" funded by the Anglo-German Foundation (grant number: 1462), and "The dynamics of income, health and inequality over the lifecycle" (ECuityIII Project), which was funded in part by the European Community's Quality of Life and Management of Living Resources programme (contract: QLK6-CT-2002–02297). We would like to thank Martin Schellhorn (National Research Centre for Health and Environment, Munich) and Lynn Gambin (Institute for Employment Research, University of Warwick) for valuable help during these projects.
[1] See Frerichs and Taylor (2005).

countries with, for example, the increase in housing wealth being more important in Britain and the generosity of pension schemes being a key factor in Germany. In addition, more generous health and disability insurance systems reduce the adverse financial consequences for individuals in poor health who drop out of the labour market. The "disability route" into retirement has been identified as an important phenomenon of the labour market in both countries.[2,3]

Despite shared pressures there are differences between the two countries. Labour force participation of workers aged 55–64 years is around 58 per cent in Britain and only 43 per cent in Germany. Of the economically inactive in this age group 13 per cent describe themselves as retired in Britain and 14 per cent as ill or disabled, whereas in Germany these figures are 29 per cent and 4 per cent, respectively.[1] As we will see in this paper, when men are asked about their own perception of their general health, the distributions for the two countries are quite similar, therefore it is likely that the differences in labour market status reporting are a result of, *inter alia*, differences in the countries' pensions and benefits arrangements, rather than differences in health *per se*.

The primary motivation of this paper is to understand the effect of health on the decision of older workers to retire. While some evidence exists for Britain and Germany, there is no systematic comparative work to assess whether the impact of ill-health on early retirement varies between the countries and in particular whether it varies according to levels of social protection offered by the pension and transfer schemes. We focus on men as they have the same State retirement age, 65 years, in both countries.

Our main contribution is to compare the effects of health on early retirement across two countries that share concerns about the ageing population and its implications for the labour market and welfare system. These two countries both have longitudinal micro panel data sets that have a number of advantages for our research. First, the data sets are largely comparable. Second, they contain both good data on health and information on pension entitlement, as well as a rich set of covariates; this is rare in national data sets. Third, data are from individuals and households allowing us to consider the effect of spouse's health and employment status. Finally, the panels are relatively long, giving us a sufficient time series dimension to estimate duration models.

We use the comparable longitudinal data sets from Britain and Germany to estimate hazard models of the effect of health on early retirement among men. We condition on a broad set of socio-economic characteristics such as education, pension entitlement, housing tenure and income; we also take account of spousal health and employment status. We make efforts to deal with the potential endogeneity of health, as well as the reporting bias that may result from our use of self-reported health measures. We also take care to ensure that our variables, and thus our results, are, as far as possible, comparable across the two countries.

The results from our models show that health is a key determinant of the retirement hazard for both men in Britain and Germany. The size of the health effect appears large compared to the other variables, and in particular in relation to the effects of pension entitlement in both countries. In light of these results, designing financial

[2] See Riphahn (1997).
[3] See Blundell *et al*. (2002).

incentives to encourage people to work for longer may not be sufficient as a policy tool if people are leaving the labour market involuntarily due to health problems. Indeed, in this context even raising the statutory retirement age may have a smaller effect than anticipated. Instead our findings suggest that there is a need to improve the health of the work force and put resources into facilitating continued work for people with health problems and disabilities.

This paper is structured as follows. The following section outlines the background to our work, the subsequent section explains our methods and the following section describes our data and variables. The results are presented in the next following section and discussed in the penultimate section. The final section concludes and considers the policy implications of our work.

Background

Poorer health may increase the disutility of work, reduce the return from work and entitle the individual to benefits that are contingent on not working.[4,5] All of these factors will reduce the probability of continued work. However, poorer health may increase consumption requirements and therefore necessitate higher income; but if poorer health also reduces life expectancy then the annualised consumption available from existing wealth is raised, and this may still lead to earlier retirement.

Health effects operate within the pensions and benefits system, and there is an enormous literature on the importance of these financial incentives in determining retirement behaviour (see Borsch-Supan and Schnabel[6] for Germany and Blundell *et al.*[3] for Britain). However, Lindeboom,[7] in a comprehensive review, argues that a number of studies have shown that health is the most important determinant of an older person's labour supply. A survey for the U.K. Department for Work and Pensions[8] found that 50 per cent of people aged between 50 and 69 years were not seeking work due to ill-health, and 20 per cent had been forced to retire because of ill-health. For Germany, Siddiqui[9] finds strong effects of health on retirement behaviour. Individuals reporting a chronic condition or a disability are four times more likely to leave employment than healthy individuals. For Britain, Disney *et al.*[5] find that health shocks are an important determinant of retirement behaviour.

Our focus is on health but it is important to stress some of the key differences between Britain and Germany in relation to pensions and benefits. In both countries disability benefits are available before the statutory retirement age. In Germany, the rate depends on the extent of disability and an earnings test. Eligibility tends to have been interpreted generously and this has been used as a device to keep unemployment rates down. In Britain, Incapacity Benefit (IB) is available to those unable to work

[4] See Lazear (1986).
[5] See Disney *et al.* (2006).
[6] See Borsch-Supan and Schnabel (1997).
[7] See Lindeboom (2006).
[8] See Humphrey *et al.* (2003).
[9] See Siddiqui (1997a, b).

because of ill-health or disability; it is paid at one of three rates, depending on the length of time the individual has been unable to work. IB replaced Invalidity Benefit in 1995, accompanied by stricter eligibility criteria, in response to a rapid growth in the number of recipients. These changes reduced economic incentives to retire via the "disability route" and in principle strengthened the link between true work-related disability and inactivity. However, Berthoud[10] and Peasgood *et al.*[11] find that after controlling for health, the probability of leaving IB declines with age and the majority of economically inactive people aged 50–65 years are in receipt of IB.

In general, except in the case of very low earners, Germany has a more generous pension system than Britain. At almost all earnings levels the net replacement rate (NRR) is much higher in Germany. For example, at average earnings, the NRR is 72 per cent in Germany and only 48 per cent in Britain; compared to an OECD average of 69 per cent.[12] While private pensions in Britain compensate to some extent, these are only held by 25 per cent of men in our sample and 12 per cent of women. This two-tier pension system contributes to inequality, compared to the more homogenous pension benefits available in Germany. In Britain, around 33 per cent of pensioners claim means-tested benefits whereas in Germany it is less than 5 per cent.[13] However, inequality and poverty among older people in Germany are expected to increase as a result of pressures on the pension system.[14]

There is also a weight of evidence supporting the importance of the joint determination of the retirement decision of husbands and wives.[15,16] The effect of the health status of both partners on each other's retirement decision has been largely neglected. This is an important omission because, for example, early retirement can be caused by the necessity to provide care for a dependent spouse. In this paper, we take account of both the health and employment status of the spouse.

Methods

Estimating the effect of health on early retirement is not straightforward, especially using the subjective measures of health that are generally available in longitudinal data sets; this has been a focus of much attention.[5,17,18,19]

First, there may be simultaneity between self-assessed health (SAH) and labour market status; that is, while poor health may increase the probability of leaving the

[10] See Berthoud (2004).
[11] See Peasgood *et al.* (2006).
[12] See OECD (2005).
[13] See Oswald (1999, p. 10).
[14] See Naegele and Walker (2002).
[15] The use of the term wife does not imply anything about the legal status of the relationship and is also applied here to people living as couples who are not legally married.
[16] See, for example, Blau and Riphahn (1999), Jiménez-Martín *et al.* (1999), Gustman and Steinmeier (2000), Michaud (2003).
[17] See Kerkhofs and Lindeboom (1995).
[18] See Bound *et al.* (1999).
[19] See Lindeboom and Kerkhofs (forthcoming).

labour market, the transition to economic activity may also cause deterioration in health. Second, SAH is based on subjective judgements, which may not be comparable across individuals;[20] for example, one person's interpretation of "poor" health may be different to another person's. Third, since ill-health may represent a legitimate reason to be economically inactive, respondents who are not working may cite health problems as a way to rationalise behaviour.[17,21] Fourth, individuals for whom the financial rewards of continuing in the labour force are low, have an incentive to report ill-health as means of obtaining disability benefits. However, Bound[22] argues that objective measures of health may not be better as predictors of the relationship between health and labour market status. Objective measures are unlikely to be perfectly correlated with the aspect of health that affects an individual's capacity for work, and this "measurement error" will downwardly bias estimates, causing health to look less important as a determinant of labour market status.

Empirical studies on the role of health in retirement provide mixed conclusions about the endogeneity of SAH and the extent of the bias provided through measurement error. Kerkhofs *et al.*[23] find that the choice of health measure does affect the estimates of health on labour market outcomes; Dwyer and Mitchell[24] conclude that their models of retirement do not suffer significantly from measurement bias. Au *et al.*[25] apply a direct test for measurement error, and report significant error in their SAH variable. However, when this measure was used to predict retirement behaviour it gave similar results to those obtained from using a more objective measure of health.

The data that we use in our study includes two alternative measures of health, which means we can compare the results from the alternative approaches. First, to deal with reporting bias we employ a method used by Bound *et al.*[18] and subsequently adopted by Au *et al.*[25] and Disney *et al.*[5] In common with many studies of health and socio-economic status, the SAH measure used in our models provides an ordinal ranking of perceived health status. For example, the data for Britain is derived from the question: " … would you say that your health has on the whole been excellent/good/fair/poor/very poor?". The method involves estimating a model of this ordinal SAH variable as a function of a set of more objective health indicators (see Section III) to define a latent health variable. The predicted latent health variable is then used as an indicator of health in the model of retirement. This is an instrumental variable-type procedure and is an accepted method of dealing empirically with errors-in-variables.[26] Second, to test the robustness of our results, and to provide a more straightforward comparison between the results for Britain and Germany, we also estimate models using the raw SAH variable directly. It could also be argued that SAH may in fact be more appropriate than the latent health variable, because while it

[20] See Lindeboom and van Doorslaer (2004).
[21] See Kerkhofs and Lindeboom (1995), Kreider (1999).
[22] See Bound (1991).
[23] See Kerkhofs *et al.* (1999).
[24] See Dwyer and Mitchell (1999).
[25] See Au *et al.* (2005).
[26] See Griliches (1974), Fuller (1987).

is prone to reporting bias, what matters for behaviour is an individual's subjective assessment of his/her own health rather than a underlying objective health status.

Of further relevance is whether a change in labour market status is best identified by a health "shock" or by, for example, a slow deterioration in health. Modelling health shocks is a convenient way of eliminating one source of potential bias caused by correlation between unobserved factors that might affect both health status and retirement status, because differenciating over consecutive time periods eliminates time invariant unobserved effects. Riphahn[27] has investigated the effect of health shocks on the employment and income of older workers in Germany, and finds significant effects on leaving employment as well as small reductions in individual and equivalent household income. Disney *et al*.[5] do similar for Britain and find that positive and negative health shocks tend to have symmetric effects.

Our models include a measure of lagged health, together with initial period health. By conditioning on initial period health the coefficient on lagged health represents the effect of a health shock. It also seems plausible that lagged health may be more informative about the decision to retire because transitions take time. This also reduces fears of simultaneity bias, exploiting the timing of events by observing the effect of health shocks prior to the time of retirement.[28]

We use the duration model approach of Jenkins[29] to estimate the effect of health on the probability of early retirement. The transition to retirement is represented as a discrete time hazard model. The sample is made up of those who are working at the starting period of the analysis (they can be employed or self-employed, and working full- or part-time); these individuals can then either stay in the labour force or exit into retirement in each subsequent wave. The approach controls for "stock sampling", that is, the fact that all the people we observe are still in the labour market at the start of our analysis (p. 4).[29]

The functional form of the hazard rate is a complementary log-log.[30] The baseline hazard is modelled as a step function, using dummy variables to represent the age of our sample of individuals at risk (of retirement). All estimation is carried out in STATA using the *pgmhaz8* routine.[31]

A common problem with longitudinal data is sample attrition, and people may leave the sample for health-related reasons,[32] or reasons related to labour market status (for example, see Zabel[33] and Ziliak and Kniesner[34]). A systematic relationship between health and labour market participation and attrition will lead to bias in our results. To test for this bias we use a variable addition test proposed by Verbeek and Nijman.[35]

[27] See Riphahn (1999).
[28] See Abbring and van den Berg (2003).
[29] See Jenkins (1995).
[30] See Prentice and Gloeckler (1978).
[31] See Jenkins (1997).
[32] See Jones *et al*. (2006).
[33] See Zabel (1998).
[34] See Ziliak and Kniesner (1998).
[35] See Verbeek and Nijman (1992, p. 688).

Data and variables

Three main data sources are used in this study. The first two are nationally representative longitudinal surveys for Britain and Germany that include a rich set of socio-economic variables. In the German Socio-economic Panel (GSOEP) the same private households have been surveyed annually since 1984, when 5,921 households containing 12,290 respondents participated in the "SOEP West" survey. This was expanded in 1990 to include the former German Democratic Republic, and this "SOEP East" sample included 2,179 households with 4,453 respondents. The British Household Panel Survey (BHPS) started later in 1991; the first wave achieved a sample of around 5,500 households, covering approximately 10,300 adults.

While the BHPS and GSOEP are generally thought to be equivalent types of data, they do not have cross-national comparability as a survey goal. We supplement the individual country surveys with information from the Cross National Equivalent File (CNEF). This is the result of collaboration between researchers working with longitudinal data from individual countries; the aim of which is to produce compatible data sets for use in cross-national research. The CNEF unites comparably defined variables from the BHPS and the GSOEP that can be used independently or in tandem with the original survey data. In addition, it provides a set of constructed variables that are not immediately available in the original data; for example "pre- and post-government" household income, that is household income before and after taxes and transfers.

We consider the same time period for Britain and Germany, from 1991 to 2002. The econometric analysis uses a sample consisting of those men who were aged 50 years or over *and* had a full interview *and* were working (employed or self-employed) at the start of the analysis period. There is a potential selection issue that is not dealt with here since people in very poor health may not have been working in wave one and hence cannot be observed to retire in our sample. To focus on early retirement, individuals are dropped from the risk set when they reach the state retirement age, which is 65 years for men in both countries. For Britain we start with 549 men, and for Germany 1,003 men. The samples are reduced over time by attrition, which largely arises through refusal, non-contact and because people become ineligible to participate. Attrition may be endogenous (related to retirement) and we test for this possibility.[36] The original samples for both the BHPS and GSOEP are reduced by around one third by the end of the period; by this time almost half of the original sample is retired.

All variable codes and definitions are summarised in the Appendix. The dependent variable is retirement status and in line with previous work, the definition of retirement is self-reported. As has already been noted in the literature,[37] retirement is not a well-defined state. It is not always clear whether individuals in this age group are economically inactive because they have retired or are simply unemployed for a period of time. This problem is exacerbated by pension entitlement because some individuals may associate retirement with the final and permanent exiting from work

[36] The Verbeek and Nijman test results suggest there may be some indication of attrition bias in the BHPS sample. However, further exploration suggests that even though attrition may be related to retirement, its effect on our results is likely to be negligible.

[37] For example, Disney *et al.* (1994) and Bardasi *et al.* (2002).

whereas others may not define themselves as retired unless they are actually in receipt of a pension. Further social norms and routes into retirement via disability and unemployment complicate the self-reporting of labour market status for older workers. A Department for Work and Pensions (DWP) survey for the U.K.[8] noted that after State Pension Age people appear to redefine their status, with a sudden drop in the numbers of people defining themselves as long-term sick or disabled after State Pension Age—from 27 to 1 per cent in men, and from 16 per cent to 4 per cent in women. We have cross-checked our self-reported retirement status data with income source data (for Britain) and time use data (for Germany) in order to assess its reliability. While certainly not perfect as an indicator of retired status, the self-reported measure is suitable for our analysis.

The propensity to retire early is shown in the first row of Table 1, which contains descriptive statistics for all of the variables that we use, disaggregated by gender and by pre- and post-early retirement. A higher proportion of men report their status as retired before statutory retirement age in Germany (25 per cent) compared to GB (15 per cent). We model the transition to retirement with a dichotomous variable that takes a value 1 if the individual reports their labour market status as retired and 0 otherwise. We assume that the first transition is an absorbing state (if an individual retires they stay retired for all subsequent waves), and our models are estimated on complete sequences of observations such that should an individual leave the panel but then return at a later date, we only make use of information up to the wave of first exit.[38]

The key explanatory variable is health status. We rejected the CNEF health variable on the grounds of poor comparability across the two countries and instead we construct a health status measure directly from the general SAH question in the BHPS and the GSOEP. For the BHPS the standard question is "over the last 12 months, compared to people of your own age, would you say your health on the whole has been: excellent, good, fair, poor, very poor". For the GSOEP the question is "how would describe your current state of health: very good, good, satisfactory, poor, bad". These SAH questions (and many like them from similar surveys in other countries) provide an ordinal ranking of perceived health status that has been used widely in studies of the relationship between health and socio-economic status.[5,32,39,40] While in the BHPS the question wording aims to remove the age effect on health, this appears to be unsuccessful.[41] Unfortunately, as is often the case in longitudinal studies, there are some inconsistencies in these questions over time. In the BHPS there is a change in wording for wave nine only; to achieve consistency over all waves we use four-point reclassification recommended by Hernandez-Quevedo *et al*.[41] In the GSOEP the question was not asked in 1991 or 1993; in these years an 11-point "satisfaction with health" question was available, so the distributions for these variables were matched to our constructed four-point scale in 1992 and 1994 in order to create data for the

[38] Of those people aged over 50 years and retired in any one wave, a small proportion participate in the labour market again in subsequent waves. Subsequent transitions could be analysed but, due to the small sample sizes, we have chosen not to pursue this.
[39] See Contoyannis *et al*. (2004).
[40] See Jones and Wildman (2008).
[41] See Hernandez-Quevedo *et al*. (2005).

Table 1 Descriptive statistics—proportion of observations in each group

	BHPS			*GSOEP*		
	All	*Pre-retirement*	*Post-retirement*	*All*	*Pre-retirement*	*Post-retirement*
Retired early	0.152	—	—	0.253	—	—
Own health						
Excellent SAH	0.238	0.257	0.197	0.214	0.259	0.192
Good SAH	0.486	0.485	0.488	0.423	0.456	0.404
Fair SAH	0.213	0.2	0.24	0.325	0.259	0.361
Poor SAH	0.064	0.058	0.075	0.087	0.023	0.044
Spousal health						
Excellent SAH	0.156	0.171	0.126	0.352	0.371	0.32
Good SAH	0.431	0.437	0.419	0.356	0.328	0.406
Fair SAH	0.191	0.192	0.191	0.242	0.251	0.228
Poor SAH	0.085	0.084	0.088	0.026	0.028	0.022
Covariates						
Age	61.8	59.5	66.6	60	57.3	64.5
Married or couple	0.867	0.886	0.827	0.876	0.877	0.875
Spouse has job	0.413	0.528	0.174	0.419	0.491	0.296
High education	0.084	0.087	0.078	0.176	0.185	0.162
Medium education	0.18	0.188	0.164	0.519	0.497	0.554
Low education	0.736	0.725	0.758	0.292	0.311	0.16
Mean household inc	—	£15,123	—	—	€28,509	—
Own house outright	0.522	0.421	0.732	—	—	—
Have mortgage	0.32	0.415	0.122	—	—	—
Private rent accommodation	0.046	0.054	0.027	—	—	—
Local authority housing	0.112	0.109	0.118	—	—	—
Owner occupier	—	—	—	0.472	0.447	0.514
Subsidised housing	—	—	—	0.92	0.095	0.086
Employer pension	0.539	0.527	0.563	—	—	—
Private pension	0.402	0.454	0.274	—	—	—
State pension	0.249	0.232	0.287	—	—	—
Civil servant	—	—	—	—	0.095	—

missing years. In addition, the question was not asked in 1991 for East Germany, so the 1990 values are used in its place.

Our SAH variable is therefore a four-point classification for each wave, as shown below:

SAH	*BHPS*	*GSOEP*
1 Poor health	Very poor and poor	Bad and poor
2 Fair health	Fair	Satisfactory
3 Good health	Good	Good
4 Excellent health	Excellent	Very good

The proportion of observations in each SAH category for both countries is shown in Table 1, both before and after early retirement. Overall the health profiles are similar, although a slightly larger proportion of the German sample report their health as *fair* rather than either *poor* or *good*. For both countries, the post-retirement sample exhibits worse health.

In one set of models we use the ordinal four-point SAH measure directly, but as an alternative we also use a predicted latent health variable as described in Section II. For Britain, we estimate latent health by regressing SAH (via a random effects ordered probit model[42]) on a set of "specific health problems"; the respondent is asked whether or not they have any of the problems listed: arms, legs or hands, sight, hearing, skin conditions or allergies, chest/breathing, heart/blood pressure, stomach or digestion, diabetes, anxiety or depression, alcohol or drugs, epilepsy, migraine or other. For Germany, fewer health indicators are available, thus the constructed health stock measure is obtained by regressing SAH on all available socioeconomic variables (except labour market status), formal disability rating (an official registration made by the German Pension Office which classifies the degree of disability on a continuous scale) and satisfaction with health (an 11-point scale ranging from "not at all satisfied" to "completely satisfied"). One drawback of the different latent health models is that it is then difficult to compare the quantitative effects of health across countries. For this reason we make direct comparisons using the ordinal SAH variable, using the latent health measure as a robustness check.

In our models, we include the one period lagged value of health in an effort to reduce feedback problems from retirement status to health, and we also condition on initial period health so that the coefficient on lagged health represents the effect of a health shock.

As well as an individual's own health, the models also include spouse's health measured in the same two ways as for own health. The models also include a dummy for whether or not the spouse is employed. Education is classified as a series of binary dummies. In Germany, the distinction is made between individuals who have received only mandatory schooling (the reference group) and those with higher levels of education. For Britain, the reference group are people with no formal qualifications, and dummy variables are defined for O-levels and Certificates of Secondary Education (CSEs), Higher National Diploma (HND) and A-level and higher education and beyond.

For the BHPS we distinguish between three categories of pension: state pension only (base), private and employer pension. It is expected that the latter category results in the most generous retirement income and reliance on a state pension is likely to result in the lowest post-retirement income. In the models for Britain we also include dummy variables for employment sector and occupational classification, which act partly as proxies for pension benefits: industrial sectors are private companies, civil service and local government, and other. Occupational categories are management and administration, professional, clerical and secretarial, craft or related, personal services,

[42] In the interests of concise exposition, the results of the ordered probit models used to estimate latent health stock are not reported here.

sales, plant operative and other occupations. In Germany, there is less heterogeneity in pension coverage and the important distinction is between Class 1 civil servants and everyone else, since the civil service pension has more generous benefits. The German models also include dummies for the industrial sector (agriculture, energy, manufacturing, construction, trade, transport, banking and services, and baseline mining).

The housing tenure variable is used to proxy for wealth and social class. For the BHPS, we define four binary dummies: own house outright (base), own with a mortgage, live in private rented accommodation, live in housing association or local authority rented accommodation. For the GSOEP, we have two binary dummies: owner occupier and those who live in subsidised housing.

For Britain, the income variable is the individual specific mean of log equivalised household income across all waves prior to retirement. We use only pre-retirement waves in order to minimise endogeneity problems, because for most people income will change significantly at retirement. For Germany, the equivalent variable is the mean of the log of household post-government income.

We distinguish those people who are married or living as a couple from those who are single, widowed or divorced. Dummies are included for each age prior to statutory retirement age. Regional dummies are used to control for local labour market conditions. There are 18 regions defined for Britain and dummies for the North and South of Germany; the estimated coefficients are not reported. In Germany there are also variables that denote a person who originates from East Germany and when the individual does not have German citizenship.

Results

Figures 1 and 2 display Kaplan–Meier estimates of the probability of survival (not retiring) by SAH status in both countries. For men in Britain, those in the worst SAH state (*poor*) have the highest propensity of retirement (at all ages). However, this is followed by those in the best health state (*excellent*). Those in *good* health seem to remain longest in the labour market but the propensities to retire for those in *fair* health are very similar to this. In Germany, while men with the lowest SAH status have the greatest probability of retirement at all ages there is no clear gradient for any of the other health levels.[43] Thus this simple bivariate analysis suggests that there is some indication that SAH is important to the timing of retirement, but the relationship is not clear. Of course the bivariate analysis is confounded by many other factors, such as household income, educational attainment, employment sector and of course pension entitlement, thus we attempt to control for these factors in the multivariate models that follow.

Results for the hazard models of retirement are shown in Tables 2 and 3. Our primary focus is the role of health. Two alternative ways of measuring health are considered; the first two columns of each table use the ordinal four point SAH

[43] If we test for equality of the survivor functions for each country, for the BHPS we cannot reject the null hypothesis equality, which may be due to low numbers of retirements in some health states; for the GSOEP we do reject the null hypothesis of equality.

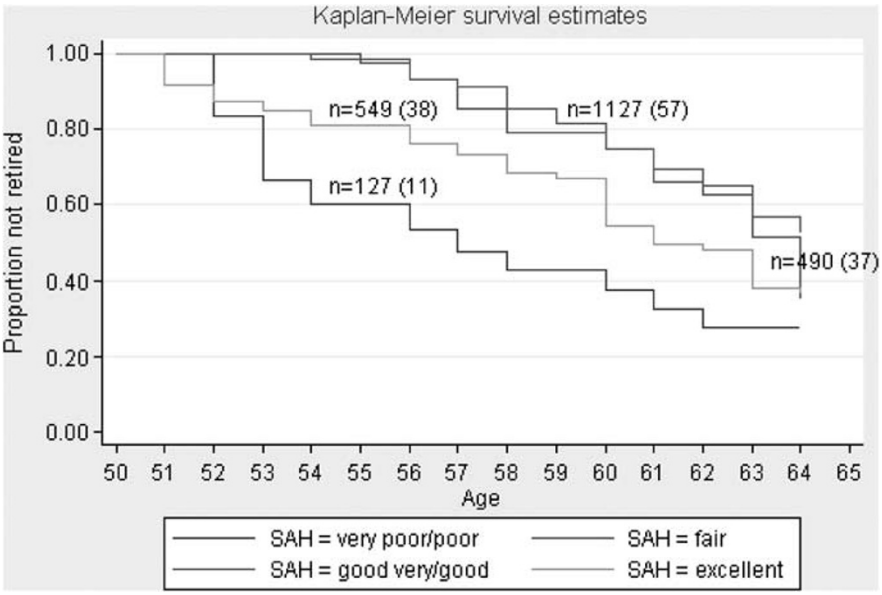

Figure 1. Kaplan–Meier survival curves for the BHPS.
Note: "n" refer to total number at risk of retirement and the figures in parentheses are the total retired for each SAH category.

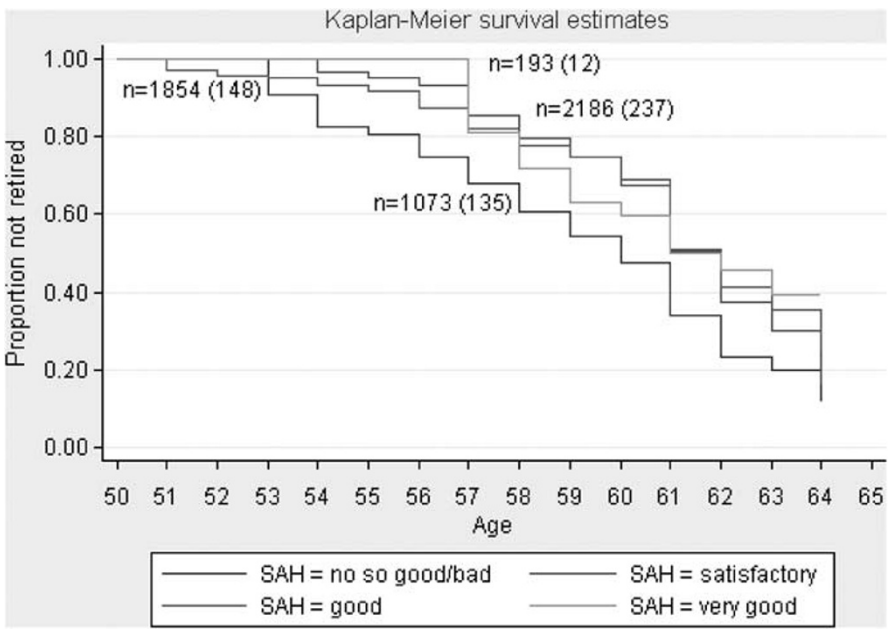

Figure 2. Kaplan–Meier survival curves for the GSOEP.
Note: "n" refer to total number at risk of retirement and the figures in parentheses are the total retired for each SAH category.

Table 2 Hazard model for retirement transition for men in GB

	Self-assessed health n = 2138		*Latent health n = 2096*	
	Coef	*Hazard ratio*	*Coef*	*Hazard ratio*
Own health				
Fair SAH ($t-1$)	−0.903*	0.405	—	—
Good SAH ($t-1$)	−1.138*	0.320	—	—
Excellent SAH ($t-1$)	−1.347*	0.260	—	—
Fair SAH (0)	−0.552	0.575	—	—
Good SAH (0)	−0.443	0.642	—	—
Excellent SAH (0)	−0.154	0.857		
Latent health ($t-1$)	—	—	−0.755*	0.470
Latent health (0)	—	—	0.0723	1.075
Spouse				
Fair SAH ($t-1$)	0.224	1.251	—	—
Good SAH ($t-1$)	−0.109	0.897	—	—
Excellent SAH ($t-1$)	−0.488	0.613	—	—
Latent health ($t-1$)	—	—	−0.199	0.819
Has job ($t-1$)	−0.479*	0.619	−0.746*	0.474
Education				
Degree or higher degree	−0.842	0.431	−1.097	0.334
HND or A levels	−0.136	0.873	−0.202	0.816
O levels or CSEs	−0.296	0.744	−0.182	0.834
Income and wealth				
Own house with mortgage ($t-1$)	0.276	1.318	0.390	1.477
Local authority or housing association ($t-1$)	0.092	1.096	0.053	1.054
Private rented housing ($t-1$)	−0.533	0.587	−1.035	0.355
Log household income	1.064*	2.899	1.059*	2.882
Pensions				
Private pension	−0.689*	0.502	−0.998*	0.368
Employer pension	0.209	1.231	0.547	1.727
Private sector (0)	0.624	1.866	0.603	1.827
Civil service/Local government (0)	1.681*	5.369	2.000*	7.389
Other sector (0)	0.483	1.621	0.504	1.655
Socio-demographics				
Married or couple	−0.199	0.819	−0.336	0.715
Age 53 years	0.223	1.250	0.119	1.127
Age 54 years	0.491	1.633	0.562	1.753
Age 55 years	−0.846	0.428	−0.946	0.388
Age 56 years	1.496	4.934	1.775*	5.901
Age 57 years	0.807	2.242	1.033	2.812
Age 58 years	1.395	4.036	1.769*	5.865
Age 59 years	0.864	2.374	1.200	3.321
Age 60 years	2.159*	8.669	2.657*	14.254
Age 61 years	1.836*	6.272	2.483*	11.981
Age 62 years	1.662*	5.271	2.217*	9.180
Age 63 years	2.765*	15.881	3.456*	31.699
Age 64 years	2.414*	11.183	3.203*	24.603
Log likelihood	−355.192		−357.665	

* Statistically significant at 5% level.
Note: (0) denotes initial (wave 1) values. Regional and occupational dummies included but not reported here.

Table 3 Hazard model for retirement transition in Germany

	Self-assessed health n = 5,306		*Latent health n = 5,212*	
	Coef	*Hazard ratio*	*Coef*	*Hazard ratio*
Own health				
Fair SAH ($t-1$)	−0.427*	0.652	—	—
Good SAH ($t-1$)	−0.561*	0.571	—	—
Excellent SAH ($t-1$)	−0.709*	0.492	—	—
Fair SAH (0)	−0.146	0.864	—	—
Good SAH (0)	−0.208	0.812	—	—
Excellent SAH (0)	−0.225	0.798	—	—
Latent health ($t-1$)	—	—	−0.225*	0.798
Latent health (0)	—	—	−0.071	0.932
Spouse				
Fair SAH ($t-1$)	0.062	1.064	—	—
Good SAH ($t-1$)	0.055	1.057	—	—
Excellent SAH ($t-1$)	−0.066	0.936	—	—
Latent health ($t-1$)	—	—	0.064	1.066
Has job ($t-1$)	−0.032	0.968	−0.060	0.941
Higher education	0.056	1.057	0.089	1.094
Income and wealth				
Log household income	−0.651*	0.521	−0.661*	0.516
Owner occupier	−0.133	0.876	−0.102	0.903
Subsidised housing	−0.216	0.806	−0.192	0.826
Pensions				
Civil service (0)	0.196	1.216	0.196	1.216
Origin				
East German	−0.057	0.944	−0.103	0.902
Foreigner	−0.458*	0.632	−0.394*	0.674
Socio-demographics				
Married or couple	0.448*	1.565	0.148	1.160
Age 54 years	0.861	2.364	0.864	2.374
Age 55 years	0.173	1.189	0.199	1.220
Age 56 years	0.966*	2.626	0.893*	2.443
Age 57 years	1.707*	5.512	1.673*	5.328
Age 58 years	1.617*	5.036	1.607*	4.992
Age 59 years	1.520*	4.575	1.523*	4.586
Age 60 years	1.882*	6.565	1.869*	6.487
Age 61 years	3.068*	21.493	3.051*	21.131
Age 62 years	3.050*	21.112	3.019*	20.462
Age 63 years	2.614*	13.654	2.558*	12.906
Age 64 years	3.716*	41.113	3.721*	41.298
Log likelihood	−1433.223		−1403.089	

* Statistically significant at 5% level.
Note: (0) denotes initial (wave 1) values. Regional and occupational dummies included but not reported here.

measure and the last two columns use the predicted latent health variable as an alternative health measure. For each of these we use the lagged value and we condition on initial period health.

Results for Britain are reported in Table 2. Own health is statistically significant, whether it is measured as SAH or latent health. The negative coefficients suggest that the retirement hazard increases as health decreases; that is, worse health means a greater probability of early retirement. The gradient on the SAH dummies are consistent with this, showing, for example, that being in *fair* health as opposed to the baseline of *poor* health reduces the retirement hazard by an estimated 60 percentage points (pp),[44] and being in excellent health reduces the hazard by around 74 pp. For the predicted latent health variable the estimated reduction in the retirement hazard is around 50 pp. The equivalent results for Germany are shown in Table 3. As for Britain, regardless of whether we use SAH directly or the predicted latent health variable, health has a significant negative effect on the retirement hazard. Looking at the coefficients on the SAH dummies, the estimated reductions in the retirement hazard are much smaller than in Britain (although the overall gradient is similar). In all cases the baseline health measure is not significant but the lag is, suggesting that it is health shocks that are important rather than continual poor health.

The health of the spouse does not appear to be important in the models for either country. However, whether or not the spouse has a job is important for men in Britain, regardless of how health is measured. Men who have a spouse in employment are less likely to retire themselves.

Turning now to the pension variables, these differ for the two countries, but they represent the relevant important distinctions between different types of pension. For Britain the pension variables represent whether an individual has made a contribution into a private pension plan during the observation period and/or been a member of an employer's pension scheme. The private pension variable is significant; compared to the baseline of a state-only pension, having a private pension is associated with around a 40–50 pp reduction in the hazard of retiring. The employment sector and occupation dummies will also partly pick up the effect of pension entitlement. Occupation dummies (not reported) are insignificant but some interesting effects are suggested by the employment sector variables. The three employment sectors are contrasted against a baseline of self-employment. For men working in the civil service or local government, it is associated with a significantly higher early retirement hazard. In Germany the important distinction is between the generous civil service pension and all other pensions, however this variable is not significant; this may be due to small sample sizes, because in wave one there were only 77 men entitled to a civil service pension.

Looking at the other conditioning variables, in both countries the models largely show the expected gradient over age categories, with the probability of retirement increasing rapidly as statutory retirement age approaches. Of the income and wealth variables, only log household income (prior to the retirement year) appears to have a significant

[44] The size of the effect is obtained from the hazard ratio in the first row of Table 2; a hazard of 0.405 represents a reduction of approximately 60 pp from 1 (or 100 per cent) to 0.405 (or 40.5 per cent).

effect. It is significant in Britain, where the probability of early retirement increases with household income. In Germany household income appears significant, but here it lowers the chance of early retirement. Also in Germany, being married increases the chances of early retirement, but being of foreign origin has a negative effect.

Discussion

Our main results suggest that regardless of the way we measure own health, it is found to be a key determinant of the early retirement hazard for men in Britain and Germany. Comparing the size of the health effect across these two countries, we find that the effects of health are greater in Britain. Being in the best, as opposed to the worst, SAH category reduces the chance of early retirement by 74 pp. in Britain and only 51 pp. in Germany. The larger estimated effect of health for men in Britain may reflect increased incentives to utilise the disability route into retirement and this in turn may be due to an increased reliance on private sector pensions where people cannot access sufficient pension benefits before statutory retirement age and thus rely on other sources of income, including disability insurance. However, it may also reflect the fact that it is easier for older workers with health problems to continue working in Germany. In 2002, Germany spent 0.3 per cent of GDP on labour market programmes for people with disabilities compared to only 0.02 per cent in the U.K.[1]

The size of the health effect is quantitatively important when compared to the other variables, and in particular when compared to the effects of pension entitlement. In the German models, despite the renowned generosity of the civil service pension, this variable is not statistically significant. Being in *fair,* as opposed to *poor,* health reduces the chance of early retirement by about 60 pp., whereas having made contributions to a private pension scheme reduces the hazard by 50 pp. While we accept that our pension variables are quite blunt (we do not have replacement rates for example), this is common in literature that focuses on health, because detailed information on both health and pensions is rarely available in the same data sets. In addition, a recent Department of Work and Pensions survey found that many people had a very low level of knowledge about their expected pension income, which may cast doubt on the need for this type of information for our modelling objectives.[8]

Our main finding is that for men in Britain the probability of retirement is reduced for people with a private pension. This result may be explained by the fact this group of older workers may have acquired private pensions at a relatively late stage in their working life in order to top up the State pension which they realised would be inadequate. Consequently as the benefits of private pensions are heavily dependent on the length of contribution period, they encourage longer working lives for this group.[45] It is also the case that to a certain extent our employment sector variables will reflect pension benefits and early retirement arrangements. So that the large positive effect of the civil service/local government variable for men in Britain is explained by arrangements in that sector that are conducive to early retirement;

[45] Meghir and Whitehouse (1997).

these may reflect pension entitlements and specific early retirement schemes such as those available to teachers. It is more difficult to explain the statistical insignificance of the civil service pension variable in Germany, however this is a small group (roughly 4 per cent of the sample) and also the effects of the generous pension might be offset by better working conditions, and thus less disutility from work. To some extent this is supported by the results for income. In Britain we find a positive effect of household income prior to retirement, suggesting that only the financially well-off can afford early retirement. Of further relevance is the fact that the early retirement provisions of private pension schemes in Britain, have often allowed those with relatively high salaries to take substantial pensions from the age of 50. For Germany, the effect of household income is negative which suggests that those with higher incomes are less likely to retire early after controlling for health status and other characteristics. This may be because the ability to obtain generous pension benefits early was not widely available until quite recently.

Conclusion

Germany and Britain share concerns about the sustainability of the public pension system and potential labour shortages arising from the ageing of the population. Policy debates have centred on encouraging people to work for longer but these tend to have neglected the important role of the health of older workers as a primary determinant of whether or not they remain in the labour market. Our findings suggest that health is an important determinant of the decision to retire early in both countries.

The trend towards increasing early retirement has obvious fiscal implications as increasing numbers of older people become dependent on a shrinking working population. It can also be considered a waste of human capital if people with education and skills are leaving the labour force prematurely. Designing financial incentives to encourage people to work for longer may not be sufficient as a policy tool if people are leaving the labour market involuntarily due to health problems. Indeed, in this context, even raising the statutory retirement age may have a smaller effect than expected if poor health is the underlying reason for inactivity.

Instead there is a need to improve the health of the workforce and to devote resources to facilitating continued work for people with health problems. More has been done in this regard in Germany than the U.K., although it has not targeted older workers particularly.[1] Optimism may come from early evaluation of the U.K. *Pathways to Work* scheme for people on IB, which suggests that this has been more effective with older claimants than younger ones.[46] However, this programme only targets people who have already left the labour force whereas it may be more effective to design policies that helps older workers to remain economically active. Once individuals leave the labour market their skills start to deteriorate so it is better to keep them in, by say allowing more flexible working arrangements to cope with health problems.

[46] Adam *et al.* (2006).

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Appendix

See Table A1.

Table A1 Variable codes, definitions and data sources

Variable name	*Description*	*Definition GB*	*Definition Germany*
Retirement status	Self-reported retirement status	1—retired 0—otherwise	1—retired 0—otherwise
Self-assessed health (SAH)	Excellent	1—excellent, 0—otherwise	1—excellent, 0—otherwise
	Good	1—good, 0—otherwise	1—good, 0—otherwise
	Fair	1—fair, 0—otherwise	1—fair, 0—otherwise
	Poor	1—poor, 0—otherwise	1—poor, 0—otherwise
Latent health	Predicted variable see Section II	Continuous	Continuous
Specific health problems	Arms, legs, hands	1—yes, 0—otherwise	—
	Sight	1—yes, 0—otherwise	—
	Hearing	1—yes, 0—otherwise	—
	Skin conditions or allergies	1—yes, 0—otherwise	—
	Chest/breathing	1—yes, 0—otherwise	—
	Heart/blood pressure	1—yes, 0—otherwise	—
	Stomach or digestion	1—yes, 0—otherwise	—
	Anxiety or depression	1—yes, 0—otherwise	—
	Diabetes	1—yes, 0—otherwise	—
	Alcohol or drugs	1—yes, 0—otherwise	—
	Epilepsy	1—yes, 0—otherwise	—
	Migraine	1—yes, 0—otherwise	—
	Other	1—yes, 0—otherwise	
Formal disability rating	Degree of disability defined by German Pension Office	—	0–100%

Health satisfaction	Person's satisfaction with own health	—	11-point scale: 0—"not at all satisfied" 10—"completely satisfied"
Education	Highest level of formal education obtained O level or CSEs	1—CSE, O level 0—otherwise	1—more than mandatory schooling 0—otherwise
	HND or A level	1—A level, HND, HNC, Teaching 0—otherwise	—
	Degree or higher degree	1—degree, higher degree 0—otherwise	—
Pension entitlement	Private pension	1—private pension 0—otherwise	1—Class 1 civil servant 0—otherwise
	Employer pension	1—employer pension 0—otherwise	—
	Private sector Civil service or local government 1—employed in civil service or local government 0—otherwise	1—employed in private company 0—otherwise —	— — —
	Other sector	1—employed in other employment sector 0—otherwise	—
Income	Individual specific mean of log household income before retirement	Continuous	—
	Mean of log household post-government income before retirement	—	Continuous
Housing tenure	Own house with mortgage	1—own house with mortgage 0—otherwise	1—owner occupier 0—otherwise
	Private rented accommodation	1—live in private rented accommodation 0—otherwise	1—live in subsidised housing
	Housing association of local authority rented housing	1—live in housing association or local authority rented accommodation 0—otherwise	—

Table A1 (***continued***)

Variable name	*Description*	*Definition GB*	*Definition Germany*
Demographic and other variables	Marital or couple	1—married or living as a couple 0—otherwise	1—married or living as a couple 0—otherwise
	Age 50–54 years	1—aged 50 and 54 years 0—otherwise	1—aged 50 and 54 years 0—otherwise
	Age 55–99 years	1—aged 55 and 59 years 0—otherwise	1—aged 55 and 59 years 0—otherwise
	Age 60–64 years	1—aged 60 and 64 years 0—otherwise	1—aged 60 and 64 years 0—otherwise
	Age 65–69 years	1—aged 65 and 69 years 0—otherwise	—
	Region/State of residence	18 individual dummy variables	—
	North	—	1—lives in North 0—otherwise
	South	—	1—lives in Sorth 0—otherwise
	East German	—	1—born in East Germany 0—otherwise
	Foreigner	—	1—born outside Germany 0—otherwise
Spouse variables	Spouse latent health	Continuous variables	Continuous variable
	Spouse SAH fair	—	1—spouse SAH is fair 0—otherwise
	Spouse SAH good	—	1—spouse SAH is good 0—otherwise
	Spouse SAH excellent	—	1—spouse SAH is excellent 0—otherwise
	Spouse health limitations	1—spouse has health limitations 0—otherwise	—
	Spouse has job	1—spouse is employed 0—otherwise	1—spouse is employed 0—otherwise
Occupational class	Management or administration	1—management or administration 0—otherwise	—

	Professional	1—professional 0—otherwise		—
	Clerical or secretarial	1—clerical or secretarial 0—otherwise		—
	Craft or related	1—craft or related 0—otherwise		—
	Personal or protective services	1—personal or protective services 0—otherwise		—
	Sales	1—sales 0—otherwise		—
	Plant operator	1—plant operator 0—otherwise		—
	Other occupations	1—other occupations 0—otherwise		—
	Agriculture	—		1—agriculture 0—otherwise
Industrial sector	Energy	—		1—energy 0—otherwise
	Manufacturing	—		1—manufacturing 0—otherwise
	Construction	—		1—construction 0—otherwise
	Trade	—		1—trade 0—otherwise
	Transport	—		1—transportation 0—otherwise
	Banking	—		1—banking or insurance 0—otherwise
	Services	—		1—services 0—otherwise