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HEALTH, RETIREMENT AND INEQUALITY:

CAN GERMANY AND THE UK LEARN FROM EACH OTHER?

Jennifer Roberts[1], Nigel Rice[2,] Martin Schellhorn[3], Andrew Jones[4], Lynn Gambin[5]

[1] Department of Economics and School for Health and Related Research, University of Sheffield, UK
[2] Centre for Health Economics, University of York, UK
[3] National Research Centre for Health and Environment, Munich, Germany
[4] Department of Economics and Related Studies, University of York, UK
[5] Institute for Employment Research, University of Warwick, UK

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Executive Summary

The motivation for this study is to understand the effect of health on the decision of older workers to leave the labour market; a decision which is made within the context of the pension and benefit systems of the UK and Germany.

The aims are to:

- Investigate the effects of health on the decision to retire within the context of pension and benefits systems.
- Use comparable national panel data sets and innovative econometric methods.
- Improve knowledge of the determinants of the retirement decision.
- Compare Germany and the UK to see what each country can learn from the other in this context.
- Inform policy around pensions, benefits and retirement.

Germany and the UK share concerns about the sustainability of the public pension system and potential labour shortages arising from the aging of the population. Debates in both countries have centred on encouraging people to work for longer but this has neglected the important role of the health of older workers as a primary determinant of whether or not they remain in the labour market as they approach retirement age. Theoretically we would expect own health to be an important factor in the decision to retire and the few studies that informed ours had confirmed that this was indeed the case.

What we add here is an improved method for dealing with the dynamics of the relationship between health and retirement and a consideration of the joint decision making of older couples by including spouse health and spouse labour market status in our models. Like the vast majority of the literature we have only subjective information on health status so our methods are designed to reduce as far as possible the problems of endogeneity, reporting bias and reporting heterogeneity that arise from using this type of information to unravel the causal relationships between health and labour market status.

We use comparable longitudinal data sets from the UK (the British Household Panel Survey) and Germany (The German Socioeconomic Panel) to estimate hazard models of the effect of health on retirement. This data are supplemented by variables from the Cross National Equivalent File (CNEF). As well as health we condition on a broad set of socio-economic characteristics such as education, pension entitlement, housing tenure, and income.

We consider the same time period for the UK and Germany, from 1991 to 2002 giving 12 waves. Our analysis sample is a stock defined at wave 1, consisting of those individuals who were aged 50 or over and had a full interview and were in the labour force in wave 1 of the survey. The samples are reduced over time by attrition, which largely arises through refusal, non-contact and because people become ineligible to participate. For both the BHPS and the GSOEP we start with just over 1100 people and this is reduced by over one third by the end of the period. At this time almost half of the original sample are retired.

The most striking result from the above models is that, regardless of the way we measure own health, it is found to be a key determinant of the retirement hazard for both men and women in the UK and Germany. The size of the health effect is large compared to the other variables, and in particular is larger than the pension entitlement effects in both countries. The results

also suggest that it is health shocks rather than a continual level of poor health that is important in determining retirement.

A 1 unit decrease in latent health stock is estimated to increase men's probability of retirement by around 35% in the UK and around 15% in Germany, for women these figures are 50% and 15% respectively. The larger estimated effect of health in the UK may reflect increased incentives to utilise the disability route into retirement and this in turn may be due to an increased reliance on a 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, and potentially it may be a reflection of less discrimination against older workers on the part of employers in Germany.

Previous work has revealed that both health and income inequalities are much greater in the UK than in Germany. One of the main reasons seems to be the difference in the relative position of the retired, who are much more concentrated in the lower income groups in the UK. As well as our causal econometric modelling we also examined concentration curves (CCs) and concentration indices (CIs) for income related health inequalities and income related early retirement. This analysis takes our 'at risk' sample (i.e. the older workers who are 'at risk' of early retirement) and looks at the incidence of subsequent health shocks that might be associated with subsequent early retirement.

The inequality analysis shows that while the distribution of health shocks is pro-poor in the UK (i.e. health shocks are more than proportionality concentrated amongst those at the lower end of the income distributions) early retirement is pro-rich, in contrast to Germany where both health shocks and early retirement are pro-poor. At first sight the results for Germany are more intuitive than those for the UK; health shocks are more concentrated among the poor, as is early retirement, meaning that the interaction of the two is 'pro-poor'. In contrast for the UK, the income gradient in early retirement is offsetting the inequality in health shocks so that even though poorer individuals are more likely to have health shocks the combination of health shocks and retirement is 'pro-rich'.

Relating the inequality analysis to the causal models, for Germany the effect of income in the causal models is negative confirming the results of the inequality analysis; those with higher incomes are less likely to retire early after controlling for health status and other characteristics. For the UK income is not significant in any model. However, the significant negative coefficient on private pensions in the UK does seem to support to the results of the inequality analysis, suggesting that reliance on private pension provision means that only the financially well-off will be able to afford early retirement.

Overall, our findings confirm those of a number of other studies; own health is indeed an important determinant of the decision to retire in the UK and Germany and its effect is larger than that of our pension entitlement and income variables. This is the case for both men and women and is observed for both latent health status and alternative health measures. The effects of spouse health do not appear to be important but there is some evidence of an effect from having a working spouse.

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 effect may have no effect if poor health is the underlying reason for inactivity.

Instead this points to a need for improving the health of the work force and putting resources into facilitating continued work for people with health problems and disabilities. More has been done in this regard in Germany than the UK, although it has not targeted older workers particularly. In the UK there is little or no communication between primary health care providers and employers so an integrated approach is virtually impossible within the current system. However, some hope is provided by early evaluation of the UK Pathways to Work scheme, designed to help people on incapacity to get back into work. This scheme does provide specific health advice and might be usefully extended more generally to help older workers with health problems. Currently, this programme only targets those workers who have already left the labour force whereas it may be more effective to design policy 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. The recent 'New Quality of Work' initiative in Germany, and its 2003 aim to promote employment for older workers, may be a way forward in terms of an integrated approach. However, thus far it is not at all specific in its policy tools. This initiative could learn from the initial successes of the UK Pathways scheme in combining health and work advice.

Overall our findings add strong support to the policy recommendations made by Frerichs and Taylor (2005); in particular the importance of health suggests the need for close coordination of policies between the government and the workplace; a greater emphasis on preventing people from leaving the labour market rather than targeting all resources on those who have already left, and increased use of measures to prevent a deterioration in health, such as provision of occupational healthcare and improved work related knowledge among primary care providers.

1 Introduction

Our prime motivation is to understand the effect of health (own and spouses) on the decision of older workers to leave the labour market. The decision is made within the context of the pension and benefit systems of the UK and Germany.

Our aims are to:

- Investigate the effects of health on the decision to retire within the context of pension and benefits systems.
- Use comparable national panel data sets and innovative econometric methods.
- Improve knowledge of the determinants of the retirement decision.
- Compare Germany and the UK to see what each country can learn from the other in this context.
- Inform policy around pensions, benefits and retirement.

Both Germany and the UK are experiencing population ageing combined with increasing early exit of older workers from the labour market; these common trends are occurring despite important differences in the institutional arrangements between the countries. As a result there are problems in financing support for growing numbers of retired people, and considerable debate around policies to reverse the trend to early retirement. This has been the subject of a number of reports from the Anglo German Foundation as well as other organisations[1]. Much of the policy focus is on direct changes to retirement ages and changes to incentives designed to encourage greater pension saving. The role of the health of older workers seems largely to have been neglected in these debates. A recent review of policies for the 'greying labour market' in both the UK and Germany found no specific policies targeting older workers with health problems and only two recent policy initiatives that may includes this group as part of a larger population (Frerichs and Taylor, 2005)[2].

Despite shared pressures there are differences between the two countries. Labour force participation of workers aged 55-64 is around 58% in the UK and only 43% in Germany. However, of the economically inactive in this age group 13% describe themselves as retired in the UK and 14% as ill or disabled, whereas in Germany these figures are 29% and 4% respectively (Frerichs and Taylor, 2005: Tables 1 and 5). In addition, there seems to be a greater commitment to an integrated policy approach in the UK (which may be explained by the above statistics), whereas in Germany older people have been neglected in active labour market policy. These differences mean there are opportunities for Germany and the UK to learn from each other. This may be particularly important if (as suggested by Nagaele and Walker, 2002) inequality and poverty among older people in Germany is expected to increase as a result of pressures on the pension system.

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. 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 (Riphahn, 1997; Blundell, Meghir and Smith, 2002).

Previous research has shown that both financial incentives and health status are important determinants of the decision to retire. However, there is no consensus on the relative importance of these phenomena and studies have usually failed to take into account the dynamics of the

[1] See for example Frerichs and Taylor (2005), Nagaele and Walker (2002), Oswald (1999).
[2] These policies are Pathways to Work in the UK, and 'New Quality of Work' in Germany. Pathways for example is designed to help people on Incapacity Benefit and most claimants are aged over 50.

relationship between health and retirement and joint decision making by couples, both of which are considered here. In addition while some evidence exists for the UK and for Germany there is no systematic comparative work to assess whether the impact of ill-health on retirement varies between the countries and in particular, whether it varies according to levels of social protection offered by the pension and transfer schemes.

Previous work for the *ECuity* projects[3] has revealed that both health and income inequalities are much greater in the UK than in Germany. One of the main reasons seems to be the difference in the relative position of the retired, who are much more concentrated in the lower income groups in the UK. Further it is hypothesised that the relative importance of financial incentives will differ between the UK and Germany; for example the increase in housing wealth may be more important in the UK and the generosity of pension schemes may be a more important factor in Germany.

This report is structured as follows. Section 2 outlines the background to our work, Section 3 explains the data and methods that we employ and Section 4 presents the results. In Section 5 we discuss these results and Section 6 concludes and considers the policy implications.

2 Background

2.1 The effect of health on income and retirement

Economic theory on the relationship between retirement and health (for example Lazear, 1986) states that agents have preferences over current and future leisure which depend, *inter alia*, on current and expected health status. Poorer health reduces the probability of continued work because it may: increase the disutility of work; reduce the return from work (via lower wages); entitle the individual to benefits and other non-wage income that is contingent on not working. A possible counteracting affect is that poorer health may increase consumption requirements (for example via increased health care costs) therefore necessitate higher income. However, 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 alongside the effects of the pensions and benefits system, and there is an enormous literature on the importance of these financial incentives in determining retirement behaviour (see Lumsdaine and Mitchell, 1999 for a review). However, Lindeboom (2006) in a comprehensive review, argues that a number of empirical studies have shown that health is the most important determinant of an older persons labour supply; a finding rejected by other studies, which point to problems in finding an appropriate measure of health and problems arising from the endogeneity of health in models of retirement (Deschryvere, 2004). However, a recent survey for the UK Dept for Work and Pensions (Humphrey et al 2003) found that, of 2800 people aged between 50 and 69, 50% stated that they were not seeking work due to ill-health, and 20% reported that they had been forced to retire or leave a job because of ill-health.

For Germany, Siddiqui (1997a, 1997b) uses the GSOEP and 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. Riphahn (1997) carries out similar analysis distinguishing between unemployment and disability routes into retirement and shows that these routes cannot be considered substitutes because they are driven by different forces. In an OECD study for Germany Antolin and Scarpetta (1998) find a highly significant impact of health on the transition into disability retirement but no significant impact for the transition into early/regular retirement.

[3] http://www.eur.nl/bmg/ecuity/

2.1.1 The endogeneity of health

It is not straightforward to identify a causal effect of health on retirement, especially using the subjective (self-reported) measures of health that are usually available (see for example, Anderson and Burkhauser. 1985; Bazzoli, 1985; Stern, 1989; Bound, 1991; Kerkhofs and Lindeboom, 1995; Bound et al., 1999). There are many reasons why one may expect biases to arise. First, self-reported measures of health are based on subjective judgements and there is no reason to believe that these are comparable across individuals. Secondly, self-reported health may not be independent of labour market status. Thirdly, since ill-health may represent a legitimate reason for a person of working age to be outside the labour force, respondents not working may cite health problems as a way to rationalize behaviour. Fourthly, for individuals for whom the financial rewards of continuing in the labour force are low there is a financial incentive to report ill-health as means of obtaining disability benefits.

Bound (1991) identifies the bias that results from each of the above problems. Reporting heterogeneity resulting in a lack of comparability in self-assessed health (SAH) across individuals represents measurement error that leads to an underestimation of the impact of health on labour force participation. Conversely, endogeneity in the health-retirement relationship will lead to an overestimation of the impact of health.

Empirical studies provide mixed conclusions about the endogeneity of SAH and the extent of the bias provided through measurement error. For example, while Kerkhofs, Lindeboom and Theeuwes (1999) find that the choice of health measure does affect the estimates of health on labour market outcomes, Dwyer and Mitchell (1999) conclude that SAH is not endogenous and their models of labour market retirement do not suffer significantly from measurement bias. Further, by applying a direct test for measurement error Au, Crossley and Schellhorn (2005) 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 and to those obtained through instrumental variable approaches.

Of further relevance is whether a change in labour market status is best identified by a 'shock' to an individual's health or by a levels effect (for example, a slow deterioration in health). We use the term health shock, as it has been traditionally used in the literature, to mean deterioration in health over a set time period (usually one or two years in our analysis). There is no suggestion that these 'shocks' must be fully unanticipated, and in places we use the term health shock and health deterioration interchangeably. Modelling health 'shocks' is a convenient way to eliminate one source of potential endogeneity bias caused through correlation between individual-specific unobserved factors and health because differencing the data over consecutive time periods consequently eliminates unobserved individual effects.

Disney, Emmerson and Wakefield (2006) find that health shocks are an important determinant of retirement behaviour in the UK., and that positive and negative health shocks tend to have symmetric effects. For Gemany, Riphahn (1999) finds significant effects of a health shock on leaving employment for older workers. She also shows that these shocks seem to happen more often to those individuals/households which are already at the lower end of the income distribution; an illustration of income related health inequality that is also reflected in or analysis below.

2.1.2 The joint decision making of couples

There is a weight of empirical evidence supporting the importance of the joint determination of the retirement decision of husbands and wives[4] (see for example Michaud, 2003; Jimenez-Martin et al 1999; Blau and Riphahn, 1999; Hurd, 1990; Clark and Johnson, 1980). In a recent

[4] The use of the terms husband and 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.

development Gustman and Steinmeier (2000) estimate a structural model of retirement in dual-career families motivated by the observed tendency of couples to retire together in the US. The results suggest that the primary reason for spouses retiring together is shared preferences for leisure, with each individual valuing retirement more highly when their spouse has also retired.

The effect of the health status of both partners on each others 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 our comparative context it is of interest to see whether this interdependence can be partially explained by the features of the social security systems which facilitate caregiving to a disabled partner. For example, in Germany, with the introduction of the mandatory 'Pflegeversicherung' (care or nursing insurance) in-home provision of care is subsidized.

2.2 Demographic structure and health in the UK and Germany

Much of the Western world has concerns about the aging of the population and the level of future financial support needed from the working population to support the elderly. The UK and Germany are no exception to this, and in fact concern is particularly acute in Germany due to the current generosity of the pension system.

Gains in life expectancy are largely due to improvements in living conditions, public health interventions and advances in health care technology. This is reflected in Table 2-1 below and the figures for both countries are very similar. Life expectancy at retirement age has increased substantially for both men and women in the UK and Germany.

Table 2-1: Life expectancy (years)

		men		women	
		at birth	at age 65	at birth	at age 65
UK	1970	68.7	12	75	16
	1980	70.2	12.6	76.2	16.6
	1990	72.9	14	78.5	17.9
	2000	75.5	15.7	80.2	18.9
% change 1970-2000		9.90%	30.80%	6.90%	18.10%
Germany	1970	67.2	12	73.6	15
	1980	69.6	13	76.1	16.7
	1990	72	14	78.4	17.6
	2000	75	15.7	81	19.4
% change 1970-2000		11.60%	30.80%	10.10%	29.30%

Source: OECD Health Data 2004

Figures 2-1 and 2-2 show the proportion of the population aged 65+ and the age dependency ratios for the UK and Germany. For both countries the share of the population aged 65 and over has steadily increased since 1970[5]. The dependency ratios have followed a similar trend and sit at around 50% although there is some indication that the current trend is upwards for the Germany and downwards for the UK.

[5] The relatively sharp fall in the proportion in Germany in the early 1990s coincides with reunification and reflects the relatively young age of the population of East Germany. During most of its existence, the only segment of East Germany's population permitted to leave for West Germany were retirees.

Figure 2-1:% population age 65 and over

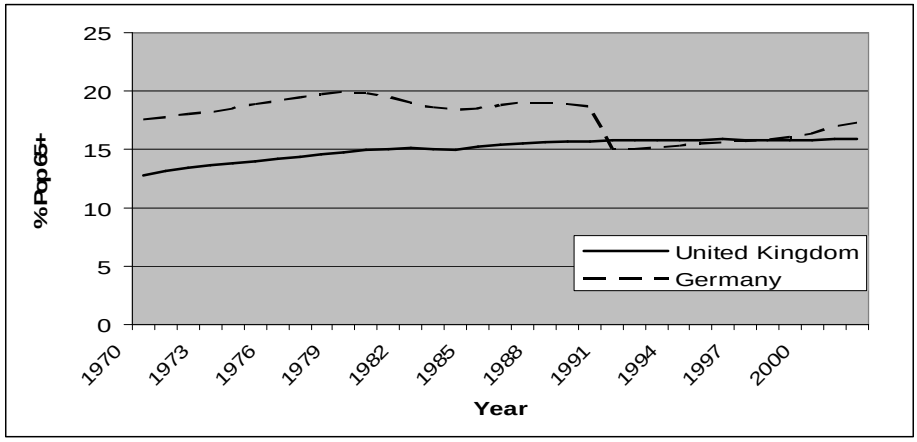
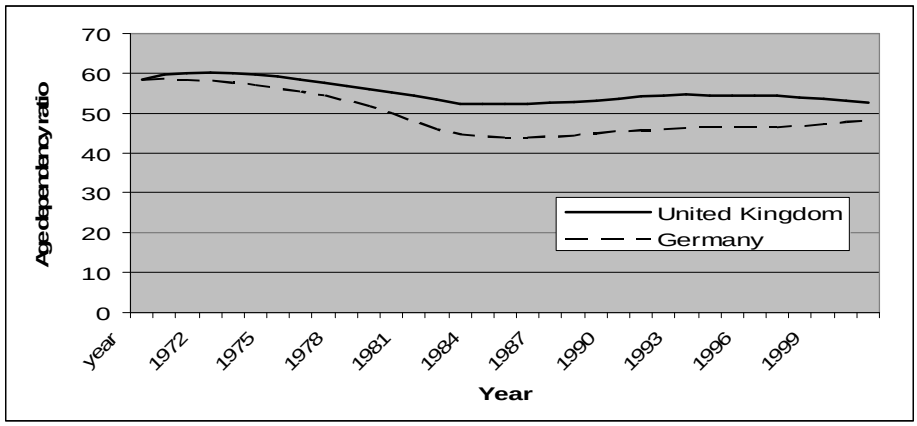


Figure 2-2:Age Dependency Ratio (Pop. 0-14 & 65+/pop.15-64)



2.3 Overview of Pension Systems in the UK and Germany

The primary focus of this study is the effect of own and spouse health on the decision to retire. The financial incentives for retirement have already been extensively studied[6] and our longitudinal data sets do not contain detailed financial information on pension entitlement. Nevertheless decisions are taken within the context of the pension and benefit system so this section gives an overview for the UK and Germany.

The basic state pension (BSP) is a fundamental part of the UK pensions system with no equivalent in Germany. The BSP is a flat rate contributory benefit indexed to the retail price index. It is payable to people above the state pension age (65 for men, 60 for women) and is close to universal. The BSP was only worth around 16% of average male earnings in 2002 thus pensioners often have to rely on other sources of income such as alternative pension income or benefits.

The State Earnings Related Pension Scheme[7] (SERPS) is the second tier of the UK pension system. This is a contributory scheme that pays a pension equal to a fraction of an individual's qualifying annual earnings and its generosity has been reduced over time, to around 20% of average lifetime earnings for anyone retiring after 2000.

[6] See for example Borsch-Supan and Schabel (1997) for Germany and Blundell et al (2002) for the UK.
[7] The 'State Second Pension' from 2002.

The German public pension system has broad mandatory coverage of workers[8] and is financed by contributions that are split evenly between employees and employers, with rates steadily rising since the late 1960s. The pensions are indexed to wages and early retirement is possible through several mechanisms using the public transfer system.

Civil servants in Germany are exempted from the public pension system and they acquire pension claims that are considerably more generous than those of the public pension system; they also have distinctive early retirement incentives.

In the UK, employees can opt out of the second tier pension scheme into private provision[9]. Contributions are made out of pre-tax income, so are effectively subsidized by the Government. Private pensions have high take-up and in 2002, around 45% of employees had an occupational pension, and around 25% a personal pension. Private pensions are more common among younger workers and men. This is illustrated for our UK analysis sample in Table 2-2. The higher proportion for men aged 55-64 than those aged 50-54 may reflect the fact that many workers take on these pensions at a relatively late stage when then realise that the state pension will be inadequate.

Table 2-2: Percentage of individuals in UK sample with private pensions by age group.

Age	Male	Female
50 – 54 years	32.0	19.5
55 – 59 years	45.8	14.2
60 – 64 years	44.4	8.2
65 – 69 years	8.7	5.1
65+ years	6.5	5.3
Total	25.3	12.2

In 2002, the federal government in Germany initiated private retirement schemes to complement the public system. Many employers also provide additional private personal schemes for their workers. Nearly half of all German employees are now members of such schemes.

2.3.1 Other benefits

Income Support is a flat rate, non-contributory means-tested benefit paid on top of the pension in the UK. It is automatically paid to those aged 60 years and over who are on low incomes and not in paid employment. From April 1999, income support for pensioners was renamed the Minimum Income Guarantee (MIG) and was made more generous. The pension system in Germany has no comparable aspect. Anyone not entitled to receive sufficient public pensions in Germany enter the welfare system to meet their income needs.[10]

Contributions to German retirement insurance also finance disability benefits to workers of all ages and survivor benefits to spouses and children. Disability benefits are paid at rate which depends on the extent of disability and an earnings test. Eligibility tends to have been interpreted generously and has been used as a device to keep unemployment rates down. In the UK Incapacity Benefit (which replaced Invalidity Benefit in 1995), is a contributory earnings replacement benefit for those unable to work because of ill-health or disability. It is currently

[8] Only the self-employed and, until 1998, workers with earnings below the official minimum earnings threshold are not subject to mandatory coverage.
[9] Private provision can include employer (occupational), personal or stakeholder pension schemes.
[10] Zaidi et al (2005), Aging & Society, 25, 543-565.

paid at one of three flat rates, depending on the length of time the individual has been unable to work. There was rapid growth in the number of recipients during the 1980s and this incited the 1995 reforms which introduced stricter eligibility criteria and tightened up screening.

While Disney et al (2006) find no effect of the 1995 reforms on the probability of 'retirement', they admit that their test is weak. The 1995 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 (2004) and Peasgood et al (2006) find that after controlling for health, the probability of leaving IB declines with age and the majority of economically inactive people aged 50+ in the UK are in receipt of Incapacity Benefit.

2.3.2 Pension generosity

Table 2-3: Measures of pension adequacy (mandatory pension programmes, men).

	individual earnings, multiple of average					
	0.5	0.75	1	1.5	2	2.5
Net Replacement Rate (NRR): % of individual pre-retirement net earnings						
Germany	61.7	66.6	71.8	79.2	67.0	54.2
UK	78.4	57.7	47.6	38.2	29.8	24.7
OECD average	84.1	73.2	68.7	64.3	59.4	54.5
Pension Wealth: Multiple of economy-wide average earnings						
Germany	4.3	6.2	8.3	12.5	13.7	13.7
UK	5	5.2	5.5	6.6	6.7	6.7
OECD average	5.7	7.2	8.9	12.1	14.8	16.8

Source: OECD, Pensions at a Glance (2005); Tables 4.1, 4.2 & 6.2.

The net replacement rate (NRR) is a measure of individual pension earnings divided by pre-retirement earnings, taking into account personal income taxes and social security contributions. At almost all earnings levels the NRR is much higher in Germany than the UK (Table 2-3)

Table 2-3 also sets out pension wealth as multiples of average earnings. Pension wealth (PW) takes into account life expectancy, retirement ages and the indexation of pension benefits. Standard actuarial techniques are used to convert pension entitlement at retirement into a value of pension 'wealth', defined as the size of a lump sum necessary to buy a flow of pension payments equal to that set out by the mandatory pension system[11]. Again at nearly all earnings levels PW is much higher in Germany than the UK.

In general therefore, except in the case of very low earners, Germany has a more generous pension system than the UK. If UK pensioners rely solely on public pensions they are worse off than their German counterparts and while private pensions compensate to some extent they also result in more inequality. In Germany less than 5% of all pensioners claim means tested benefits, whereas in the UK it is around 33% (Oswald, 1999; p10).

[11] A uniform discount rate of 2% and country-specific life expectancies, as projected for the year 2040, have been used in the OECD calculations.

3 Data and Methods

3.1 Data Sources

The data sets employed in this study are longitudinal surveys for the UK and Germany. The data come from four sources:

- British Household Panel Survey (BHPS)
- German Socio-economic Panel (GSOEP)
- Cross National Equivalent File (CNEF) - BHPS
- Cross National Equivalent File (CNEF) - GSOEP

The BHPS and GSOEP are generally thought to be 'equivalent' types of data for the UK and Germany. They are nationally representative longitudinal studies of individuals within private households, and they include a rich set of socio-economic variables. These datasets do not have cross-national comparability as a survey goal, so for a comparative study care must be taken with each variable to ensure that wherever possible these are equivalent for both countries.

3.1.1 The German Socio-Economic Panel

The same private households, persons, and families have been surveyed annually since 1984, and in June 1990 the survey was expanded to include the territory of the former German Democratic Republic. GSOEP has a high degree of stability, which is mainly due to the work done to maintain response rates. In 1984 5,921 households containing 12,290 respondents participated in the "SOEP West"; in 1990 2,179 households with 4,453 respondents were surveyed in the GDR. This sample constituted the "SOEP East" sample. The most recent wave of data (2002) includes 3,889 households with 7,175 respondents for the SOEP West sample, and 3,466 respondents in 1,818 households in the SOEP East sample. They are 18 waves of data available for the West and 11 for the East.

3.1.2 The British Household Panel Survey

The BHPS started, later than the GSOEP, in 1991 and 12 waves (to 2002) were available at the time of our analysis. The first wave achieved a sample of 5,500 households, covering approximately 10,000 adults. It is a clustered and stratified sample, with 250 primary sampling units, stratified by region, and a number of census social indicators. The BHPS is an indefinite life panel survey, without sample replacement. The Longitudinal Sample consists of members of the original households, and their natural descendants born since the start of the panel. Original sample members are eligible for interview in each wave as long as they remain in scope[12]. Sample members are followed if and when they move.

3.1.3 The Cross National Equivalent File

The CNEF is the result of collaboration between researchers working with multiple waves of longitudinal data from Canada, Germany, Great Britain, and the United States[13]. The aim is to produce compatible data sets for use in cross-national research. The CNEF unites comparably defined variables from the BHPS and the GSOEP in a single data file that can be used independently or in tandem with the original survey data. In addition, the CNEF provides a set

[12] This means in GB, or from 1997 UK.

[13] The collaboration involves Cornell University, the Institute for Social and Economic Research (ISER) at the University of Essex, the German Institute for Economic Research Deutsches Institut für Wirtschaftsforschung - DIW) in Berlin, Statistics Canada in Ottawa, and the Survey Research Center at the University of Michigan. The data is administered at Cornell University in the US.

of constructed variables that are not immediately available in the original data sets (for example pre- and post-government household income).

The CNEF is updated each year as additional waves of its four panels become available. Where possible, CNEF variables are created to be equivalent across surveys and over time. Where not possible, the differences are noted in the documentation so that researchers can take them into account in their analyses. Each variable is assigned a reliability code that represents the degree of cross-national comparability that the surveys permit[14].

Given the aims of the CNEF collaboration and the efforts taken to ensure comparability of this data we have used CNEF variables wherever possible. However, for some of our key variables this was not a feasible approach and instead we use variables from the original surveys.

Descriptive statistics on key variables were produced to check for data quality and compatibility between the two data sets (these are reported in Appendix 1 and discussed below).

3.2 The analysis sample

We consider the same time period for the UK and Germany, from 1991 onwards to 2002 giving 12 waves. Our main econometric analysis will employ the duration model stock-sampling approach of Jenkins (1995). This method represents the transition to retirement as a discrete time hazard model enabling us to estimate the effect of a broad set of variables on the probability of retirement. This approach uses a 'stock sample' defined at wave 1, which consists of those individuals who were aged 50 or over and had a full interview and were in the labour force (defined as employed or self-employed) in wave 1 of the survey.

The samples are reduced over time by attrition, which largely arises through refusal, non-contact and because people become ineligible to participate. The sample composition by wave is shown in Appendix 2. The statistics are reported for the overall samples and also for men and women separately. The number of known deaths is very small and we do not know the reasons behind the majority of the attrition.

For both the BHPS and the GSOEP we start with just over 1100 people (more men than women) and this is reduced by over one third by the end of the period. At this time almost half of the original sample are retired. The categories 'long term sick and disabled' and 'other'[15] in the UK data are not available for Germany.

3.3 Variables

Variable codes, definitions and data sources are summarised in Appendix 3.

Retirement Status

As has already been noted in the literature (e.g. Bardasi et al 2002; Disney et al 1994) retirement is not a well-defined state. The basic retirement measure available in the surveys is self-reported. However, this is problematic because it is not always clear whether individuals in the relevant 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

[14] A code of '1' indicates that the variables are completely comparable, whereas a code of '4' indicates that there is no comparable variable between the two surveys. These reliability codes are based on direct comparisons of the survey instruments as well as on knowledge of institutional differences across the countries.
[15] 'Other' is largely family care and fulltime education.

some individuals may associate retirement with the final and permanent exiting from work 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 DWP survey for the UK (Humphrey et al 2003) 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% in men, and from 16% to 4% in women.

In line with previous work, the definition of retirement used here is self-reported[16], in answer to the question on job status in which individuals classify their status as one of the following: self-employed, employed, unemployed, retired, on maternity leave, caring for the family, in full-time education, long-term sick or disabled, or on a government training scheme. We assume that retirement is an absorbing (permanent) state[17]. The variable RETIRED is a dichotomous variable that takes a value 1 if the individual is retired and 0 otherwise.

Health Status

We rejected the CNEF health variable on the grounds of poor comparability across the two countries and instead construct our own health measure using the general SAH question from 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'. Unfortunately there is a change in wording for wave 9 only which has the question 'In general would you say your health is: excellent, very good, good, fair, poor.' So the wave 9 question does not include the age benchmark and changes the five categories[18].

For the GSOEP the question is 'how would describe your current state of health: very good, good, satisfactory, poor, bad.' The question was not asked in 1991 or 1993, but in these years the 11 point 'satisfaction with health' question was available, so the distributions for these variables were matched to the 4 point scale (see below) distributions in 1992 and 1994 in order to create data for the missing years. In addition the 5 point scale health question was not asked in 1991 for East Germany so the 1990 values are used in its place.

In order to deal with the difference in the two definitions (and the wave 9 change for the BHPS) we have defined SAH on a 4 point scale as shown below.

SAH_4	definition	BHPS	BHPS wave 9	GSOEP
1	SAHPOOR	very poor & poor	poor	bad & poor
2	SAHFAIR	fair	fair	satisfactory
3	SAHGOOD	good	good & very good	Good
4	SAHEXC	excellent	excellent	very good

In our causal models SAH is used to create a latent health stock variable (see section 3.5). We also examine self-reported functional limitations (HLLT) for the UK, based on the question "does your health in any way limit your daily activities compared to most people of your age?[19]"

[16] We have cross checked self-reported retirement status data with income source data (for the UK) 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.

[17] Exploratory analysis shows that this assumption is not always valid; of those people aged over 50 and retired in any one wave, a small proportion are participating in the labour market again in subsequent waves.

[18] For more detail on the change of wording and its implications for economic analysis see Hernandez-Quevedo, Jones and Rice (2005).

[19] This question is not asked in wave 9. In our analysis we assume wave 8 values hold in wave 9.

As an alternative for Germany, the four point SAH scale is used directly in estimating the retirement hazard rates.

Education

Education is classified as a series of binary dummies which differ slightly across the two countries. In Germany, the distinction is made between individuals who have received only mandatory schooling (the reference group) and those with higher levels of education (HIGHERED)[20]. For the UK, the reference group are people with no formal qualifications, and dummy variables are defined for O-levels and CSEs (OCSE), HND and A Level (HNDALEV) and higher education and beyond (DEGHDEG).

Pension entitlement

For the BHPS we distinguish 3 categories: state pension only (base category), private (PRIVPEN) and employer (EMPPEN). 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 UK models we also include dummy variables for employment sector and occupational classification which act partly as proxies for pension benefits: industrial sectors are private companies (PRIVCOMP), civil service and local government (CIVLOCGOV), and other (JOBSECTO); the baseline is self-employment. Occupational categories are management and administration (MANAGADMIN), professional (PROF), clerical and secretarial (CLERSEC), craft or related (CRAFTREL), personal services (PERS), sales (SALES), plant operative (PLANT) and other occupations (OTHEROCC)

For the GSOEP the important distinction is between Class 1 civil servants (CIVSERV) and everyone else, since the civil service pension has more generous benefits.

Housing tenure

This variable is used to proxy for wealth and social class. For the BHPS we define 4 binary dummies: own house outright (HSEOWN – the base), own with a mortgage (HSEMORT), live in private rented accommodation (HSERENT), live in housing association or local authority rented accommodation (HSEAUTH). For the GSOEP we cannot distinguish those owners who do not have an outstanding mortgage, but we have two binary dummies: owner occupier (OWNER) and those who live in subsidised housing (SUBSID). This latter category is expected to be equivalent to the UK 'local authority …' category and is a proxy for low income households.

Income

For the UK models, the income variable is the individual specific mean of log household income[21] across all waves prior to retirement (MLNHINC). We use only pre-retirement waves in order to minimise endogeneity problems (as income will normally change significantly at retirement). For Germany the equivalent variable is the mean of the log of household post-government income (M2LNHINC).

Demographics and other variables

We distinguish those people who are married or living as a couple (MARCOUP) from those who are single, widowed or divorced.

[20] The base and MIDED categories defined in Section 3.1.5.3 are combined in the causal models.

[21] Household income consists of labour and non-labour equivalised real income, adjusted using the Retail Price Index and equivalised by the McClement's scale to adjust for household size and composition.

Binary dummies are included for age ranges 50-54 (AGE5054), 55-59 (AGE5559), 60-64 (AGE6064) and 65-69 (AGE6569); age 70 and above acts as the base.

Regional dummies are used to control for local labour market conditions. The estimated coefficients are not reported for the UK models, but dummies for the North and South of Germany are included.

The German model also includes binary dummies for each industrial sector (agriculture, energy, manufacturing, construction, trade, transport, banking and services, and the baseline, mining). There are also variables that denote a person originally being from East Germany (EASTGERMAN) and that the individual does not have German citizenship (FOREIGNER).

Spouse variables

A further issue of interest is that the majority of people in this age group live as a couple and decisions on when to retire are often taken at the household level. Hence we also consider the affect of spousal health and labour market status on an individual's decision to retire.

The UK models include spousal health defined as either the latent health stock index defined above (SLATSAH) or functional limitations (SHLLT). The German models include either dummies for spouse SAH in the four categories (SSAH) or the latent health stock index (SLATHEALTH1). Both models also include a dummy for whether or not the spouse is employed (SJOB).

3.4 Income related health Inequalities and retirement

Work from the ECuity project and other sources has already shown that older people are among the poorest and least healthy in most European countries, so as populations grows older the potential for increased inequality is clear. This is not just an issue for the 'oldest old', and the relative position of older workers and what happens to them on retirement is an important contributor to the degree of income related health inequality exhibited by a society.

In order to gain a greater understanding of this inequality we examine concentration curves (CCs) and concentration indices (CIs) for income related health inequalities and income related early retirement. This takes our 'at risk' sample (i.e. the older workers who are 'at risk' of early retirement) and looks at the incidence of subsequent health shocks that might be associated with subsequent early retirement.

The CCs and CIs provide measures of relative income-related health inequality (Wagstaff, Van Doorslaer and Paci, 1989). These measures capture the socioeconomic dimension of health inequalities, use information from the whole of the distribution rather than just the extremes and give the possibility of visual representation.

The sample is ranked by socioeconomic status using equivalised household income in wave 1; thus the horizontal axis begins with the poorest individual and progresses through the income distribution to the richest individual. This relative income rank is then plotted against the cumulative proportion of health shocks on the vertical axis. The 45-degree line shows the line of perfect equality, along which population shares of health shocks are proportional to income, such that the poorest 20% of individuals experience 20% of the illness in the population, and so on. There is said to be "pro-poor" inequality if the CC is lies above the 45 degree line while there is "pro-rich" inequality when the curve lies below the line. The size of inequality can be summarised CI, which is given by twice the area between the CC and the 45-degree line.

We use balanced samples for this analysis, based on our stock samples in Wave 1. The health shocks are measured as the change in the category of SAH in wave 1 compared to that status in wave 12 thus only individuals who are present in all 12 waves are included. For this analysis we use the 5 point SAH scales present in the country specific data.

The CCs and CIs are obtained using Stata; individuals are ranked according to equivalised household income (R_i) at wave 1. The analysis then proceeds in two stages. The first stage considers whether there is inequality in health shocks by initial socio-economic status. We define a health shock (H_i) as a deterioration in health which is measured as either a 1-point or a 2-point decrease in SAH[22].

In the second stage, we attempt to determine whether there is inequality in health-related early retirement by initial socioeconomic status. We again rank by equivalised household income in wave 1. We now combine the health shock indicators with an indicator of early retirement (RET_i) i.e. whether or not the individual 'retired' before the prescribed state pension age. Combining the health shock (H_i) and early retirement (R_i) variables we define the variable $HRET_i$ which equals 1 if a person suffers a health shock and retires early. Otherwise, this variable takes the value of 0.

3.5 Methods for dealing with the endogeneity of health

Our approach follows that of Bound (1991), implemented in Bound et al (1999), Disney et al (2006) and Au et al (2005). This involves estimating a model of SAH as a function of more objective measures of health to define a latent `health stock' variable. This health stock variable is then used as an indicator of health in the model of retirement. The technical details are set out in Roberts et al (2007).

For the UK we estimate health stock by regressing SAH (via an ordered probit model) on a set of 'specific health problems'. Here 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 objective health measures 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 and satisfaction with health[23]. The estimated latent health stock (LATSAH) is then used as an indicator of health in the model of retirement[24].

In addition to the models using latent health stock, alternative health measures have been examined. For the UK, we use self-reported functional limitations (HLLT), which is arguably more objective that the general SAH question. As an alternative for Germany, the four point SAH scale is used directly in estimating the retirement hazard rates.

3.6 Model Specification

To identify a health shock we include a contemporaneous measure of health together with initial period health (variable names are suffixed with 0). By conditioning on initial period health

[22] For comparative purposes, we also defined a health shock in terms of the acquisition of a health limitations for the UK. These results are not reported but are very similar to those for 2 point SAH changes.

[23] Formal disability rating is an official registration made by the German Pension Office which classifies the degree of disability on a continuous scale. Health satisfaction is an 11 point scale ranging from "not at all satisfied" to "completely satisfied" with own health.

[24] The results of the ordered probit models used to estimate latent health stock are not reported here.

the coefficient on contemporaneous health represents the effect of a health shock. This approach has the advantage of controlling for person-specific unobserved health-related heterogeneity. The relative effects of the estimated coefficient of initial period and contemporaneous health is informative of whether it is a health shock that determines retirement or a levels effect observed through continual poor health (see Bound et al., 1999).

It also seems plausible that lagged health may be more informative about the decision to retire because transitions take time. To assess this we specify models of lagged (one period) health conditional on initial health. This has the advantage of reducing fears of endogeneity bias, exploiting the `timing of events' by observing the effect of health shocks prior to the time of retirement (for example, see Abring and van der Berg, 2003).

4 Results

4.1 Descriptive Statistics

The descriptive statistics in Appendix 1 show key measures for the two countries disaggregated by gender and also by time pre- and post-retirement. Variable definitions for each of these variables are given in Appendix 3.

Overall for both countries just over one-third of the sample retires during the time period under observation. The health profiles are similar, although a larger proportion of the German sample report health in the 'excellent' category, with slightly less in 'very good or good. In Germany women seem to report better health than men, but this distinction is not so clear in the UK. For both countries, the post-retirement sample exhibits worse health, although it is important to note that these simple descriptive statistics do not adjust for covariates such as age or income. The average age of the UK and German samples is very similar, reflecting our stock sampling approach defined by age at wave 1.

Marital status is distributed similarly in the two countries. The vast majority of the sample is married or living as couple. The distribution of education is different, with generally higher levels of education in Germany than the UK. In both samples overall around 40% of men have working spouses, but this is much higher in the pre-retirement than the post –retirement sample which may indicate synchronised retirement by couples. For women the situation differs by country.

In the UK we can distinguish between four categories of housing tenure: 'owned outright', 'owned with a mortgage', 'local authority and housing association rental', and 'other rental'. In Germany we can only distinguish two categories: 'owner', or 'living in subsidised housing'. Around 10% of the sample lives in this latter type of 'low-income' housing, but while this is slightly higher post-retirement in the UK, it is slightly lower post-retirement in Germany. In the UK, we see a large increase in the proportion who own outright after retirement, and this may reflect the use of lump sums to pay off mortgage debt.

In the UK we distinguish between 3 categories of pension entitlement: state pension only (base category), private (PRIVPEN) and employer (EMPPEN). Substantially more men than women have a private or employer pension, reflecting their relative positions in the labour market. Around 25% of men and 50% of women have only a state pension. In Germany there is less heterogeneity in the pension system. We distinguish Class 1 civil servants who have more generous pension entitlement than other workers – around 10% of men and 2% of women are in this category.

4.2 Describing health in the UK and Germany

To gain a better understanding of the impact of health on retirement we look at the distribution of health in each country and consider how it varies with age and labour market status. Three different samples are considered: (i) the full sample of individuals aged 18 years and older; (ii) as a subset of this data, only those individuals who are employed or self-employed; (iii) the sample utilized in our econometric analysis, those who were aged 50 and over and working in Wave 1.

United Kingdom

Figures A4-1 to A4-8 (Appendix 4) show the distribution of SAH for our three samples. For both men and women the best health is reported by the samples of workers of all ages, confirming that health is a common reason for people leaving the labour force. For men, it is difficult to rank the health of the other two samples; the proportion reporting excellent health is lower in the analysis sample than the full sample, but this ordering is revised for good and very good health. Also more of the full sample report poor and very poor health. For women, the analysis sample displays better health than the full sample, suggesting that despite the older age of the analysis sample, the fact that all these individuals are working in wave 1 suggests they tend to have good health. Comparing figures A4-1 and A4-2 it is clear that men display better health than women.

Figures A4-3 and A4-4 show the evolution of a variety of health measures over time and there is a clear deterioration in health during the 12 waves[25]. Tables 4-1 and 4-2 show changes in health for the balanced sample (i.e. those individual who remain in the sample through to wave 12). Around 40% of both men and women report a decline in SAH; lower proportions report the acquisition of a specific health problem or health limitation. However, for some of the sample, despite their advancing age they report improvement in health.

Table 4-1: Percentage of non-attriting men with changes in health from wave 1 to wave 12

	Decline	Improve	No change
sah	42.0	17.3	40.7
hlprbyes	29.3	4.6	66.1
hlltyes	16.6	1.6	81.8

Table 4-2: Percentage of non-attriting women with changes in health from wave 1 to wave 12

	Decline	Improve	No change
sah	41.2	15.6	43.1
hlrprbyes	27.9	5.3	66.8
hlltyes	14.5	4.2	81.3

Germany

Figures A4-5 and A4-6 show the distribution of SAH for the three samples (full, working and analysis). The distribution of SAH over the 4 categories (for all samples) is clearly different in Germany to the UK and this is discussed further below. However, like the UK, for both men and women the best health is reported by the samples of workers of all ages. Unlike the UK the ranking of health for the other two samples is clear, and for both men and women the analysis sample has the worst health. Again men display better health than women.

[25] The anomalies in wave 9 are caused by the change in the 5 point scale for that wave only.

Figures A4-7 and A4-8 show the evolution of a variety of health measures over time and health deterioration appears more marked than in the UK particularly for men. Tables 4-3 and 4-4 show changes in health for the balanced sample. Around 40% of both men and women report a decline in SAH (and 17% an improvement) which is similar to the figures for the UK. Over 50% of men, and 45% of women, report decreased satisfaction with their health and disability levels also increase over time.

Table 4-3: Percentage of non-attriting men with changes in health from wave 1 to wave 12

	Deteriorated	Improved	No change
sah	39.5	14.9	45.5
hlsatis	53.3	23.9	22.8
disability	16.6	2.7	80.8

Table 4-4: Percentage of non-attriting women with changes in health from wave 1 to wave 12

	Deteriorated	Improved	No change
sah	38.1	16.9	44.9
hlsatis	44.94%	29.2	25.9
disability	19.05%	1.2	79.8

4.2.1 Comparison of Self-Assessed Health Distributions

The distributions of SAH are clearly different for the analysis samples from the two countries. Comparisons are not straightforward due to the different scales used. The lowest level of SAH is ‘poor or very poor’ in the UK and ‘poor or bad’ in Germany. In the UK, the next to top category is good or very good whereas in Germany it is simply good. While the fair and excellent categories share the same classification, it is not clear that they are directly comparable since they exist within these different scales.

At face value the overall distribution of SAH is worse in Germany than the UK, particularly at older ages. In Germany, less than 50% of men rate their health as one of the two highest categories, ‘poor’ and ‘fair’, while in the UK, almost 75% of men consider their health to be either ‘good or very good’ or ‘excellent’. More than 20% of men in the UK rate their health as excellent while just 6.6% in Germany do so.

66% of women in Germany rate their health as fair or poor, compared to only 25% in the UK; and only 3% are in the top category compared to 21% in the UK. For both sexes the deterioration in good and excellent health with age is much greater in Germany.

Without comparable data on objective health measures it is difficult to interpret these results; however they may reflect cultural differences in the interpretation of the definitions rather than real differences in health.

4.3 Income related health Inequalities and retirement

Within the balanced sample from the UK, there are a total of 569 individuals (307 men and 262 women), see Table 4-5. Of these, 29% of men and 33% of women experience a 1-point deterioration in SAH (on a 5 point scale) at some point between wave 1 and wave 12 and a

smaller proportion indicates a 2-point deterioration. 14.5% of women and 16.6% of men suffer a health limitation (*hllt*) between wave 1 and wave 12. A greater proportion of men than women in our sample retire early; 39% of men and only 19% of women. A very small proportion of our sample both retires early and suffers a health deterioration; less than 10% in all cases. While this is not causal analysis it does suggest that the vast majority of health deteriorations for people who were working at age 50 do not culminate in early retirement.

Table 4-5: Occurrence of health deteriorations and early retirement - United Kingdom.

	Individuals			percentage		
	men	**women**	**total**	**men**	**women**	**total**
Health deterioration						
1-pt SAH	90	86	176	29.3	32.8	30.9
2-pt SAH	34	18	52	11.1	6.9	9.1
Retires early	120	49	169	39.1	18.7	29.7
Retired early & has health deterioration						
1-pt SAH	28	15	43	9.1	5.7	7.6
2-pt SAH	18	4	22	5.9	1.5	3.9
TOTAL	307	262	569	100	100	100

The balanced sample from Germany (see Table 4-6), contains considerably more individuals: 567 men and 336 women. The proportions with health deteriorations are similar to those observed in the UK data. 30% of men and 30% of women suffer a 1-point deterioration in SAH while only 9% of men and 7% of women experience a 2-point deterioration. In section 4.2 we saw that the distributions of SAH itself were quite different between the UK and Germany with far fewer men and women in Germany classifying themselves as being in the best SAH categories, however despite this the distribution of changes in SAH appears to be similar.

Table 4-6: Occurrence of health deteriorations and early retirement – Germany.

	Individuals			percentage		
	men	**women**	**total**	**men**	**women**	**total**
Health deterioration						
1-pt SAH	169	101	270	29.8	30.1	29.9
2-pt SAH	50	23	73	8.8	6.9	8.1
Retires early	389	245	634	68.6	72.9	70.2
Retired early & has health deterioration						
1-pt SAH	115	72	187	20.3	21.4	20.7
2-pt SAH	33	21	54	5.8	6.3	5.9
TOTAL	567	336	903	100	100	100

Early retirement is observed much more frequently in Germany than the UK. More than two thirds of individuals in our sample from Germany retire before the prescribed state retirement ages. Given the relatively high incidence of early retirement we observe a greater percentage of individuals in Germany who both retire early and indicate a health deterioration.

4.3.1 Inequality in health shocks

The CC obtained for 1-point deteriorations in SAH for the UK is shown in Figure 4-1 (along with that for Germany). The UK curve is predominantly above the diagonal however there are places where it drops below. The CI is -0.018 (Table 4-7), indicating pro-poor inequality in 1-point SAH shocks, so for example, the poorest 10% of the sample are experiencing more than 10% of the health deteriorations.

Figure 4-1: CCs 1-point deterioration in SAH for the UK and Germany.

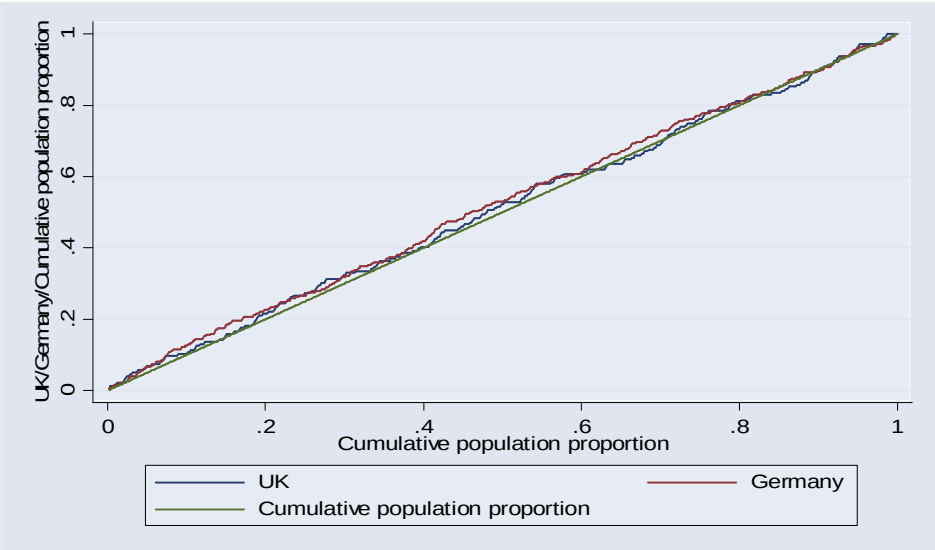
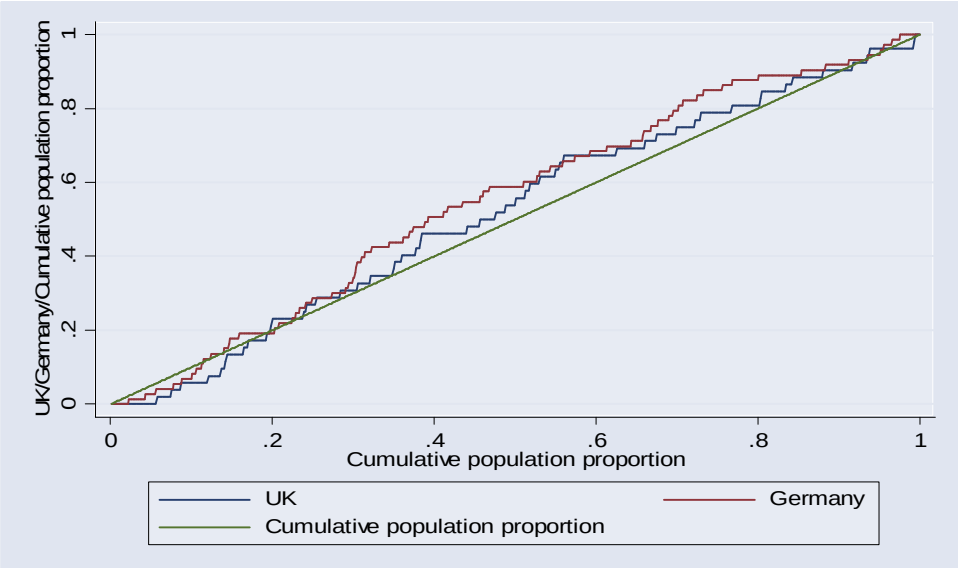


Table 4-7: Concentration indices for the United Kingdom & Germany.

		UK	Germany
C1	1-point SAH shock	-0.018	-0.038
C2	2-point SAH shock	-0.042	-0.105
C3	Early retirement	0.115	-0.058
C4	Early retirement & 1-point shock	0.056	-0.090
C5	Early retirement & 2-point shock	0.088	-0.102

The results for 2 point health shocks are similar (see Figure 4-2 but reflect greater inequality for (CI = -0.042 v. -0.018). As with the curve for 1-point shocks, the CC for a 2-point health shock is predominantly above the diagonal but it also drops below especially near the left-hand side. This suggests that generally over the entire income ranking the poorest experience a disproportionate share of the health deteriorations, but at the very lowest end of the income rankings (the first 20%) this group tend to experience less than 20% of the health deteriorations. This may be the result of our sample selection in which all respondents are working in wave 1 and hence may have better health on average than the lowest income groups in the total population of people aged 50 years plus.

Figure 4-2: CCs for 2-point deterioration in SAH the UK and Germany.

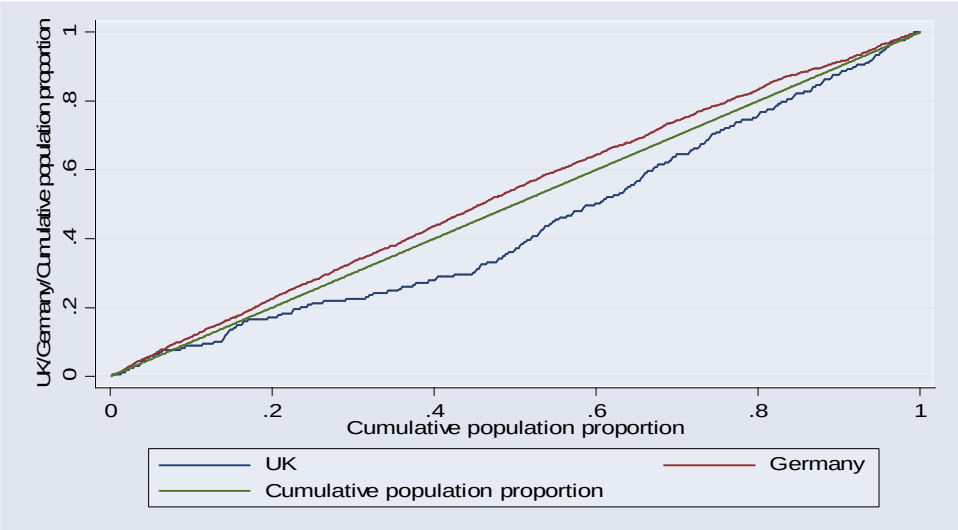


Findings for Germany are very similar to those for the UK. The CC obtained for 1-point deteriorations (Figure 4-1) is predominantly above the diagonal. The CI is also negative (-0.038) but the magnitude is greater than the UK indicating greater pro-poor inequality in 1-point SAH shocks in Germany. Regarding 2-point health shocks, again there is pro-poor inequality as the CC shown in Figure 4-2 is mainly above the diagonal and the CI is -0.105. The level of inequality is again greater for Germany than for the UK as the CC is further from the 45 degree line. Again for the lowest income rankings the CC is below the diagonal, but where in the UK this applies to the bottom 20% it is around 15% in Germany.

4.3.2 Inequality in early retirement

The CCs for early retirement (see Figure 4-3) are quite different between the two countries. In the UK the CC is predominantly below the diagonal indicating pro-rich inequality i.e. early retirements are concentrated among the richest members of our sample. The CI reflects this with a value of 0.115. The opposite is found in Germany with the CC being wholly above the diagonal and with a CI of -0.059, meaning that early retirements are concentrated in the poorest sample members. The absolute level of inequality in early retirement is greater in the UK than Germany. The lower level of inequality in Germany is likely attributable to the easier movement into retirement before reaching state retirement age allowed by the pension system in that country. Pro-rich inequality in the United Kingdom may be attributed to the fact that lower earners in the UK cannot afford to leave the labour market early and must wait until they can draw on the State Pension, which is only available when they reach statutory retirement age.

Figure 4-3: CCs for early retirement (*RETi*) for the UK and Germany.



4.3.3 Inequality in early retirement with a health shock

For the United Kingdom, we observe pro-rich inequality in early retirement i.e. the curve generally lies below the diagonal (Figures 4-4 and 4-5). While the curves are predominantly below the diagonal there are a number of places where the curves cross the line. The curves are also very 'stepped' as we have very few individuals in this balanced sample who retire early and experience one of the health shocks defined here.

Contrary to the results obtained for the United Kingdom, we find pro-poor inequality for Germany . The CIs are both negative with slightly greater inequality indicated for early retirement and a 2-point decrease in SAH (CI = -0.102).

Figure 4-4: CCs for early retirement and 1-point SAH shock for the UK and Germany.

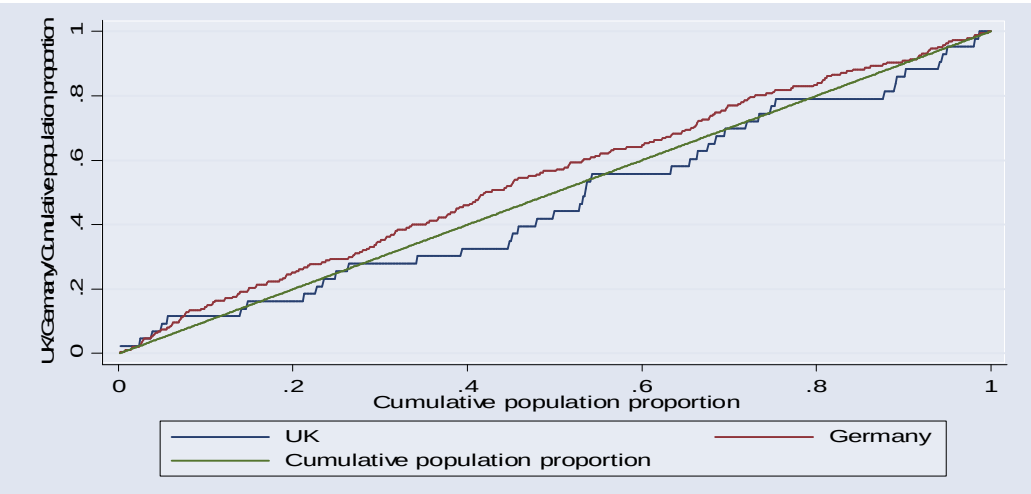
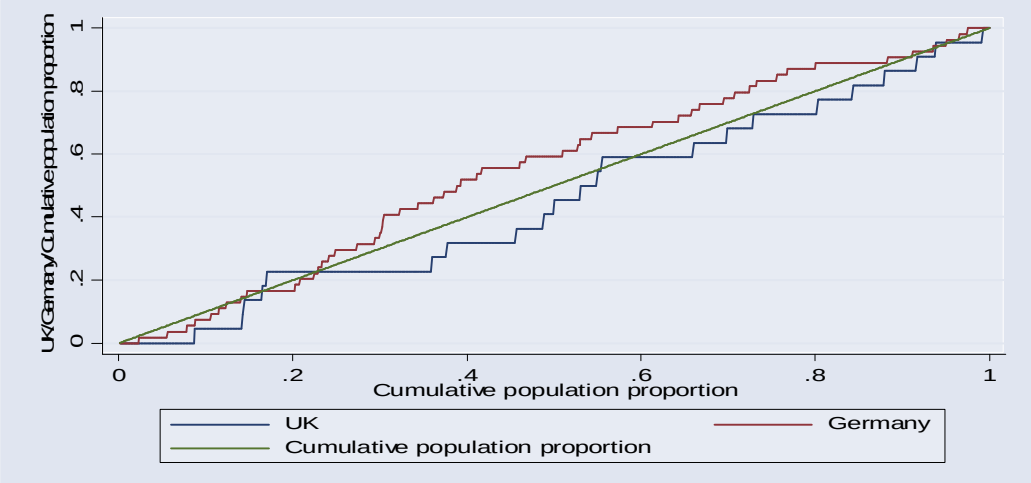


Figure 4-5: CCs for early retirement and 2-point SAH shock for the UK and Germany.



4.3.4 Summary of inequality analysis

Table 4-7 summarizes the CIs discussed for the United Kingdom and Germany. Comparing the two countries we first notice that the indices for SAH shocks have the same negative signs for both countries (indicating pro-poor inequality), with greater absolute magnitude for Germany. The CI for early retirement alone (C3) has a negative sign in Germany but a positive sign for the United Kingdom. The signs of the CIs for the UK and Germany also differ for the combination of early retirement and health shocks. These two indices (C4 and C5) are positive for the UK but negative for Germany.

For both the UK and Germany health deteriorations are concentrated among the poorest sample members. The pro-rich inequality in early retirement and early retirement with a health shock in the United Kingdom indicates that moving into retirement before the state retirement age more commonly occurs amongst those with greater levels of household income. The reverse is true in Germany where there is pro-poor early retirement and early retirement with a health shock.

At first sight the results for Germany are more intuitive than those for the UK; health shocks are more concentrated among the poor, as is early retirement, meaning that the interaction of the two is ‘pro-poor’. In contrast for the UK, the income gradient in early retirement is offsetting the inequality in health shocks so that even though poorer individuals are more likely to have health shocks the combination of health shocks and retirement is ‘pro-rich’.

The income gradient may arise from the fact that the UK pension system is more reliant on private pension provision that Germany. Private pension benefits are heavily dependent on length of service and thus may deter people from retiring early. Only those who are financially well-off can afford to retire early thus early retirement is concentrated among the richer sections of society.

4.4 Kaplan-Meier Survival Curves

Figures A5-1 to A5-8 (Appendix 5) display Kaplan-Meier estimates of the probability of survival (not retiring) by health status separately for men and women in both countries. In general, the probability of retiring increases with decreasing SAH and with the degree of registered disability for men (Germany) or the presence of health limitations (UK). Similar, albeit less pronounced results are observed for women. Other survival curves were considered for partners health status (not reported here) but none of these displayed a clear pattern. Thus this simple bivariate analysis suggests that own health is important the retirement decision but spouse health may not be an important factor.

4.5 Causal models of the determinants of early retirement

UK

The hazard model results for the UK are shown in Appendix 6 Tables A6-1 (men) and A6-2 (women). Each table presents results for health limitations (HLLT) in the first set of columns and self-assessed latent health (LATSAH) in the second set of columns.

Models for men and women show the expected gradient over age categories. The hazard for retiring is negative for all categories except for ages 65 to 69 for men. This covers the state retirement age and accordingly is positive but this coefficient is not statistically significant. For men, there is a gradient across educational attainment such that higher levels of education are associated with a decreasing hazard of retiring. However, the effects are significant for degree or higher degree (DEGHDEG) only. None of the educational attainment dummies are significant for women. For men, the employment sector variables (measured at the first wave) are positive and contrast against a baseline of self-employment. The coefficients on the private sector and civil and local government are significant. Accordingly, the hazard of retirement is greater for employees compared to the self-employed. The largest effect is observed for individuals employed within civil and local government (CIVLOCGOV), followed by the private sector (PRIVCOMP) and those employed in other sectors (JBSECTO). The effects are reversed for women where the hazard is greater for the self-employed however, the effects are not significant.

We also observe an effect of pension entitlements. These variables represent whether an individual has made a contribution into a private pension plan (or an employer has made a contribution on behalf of the individual) during the observation period (PRIVPEN) and whether an individual has been a member of an employers pension scheme during the observation period (EMPPEN). Compared to the baseline of state only pension entitlement, having a private pension is associated with around a 70% decrease in the likelihood of retiring for men (80-90% for women). In contrast, having an employer pension increases the likelihood of retiring for men by almost two-fold but this is not significant for women.

For men if the spouse as a job the probability of retirement is decreased by around 30-40% but this variable is not significant for women. The effects of housing tenure (HSEMORT, HSEAUTH and HSERENT), mean logged household income (MLNHINC) and marital status are largely not significant in any of the models. The only exception is for women in the model with health limitations where HSEMORT is negative and statistically significant.

The Standard Occupational Classification (SOC) variables (MANAGADMIN, PROF, CLERSEC, CRAFTREL, PERSPRO, SALES, PLANT, OTHEROCC) achieve the same signs across the models with health limitations and with latent health however the signs differ between men and women. None of the estimated coefficients for the SOC variables are statistically significant.

Our primary focus is the role of health in determining retirement behaviours. To this end we consider both the measure of health limitations (HLLT) and the measure of underlying latent health stock (LATSAH). Both of these variables are lagged one period to avoid problems of simultaneity. We also condition on the first periods health status so that the estimated effect of lagged health can be interpreted as a health shock. Further we consider the health of a respondent's spouse or partner. Clearly, this can only be defined should a respondent have a spouse or partner and therefore needs to be interpreted alongside the estimated effect of the marital status variable (MARCOUP).

For men we observe a large, positive and highly significant effect for health limitations. This implies that the hazard of retiring is greater for individuals experiencing a shock to health that leads to a health limitation. For our constructed measure of underlying latent health (which is increasing in health) we observe a negative and significant coefficient implying that the retirement hazard increases as health decreases. For both models, while we observe the expected signs, the estimated coefficients on spousal health are not significant.

Results for the health variables for women are similar to the results observed for men and quantitatively the hazard ratios are of similar size. The effect of spousal health is negative but insignificant.

Germany

The hazard model results for Germany are shown in Appendix 6 Table A6-3 (men) and A6-4 (women). The first set of columns presents the results for models where SAH was used directly. The second set of columns presents the estimates obtained using latent health stock[26].

Models for men and women show the expected gradient over age categories. The hazard for retiring is negative for all categories compared to a baseline of over 64 years. No significant effect of a higher educational attainment is found. For men, the industry sector of employment (measured at the first wave) has some significant impacts on the retirement hazard. Compared to the reference sector, mining, the hazard of retiring is significantly lower for men working in trade or services in the first set of estimates (with SAH directly). No significant effect of industry sector is found for women. Working in the civil service (CIVSERV) has a negative effect on the hazard for women and a positive effect for men however, these effects are not significant.

The region of residence does not have a significant effect in either model for men and women; and nor dies originally being from East Germany. However, being of foreign origin has a negative effect on the retirement hazard which is statistically significant for men in both models and for women in the model with the latent health measure.

Household income has a significant negative impact on the hazard of retirement for men, while no such effect is observed for women. Of the other wealth proxies, only living in subsidized housing has a weakly significant positive impact on the hazard for retiring of women in the model with SAH.

Turning to the primary focus of this paper, generally, a significant negative impact on the hazard rate is observed for better health states (as compared to the reference category of poor health). The estimates for SAH are negative and significant for all cases except SAHEXC(t-1) for women. For the constructed measure of underlying latent health we observe a negative and significant coefficient for men and women. The latent health scale is increasing in health so that the negative coefficient implies that the retirement hazard increases as health decreases. Initial health, while having the same sign of coefficients as health lagged by one period generally has no significant effect on the hazard rate. This is indicative of changes/shocks to

[26] Results for the ordered probit latent health stick models are nor reported here.

health status being more important for the retirement decision than health levels. No significant effect of the health of the spouse on retirement behaviour is observed.

With regard to joint decision making of spouses no significant effect of the spouse working in the last period (JOB(t-1)) is observed for men. However, for women, having a working spouse significantly lowers the hazard of retirement. Having a spouse, as indicated by MARRIED insignificantly increases hazard rates for men and lowers them for women.

4.5.1 Attrition and attrition bias

.Approximately 43% of the original sample of men and approximately 38% of women have dropped out of the sample by the end of the period for both the BHPS and GSOEP (Appendix 2); some of this attrition may be health-related[27], or may also be related to labour market status (for example, see Zabel (1998) and Ziliak and Kniesner (1998)). A systematic relationship between health and labour market participation and attrition will lead to bias in our empirical models. To test for such bias we use a simple variable addition test as proposed by Verbeek and Nijman (1992, p. 688). The test variable we use is an indicator for whether the individual responds in the subsequent wave (NEXTWAVE). This is regressed, together with the set of conditioning variables, on the retirement indicator using a discrete-time duration framework. A test of the significance on the corresponding parameter estimate provides a test for attrition bias[28].

For models of health limitations and latent self-assessed health using the BHPS data, there is insufficient evidence to suggest we can reject the null-hypothesis of no attrition bias for either men or women (Appendix 6, Table A6-5). This is evidenced through the non-significance of the NEXT WAVE variable, with p-values ranging from 0.070 to 0.627. Variable addition tests are also performed on the models estimated using data in GSOEP. For women the addition of NEXTWAVE proves to be non-significant in all models and accordingly we conclude that sample attrition does not lead to biases in the estimates of the health or socioeconomic conditioning variables in the model. Including NEXTWAVE in the model for men leads to a significant effect, indicating that we cannot reject the hypothesis that sample attrition is related to retirement behaviour. However, inclusion of NEXTWAVE results in little change to the coefficients on the conditioning set of variables, indicating that although statistically attrition is related to retirement, its effect seems negligible. Accordingly, we do not attempt to adjust our estimation procedure for attrition bias.

5 Discussion

The most striking result from the above models is that, regardless of the way we measure own health, it is found to be a key determinant of the retirement hazard for both men and women in both the UK and Germany. The size of the health effect is large compared to the other variables, and in particular is larger than the pension entitlement effects in both countries. Indeed for the German models, despite the renowned generosity of the civil service pension and the incentives for early retirement that it provides, this variable is not statistically significant.

For our latent health variable the baseline health measure is not significant but the lag is, suggesting that it is health deterioration (shocks) that are important rather than continual poor health. A 1 unit decrease in latent health is estimated to increase men's probability of retirement by around 35% in the UK and around 15% in Germany, for women these figures are

[27] See Contoyannis, Jones, and Rice (2004) and Jones, Koolman, and Rice, N. (2006) for a discussion of health-related attrition and the consequences for models of the determinants of health using the BHPS.

[28] It should be noted that the test has low power and is not intended to correct for any observed attrition bias (Verbeek, 2000).

50% and 15% respectively. The larger estimated effect of health in the UK may reflect increased incentives to utilise the disability route into retirement and this in turn may be due to an increased reliance on a 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. This may seem counterintuitive given the policy review that found no active labour market policies for older workers in Germany; however, in 2002, Germany spent 0.30% of GDP on labour market programmes for people with disabilities compared to only 0.02% in the UK (Frerichs and Taylor, 2005; Table 6). It may also reflect less discrimination against older workers on the part of employers in Germany but we have no way of testing this hypothesis in the current context.

While the alternative health measures cannot be compared directly, and they are more prone to reporting bias than latent health, they do confirm the relatively large effects of health and the fact that the effects are larger in the UK. In the UK acquiring a health limitation increases the probability of retirement by a factor of 3.5 for men and 2.5 for women. In Germany, for men if health changes from fair to poor the probability of retirement increases by around 30%, deterioration from good to poor would increase the probability by 35%, and from excellent to poor by 45%. The figures are very similar for women.

The variables used to represent pension systems appear to have a greater effect on the hazard to retirement in the UK than in Germany. Our models do not contain detailed information on pensions and this is common in the literature that focuses on health effects, since detailed health and pension information is rarely available in the same data sets. A recent DWP survey in the UK found that people had a very low level of knowledge about their pensions, which may cast doubt on the need for detailed pension information for our modelling objectives (Humphrey et al 2003). Our main finding in relation to pensions is that for both men and women in the UK 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 (Meghir and Whitehouse, 1997). 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 civic or local government variable for men in the UK is explained by arrangements in that sector that are conducive to early retirement; these may reflect pension entitlements and specific early retirement schemes such as those available to teachers. It is more difficult to explain the insignificance of the civil service pension variable in Germany, however this is a small group (roughly 4% of the sample) and also the effects of the generous pension might be offset by better working conditions, and thus less disutility from work.

These results should be interpreted in the light of the inequality analysis presented above, which showed that while the distribution of health shocks is pro-poor in the UK (i.e. health shocks are more than proportionality concentrated amongst those at the lower end of the income distributions) early retirement is pro-rich, in contrast to Germany where both health shocks and early retirement are pro-poor. For Germany the effect of income in these causal models is negative (and significant for males) confirming the results of the inequality analysis; those with higher incomes are less likely to retire early after controlling for health status and other characteristics. For the UK income is not significant in any model. However, the significant negative coefficient on private pensions in the UK does seem to support to the results of the inequality analysis, suggesting that reliance on private pension provision means that only the financially well-off will be able to afford early retirement. The negative significant result for higher education for men in the UK is somewhat counter intuitive to this as we would expect this to be positively correlated with income. However, it may reflect the fact that people

with higher education are in jobs that they are less likely to want to retire from and it is consistent with the predictions of human capital theory that more highly qualified people remain longer in the labour market to extend the payback period on their investment.

6 Conclusion and policy recommendations

Germany and the UK share concerns about the sustainability of the public pension system and potential labour shortages arising from the aging of the population. Debates in both countries have centred on encouraging people to work for longer but this has neglected the important role of the health of older workers as a primary determinant of whether or not they remain in the labour market as they approach retirement age. Theoretically we would expect own health to be an important factor in the decision to retire and the few studies that informed ours had confirmed that this was indeed the case. What we add is an improved method for dealing with the dynamics of the relationship between health and retirement and a consideration of the joint decision making of older couples by including spouse health and spouse labour market status in our models.

Like the vast majority of the literature we had only subjective information on health status so our methods are designed to reduce as far as possible the problems of endogeneity, reporting bias and reporting heterogeneity that arise from using this type of information to unravel the causal relationships between health and labour market status.

Our findings confirm those of a number of other studies; own health is indeed an important determinant of the decision to retire in the UK and Germany and its effect is larger than that of our pension entitlement and income variables. This is the case for both men and women and is observed for both latent health status and alternative health measures. The effects of spouse health do not appear to be important but there is some evidence of an effect from having a working spouse.

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 effect may have no effect if poor health is the underlying reason for inactivity.

Instead this points to a need for improving the health of the work force and putting resources into facilitating continued work for people with health problems and disabilities. More has been done in this regard in Germany than the UK, although it has not targeted older workers particularly (see Frerichs and Taylor, 2005). In the UK there is little or no communication between primary health care providers and employers so an integrated approach is virtually impossible within the current system. This is exacerbated by the fact that the UK has very poor provision of occupational health professionals - about 12 for every 43000 employees (CBI, 2004). While the New Deal 50 Plus[29] is designed to help older people on benefits get back into work, unlike Pathways to Work (DWP 2002) for people on Incapacity Benefit, the New Deal does not provide specific health advice and evidence suggests that this is perceived as a shortcoming by potential clients, and the level of participation by people with disabilities is low (Kodz and Eccles 2001). Instead the integrated approach of Pathways might be extended more generally to help older workers with health problems. Indeed early evaluation suggests that Pathways has been more effective with ‘older’ claimants (aged 45+) than younger ones (Adam

[29] www.newdeal.gov.uk/

et al, 2006). However, even this programme only targets those workers who have already left the labour force whereas it may be more effective to design policy that helps older workers to remain economically active. Once individuals leave the labour market thjeir skills start to deteriorate so it is better to keep them in, by say allowing more flexible working arrangements to cope with health problems. The recent 'New Quality of Work' initiative in Germany, and its 2003 aim to promote employment for older workers, may be a way forward in terms of an integrated approach. However, thus far it is not at all specific in its policy tools. This initiative could learn from the initial successes of the UK Pathways scheme in combining health and work advice.

Overall our findings add strong support to the policy recommendations made by Frerichs and Taylor (2005); in particular the importance of health suggests the need for close coordination of policies between the government and the workplace; a greater emphasis on preventing people from leaving the labour market rather than targeting all resources on those who have already left, and increased use of measures to prevent a deterioration in health, such as provision of occupational healthcare and improved work related knowledge among primary care providers.

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Appendix 1: Descriptive Statistics

	BHPS							**GSOEP**					
	Men			Women				Men			Women		
	All	Pre - Retirement	Post - Retirement	All	Pre – Retirement	Post - Retirement		All	Pre - Retirement	Post - Retirement	All	Pre – Retirement	Post - Retirement
RETIRED	0.324			0.365				0.369			0.378		
Own Health													
SAHEXC	0.238	0.257	0.197	0.209	0.241	0.153		0.315	0.339	0.275	0.347	0.382	0.289
SAHGOOD	0.486	0.485	0.488	0.521	0.514	0.535		0.364	0.312	0.452	0.378	0.341	0.441
SAHFAIR	0.213	0.2	0.24	0.209	0.193	0.238		0.285	0.306	0.249	0.248	0.252	0.241
SAHPOOR	0.064	0.058	0.075	0.061	0.053	0.075		0.035	0.041	0.023	0.027	0.025	0.029
Spousal Health													
SAHEXC	0.156	0.171	0.126	0.157	0.183	0.113		0.352	0.371	0.32	0.368	0.397	0.309
SAHGOOD	0.431	0.437	0.419	0.338	0.356	0.307		0.356	0.328	0.406	0.332	0.295	0.406
SAHFAIR	0.191	0.192	0.191	0.171	0.161	0.187		0.242	0.251	0.228	0.252	0.259	0.238
SAHPOOR	0.085	0.084	0.088	0.062	0.059	0.068		0.026	0.028	0.022	0.024	0.025	0.023
Covariates													
AGE	61.8	59.5	66.6	61	58.7	64.9		60	57.3	64.5	59.8	57.1	64.4
MARCOUP	0.867	0.886	0.827	0.744	0.774	0.691		0.876	0.877	0.875	0.743	0.791	0.662
SPOUSEJB	0.413	0.528	0.174	0.369	0.493	0.153		0.419	0.491	0.296	0.56	0.629	0.445
EDUHIGH	0.084	0.087	0.078	0.061	0.064	0.057		0.176	0.185	0.162	0.093	0.087	0.103
EDUMID	0.18	0.188	0.164	0.113	0.114	0.11		0.519	0.497	0.554	0.394	0.408	0.371
EDULOW	0.736	0.725	0.758	0.826	0.822	0.833		0.292	0.311	0.16	0.498	0.494	0.504
HSEOWN	0.522	0.421	0.732	0.563	0.484	0.699							
HSEMORT	0.32	0.415	0.122	0.247	0.322	0.116							
HSERENT	0.046	0.054	0.027	0.044	0.055	0.024							
HSEAUTH	0.112	0.109	0.118	0.147	0.139	0.16							
OWNER								0.472	0.447	0.514	0.436	0.426	0.453
SUBID								0.92	0.095	0.086	0.089	0.085	0.097
EMPPEN	0.539	0.527	0.563	0.372	0.38	0.359							
PRIVPEN	0.402	0.454	0.274	0.224	0.266	0.142							
STATEP	0.249	0.232	0.287	0.594	0.484	0.541							
CIVSERV									0.095			0.024	

Appendix 2: Labour market status by wave

Table A2-1: BHPS labour market status by wave

	1	2	3	4	5	6	7	8	9	10	11	12
Attrition		122	193	247	296	331	347	365	391	418	441	464
Self-	214	169	153	134	116	111	94	83	62	54	59	47
employed	921	691	559	470	394	344	302	260	215	175	144	113
Employed		26	24	29	22	16	13	7	6	8	0	3
Unemployed		82	152	190	239	269	320	359	400	442	462	475
Retired		13	28	30	33	33	33	30	23	15	15	10
LT sick, dis		26	18	26	23	25	17	22	25	16	10	13
Other		6	8	9	12	6	9	9	13	7	4	10
Known	1135	1135	1135	1135	1135	1135	1135	1135	1135	1135	1135	1135
Deaths	1135	860	712	604	510	455	396	343	277	229	203	160
Total												
In work*												

Table A2-2: BHPS labour market status by wave- men

	1	2	3	4	5	6	7	8	9	10	11	12
Attrition		68	116	146	176	199	209	222	235	248	262	278
Self-employed	162	138	124	105	97	89	76	68	53	46	49	38
Employed	479	349	270	228	193	169	147	129	104	93	78	62
Unemployed		19	20	23	13	10	9	5	6	5	0	2
Retired		50	80	105	125	141	168	187	214	226	233	241
LT sick, disabled		11	23	25	27	28	25	22	19	13	14	10
Other		2	2	2	1	1	3	1	4	5	1	1
Known Deaths		4	6	7	9	4	4	7	6	5	4	9
Total	641	641	641	641	641	641	641	641	641	641	641	641
In work*	641	487	394	333	290	258	223	197	157	139	127	100

Table A2-3: BHPS labour market status by wave- women

	1	2	3	4	5	6	7	8	9	10	11	12
Attrition		54	77	101	120	132	138	143	156	170	179	186
Self-employed	52	31	29	29	19	22	18	15	9	8	10	9
Employed	442	342	289	242	201	175	155	131	111	82	66	51
Unemployed		7	4	6	9	6	4	2	0	3	0	1
Retired		32	72	85	114	128	152	172	186	216	229	234
LT sick, disabled		2	5	5	6	5	8	8	4	2	1	0
Other		24	16	24	22	24	14	21	21	11	9	12
Known Deaths		2	2	2	3	2	5	2	7	2	0	1
Total	494	494	494	494	494	494	494	494	494	494	494	494
In work*	494	373	318	271	220	197	173	146	120	90	76	60

Table A2-4: GSOEP labour market status by wave

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**12**
Attrition		73	109	164	184	230	268	332	369	481
Self-emp	123	114	95	87	79	78	66	58	50	25
Employed	1063	906	792	669	562	456	363	281	221	87
Unemployed		44	70	82	107	106	106	78	75	14
Retired		47	111	179	247	312	375	434	460	574
Known Dth		2	9	5	7	4	8	3	11	5
Total	1186	1186	1186	1186	1186	1186	1186	1186	1186	1186
In work*	1186	1020	887	756	641	534	429	339	271	112

Table A2-5: GSOEP labour market status by wave- men

	1	2	3	4	5	6	7	8	9	10	11	12
Attrition		48	60	94	111	145	163	220	238	267	298	328
Self-employed	79	72	66	59	51	53	41	38	30	24	21	17
Employed	711	608	535	449	383	308	250	195	149	120	83	61
Unemployed		28	48	60	75	78	81	53	58	46	27	11
Retired		32	75	124	165	204	247	282	304	328	353	371
Known Deaths		2	6	4	5	2	8	2	11	5	8	2
Total	790	790	790	790	790	790	790	790	790	790	790	790
In work*	790	680	601	508	434	361	291	233	179	144	104	78
	1	2	3	4	5	6	7	8	9	10	11	12

Table A2-6: GSOEP labour market status by wave- women

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Attrition		25	49	70	73	85	105	112	131	134	153	153
Self-employed	44	42	29	28	28	25	25	20	20	16	11	8
Employed	352	298	257	220	179	148	113	86	72	53	37	26
Unemployed		16	22	22	32	28	25	25	17	14	8	3
Retired		15	36	55	82	108	128	152	156	176	186	203
Known Deaths			3	1	2	2		1		3	1	3
Total	396	396	396	396	396	396	396	396	396	396	396	396
In work*	396	340	286	248	207	173	138	106	92	69	48	34

In all cases * signifies employed and self-employed

Appendix 3: Variable codes, definitions and data sources

Variable name	Description	Code UK	Definition UK	Source UK	Code Germany	Definition Germany	Source Germany
Dependent variable							
Retirement status	Self-reported employment status	RETIRED	1 - retired 0 - otherwise	BHPS	RETIRED	1 - retired 0 - otherwise	GSOEP
Explanatory variables							
Latent health		LATSAH	continuous	BHPS	LATHEALTH1	continuous	GSOEP
Self-assessed health **NOTE:** See Section 3.1.5.2 for details on change in definition for UK Wave 9 only.		SAHEXC	1 – excellent, 0 - otherwise	BHPS	SAHEXC	1 – very good, 0 - otherwise	GSOEP
		SAHGOOD	1 – good, 0 - otherwise	BHPS	SAHGOOD	1 – good, 0 - otherwise	GSOEP
		SAHFAIR	1 – fair, 0 - otherwise	BHPS	SAHFAIR	1 – fair, 0 - otherwise	GSOEP
		SAHPOOR	1 - poor or v poor, 0 - otherwise	BHPS	SAHPOOR	1 - poor or bad, 0 - otherwise	GSOEP
Health limitations	"Does your health in any way limit your daily activities compared to most people of your age?"	HLLT	1 - yes, 0 - otherwise	BHPS	--	--	--
Specific health problems	arms, legs, hands	HLPARMS	1 - yes, 0 - otherwise	BHPS	--	--	--
	sight	HLPSEE	1 – yes, 0 - otherwise	BHPS	--	--	--
	hearing	HLPHEAR	1 – yes, 0 - otherwise	BHPS	--	--	--
	Skin conditions or allergies	HLPSKIN	1 – yes, 0 - otherwise	BHPS	--	--	--
	chest/breathing	HLPCHEST	1 – yes, 0 - otherwise	BHPS	--	--	--
	heart/blood pressure	HLPHEART	1 – yes, 0 - otherwise	BHPS	--	--	--
	stomach or digestion	HLPSTOM	1 – yes, 0 - otherwise	BHPS	--	--	--
	Anxiety or depression	HLPDIAB	1 – yes, 0 - otherwise	BHPS	--	--	--
	Diabetes	HLPANX	1 – yes, 0 - otherwise	BHPS	--	--	--
	alcohol or drugs	HLPLCH	1 – yes, 0 - otherwise	BHPS	--	--	--
	Epilepsy	HLPEPIL	1 – yes, 0 - otherwise	BHPS	--	--	--
	Migraine	HLPMIGR	1 – yes, 0 - otherwise	BHPS	--	--	--
	Other	HLPOTHR	1 – yes, 0 - otherwise	BHPS			
Formal disability rating	Degree of disability as per German Pension Office	--	--	--	???	Continuous variable	GSOEP
Health satisfaction	Person's satisfaction with own health	--	--	--	???	11 point scale: 0 - 'not at all satisfied' 10 - 'completely satisfied'	GSOEP

Appendix 3: (continued)

Variable name	Description	Code UK	Definition UK	Source UK	Code Germany	Definition Germany	Source Germany
Education	Highest level of formal education obtained	OCSE	1 - CSE, O level 0 - otherwise	BHPS	HIGHERED	1 – more than mandatory schooling 0 - otherwise	CNEF-GSOEP
		HDNALEV	1 - A level, HND, HNC, Teaching 0 - otherwise	BHPS	--	--	--
		DEGHDEG	1 - degree, higher degree 0 - otherwise	BHPS	--	--	--
Pension entitlement		PRIVPEN	1 - private pension 0 - otherwise	BHPS	CIVSERV	1 - Class 1 civil servant 0 - otherwise	GSOEP
		EMPPEN	1 - employer pension 0 - otherwise	BHPS	--	--	--
		PRIVCOMP	1 - employed in private company 0 - otherwise	BHPS	--	--	--
		CIVLOCGOV	1 - employed in civil service or local government 0 - otherwise	BHPS	--	--	--
		JOBSECTO	1 - employed in other employment sector 0 - otherwise	BHPS	--	--	--
Income	Individual specific mean of log household income	MLNINC	continuous	CNEF-BHPS	--	--	--
	Mean of log household post-government income	--	--	--	M2LNHINC	continuous	CNEF-GSOEP
Housing tenure		HSEMORT	1 - own house with mortgage 0 - otherwise	BHPS	OWNER	1 - owner occupier 0 - otherwise	GSOEP
		HSERENT	1 - live in private rented accommodation 0 - otherwise	BHPS	SUBSID	1 - live in subsidised housing 0 - otherwise	GSOEP
		HSEAUTH	1 - live in housing association or local authority rented accommodation 0 - otherwise	BHPS			

Appendix 3: (continued)

Variable name	Description	Code UK	Definition UK	Source UK	Code Germany	Definition Germany	Source Germany
Demographic and other variables	Marital status	MARCOUP	1 - married or living as a couple 0 - otherwise	CNEF-BHPS	MARCOUP	1 – married or living as a couple 0 - otherwise	CNEF-GSOEP
	Age	AGE5054	1 - aged 50 and 54 years 0 - otherwise	CNEF-BHPS	AGE5054	1 - aged 50 and 54 years 0 - otherwise	CNEF-GSOEP
		AGE5559	1 - aged 55 and 59 years 0 - otherwise	CNEF-BHPS	AGE5559	1 - aged 55 and 59 years 0 - otherwise	CNEF-GSOEP
		AGE6064	1 - aged 60 and 64 years 0 - otherwise	CNEF-BHPS	AGE6064	1 - aged 60 and 64 years 0 - otherwise	CNEF-GSOEP
		AGE6569 (males only)	1 - aged 65 and 69 years 0 - otherwise	CNEF-BHPS	--	--	--
	Number of children (under 18) in household	--	--	--	HHCHILD	continuous	CNEF-GSOEP
	Region/State of residence	REGION	individual dummy variables	BHPS	NORTH	1 - lives in North 0 - otherwise	CNEF-GSOEP
		--	--	--	SOUTH	1 - lives in Sorth 0 - otherwise	CNEF-GSOEP
	Region of origin	--	--	--	EASTGERMAN	1 - born in East Germany 0 - otherwise	CNEF-GSOEP
		--	--	--	FOREIGNER	1 - born outside Germany 0 - otherwise	CNEF-GSOEP
Spouse variables	spouse latent health	SLATSAH	continuous variables	BHPS	SLATHEALTH1	continuous variable	GSOEP
	spouse SAH	--	--	--	SSAHPOOR	1 - spouse SAH is poor 0 - otherwise	GSOEP
		--	--	--	SSAHFAIR	1 - spouse SAH is fair 0 - otherwise	GSOEP
		--	--	--	SSAHGOOD	1 - spouse SAH is good 0 - otherwise	GSOEP
		--	--	--	SSAHEXC	1 - spouse SAH is excellent 0 - otherwise	GSOEP
	spouse health limitations	SHLLT	1 - spouse has health limitations 0 - otherwise	BHPS	--	--	--
	spouse employment	SJOB	1 - spouse is employed 0 - otherwise	BHPS	SJOB	1 - spouse is employed 0 - otherwise	GSOEP

Appendix 3: (continued)

Variable name	Description	Code UK	Definition UK	Source UK	Code Germany	Definition Germany	Source Germany
Occupational class (UK) or industrial sector (Germany)		MANAGADMIN	1 - management or administration 0 - otherwise	CNEF-BHPS	AGRICULTURE (males only)	1 - agriculture 0 - otherwise	CNEF-GSOEP
		PROF	1 - professional 0 - otherwise	CNEF-BHPS	ENERGY (males only)	1 - energy 0 - otherwise	CNEF-GSOEP
		CLERSEC	1 - clerical or secretarial 0 - otherwise	CNEF-BHPS	MANUFACTURING	1 - manufacturing 0 - otherwise	CNEF-GSOEP
		CRAFTREL	1 - craft or related 0 - otherwise	CNEF-BHPS	CONSTRUCTION (males only)	1 - construction 0 - otherwise	CNEF-GSOEP
		PERSPRO	1 - personal or protective services 0 - otherwise	CNEF-BHPS	TRADE	1 - trade 0 - otherwise	CNEF-GSOEP
		SALES	1 - sales 0 - otherwise	CNEF-BHPS	TRANSPORT (males only)	1 - transportation 0 - otherwise	CNEF-GSOEP
		PLANT	1 - plant operator 0 - otherwise	CNEF-BHPS	BANKINS (males only)	1 - banking or insurance 0 - otherwise	CNEF-GSOEP
		OTHEROCC	1 - other occupations 0 - otherwise	CNEF-BHPS	SERVICES	1 - services 0 - otherwise	CNEF-GSOEP

Appendix 4: Describing Health

Figure A4-1. SAH UK men – comparing 3 samples

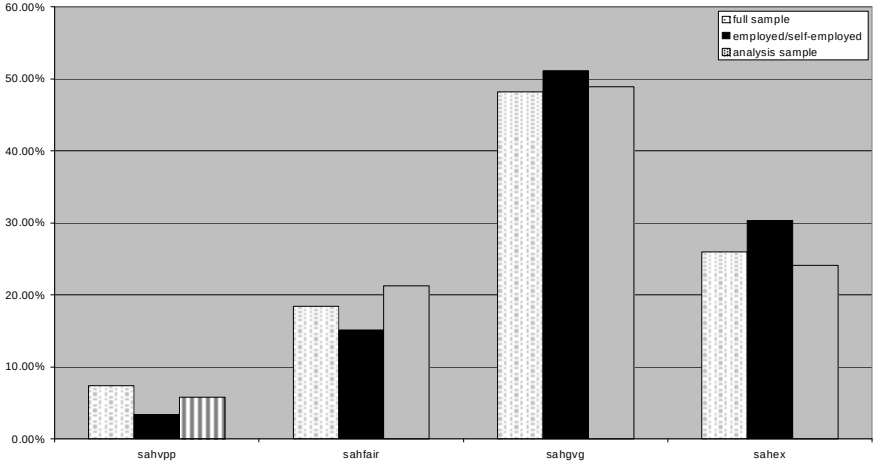


Figure A4-2. SAH UK women – comparing 3 samples

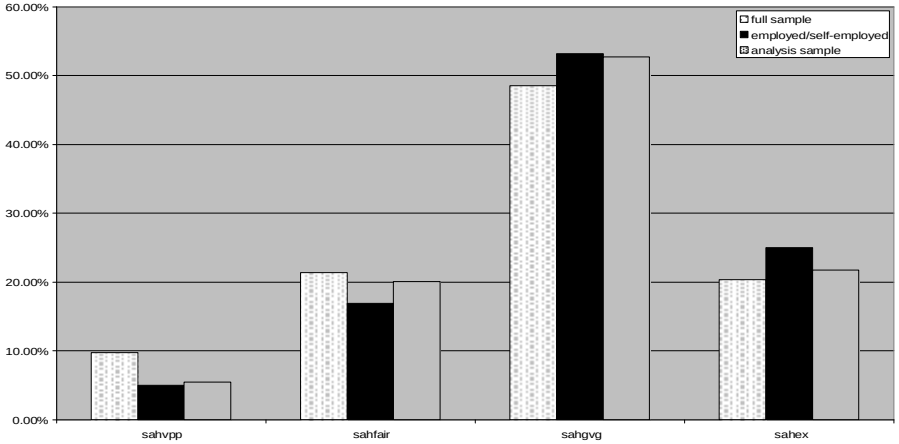


Figure A4-3. Health by wave - UK men analysis sample.

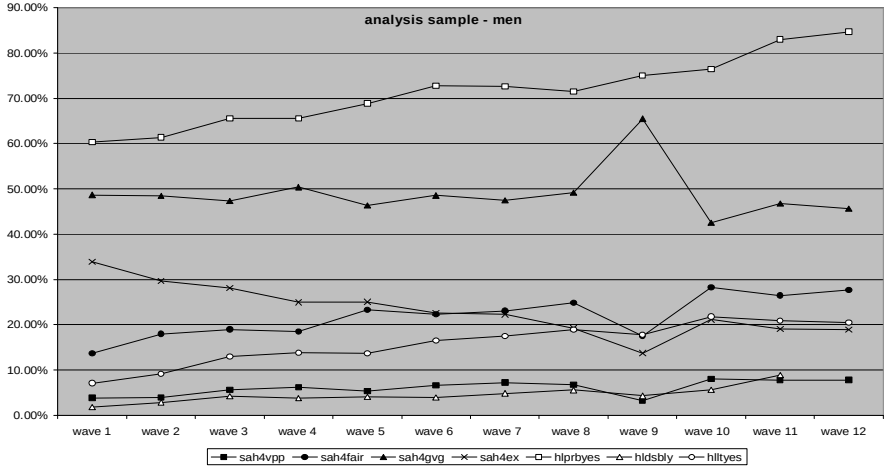


Figure A4-4. Health by wave - UK women analysis sample.

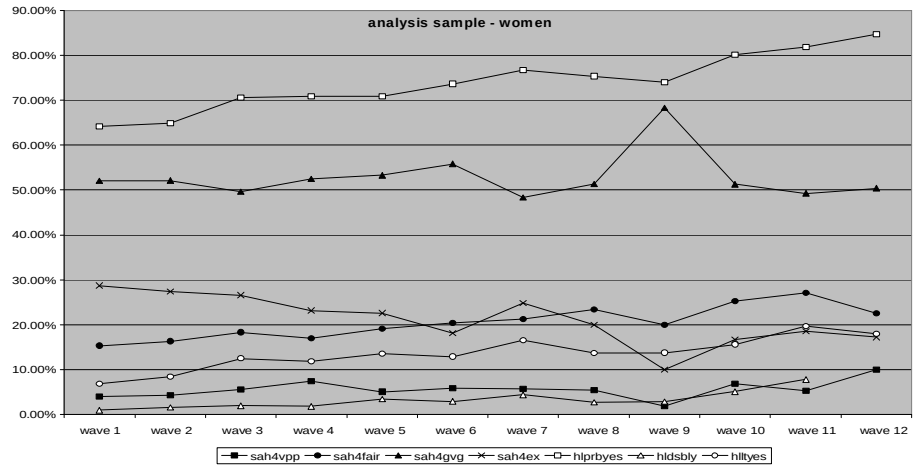


Figure A4-5. SAH for Germany men – comparing 3 samples

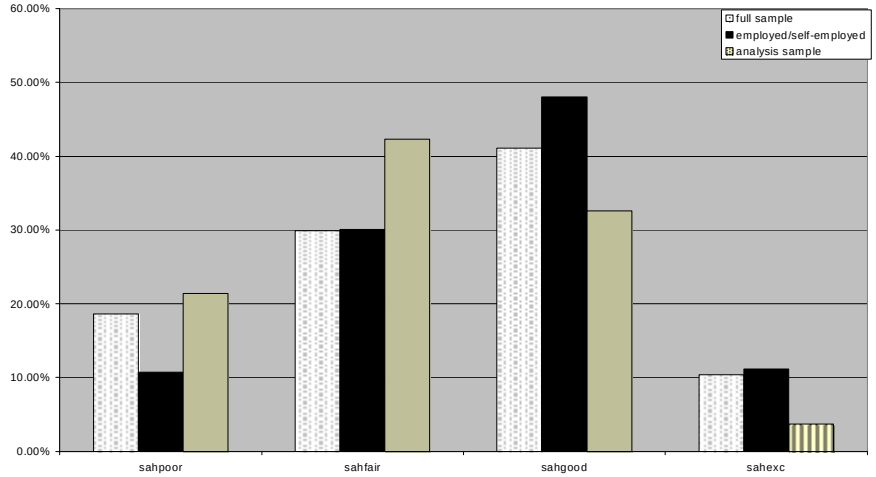


Figure A4-6. SAH for Germany women – comparing 3 samples

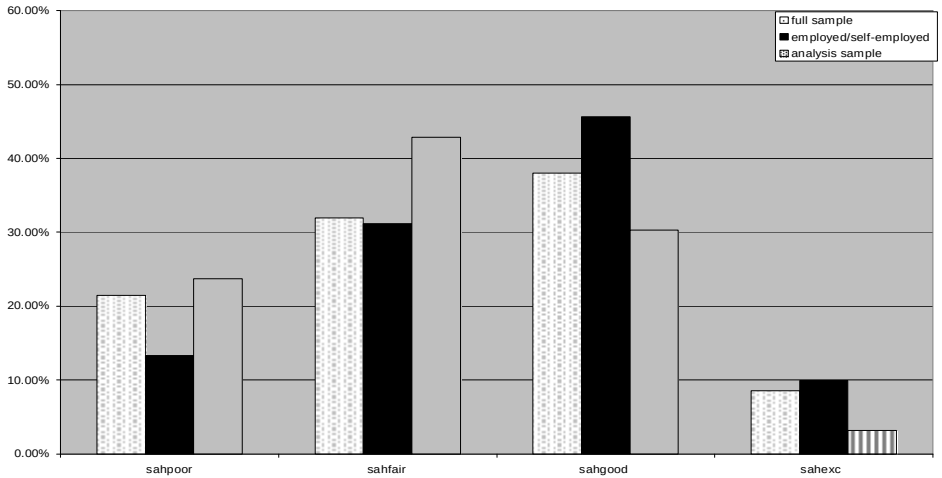


Figure A4-7. Health by wave - Germany men analysis sample.

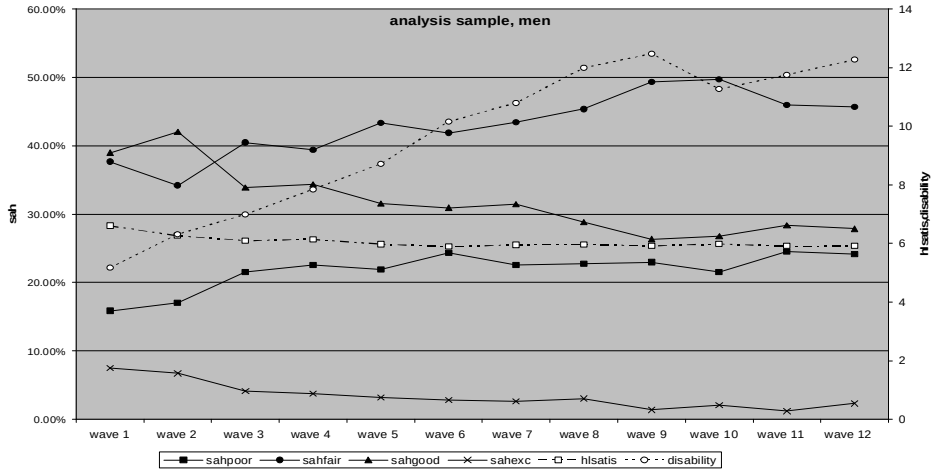
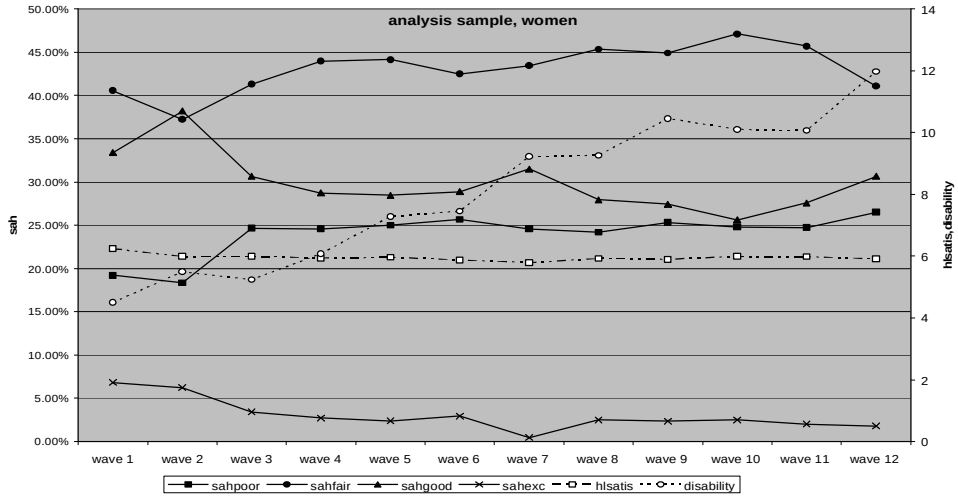


Figure A4-8. Health by wave - Germany women analysis sample.



Appendix 5: Kaplan Meier Survival Curves

Figure A5-1: KM men not retired by SAH -UK.

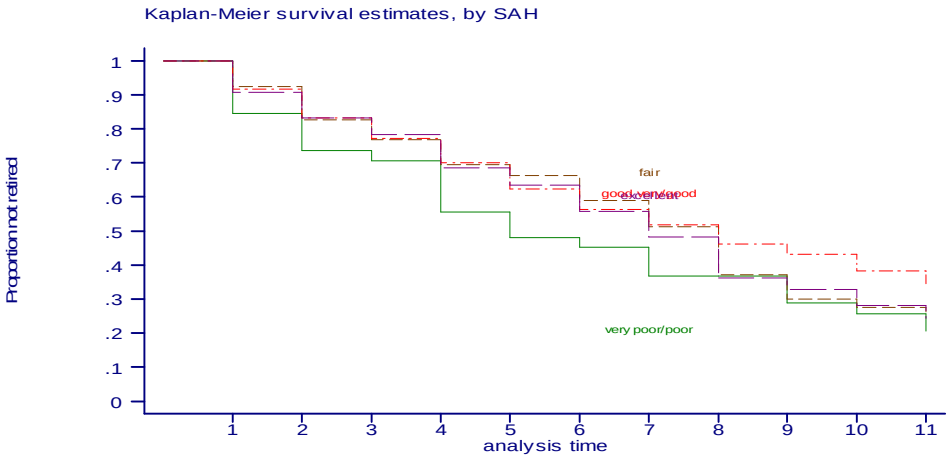


Figure A5-2: KM men not retired by health limitations-UK.

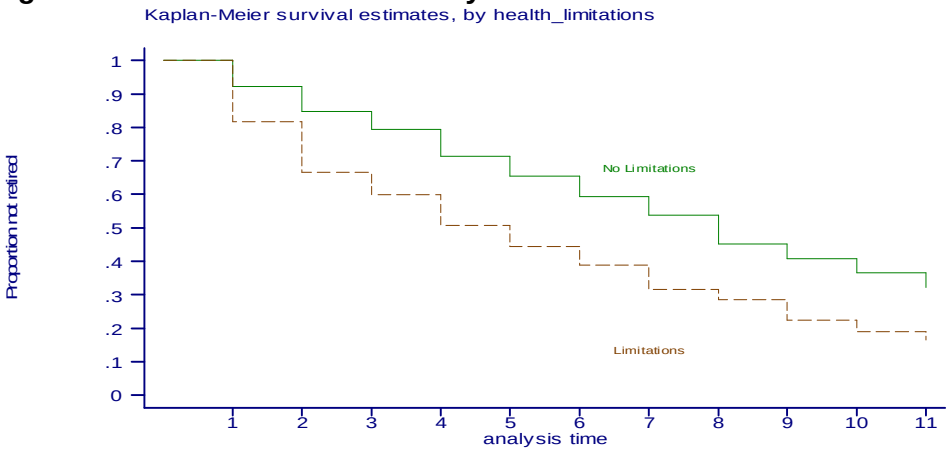


Figure A5-3: KM women not retired by SAH -UK.

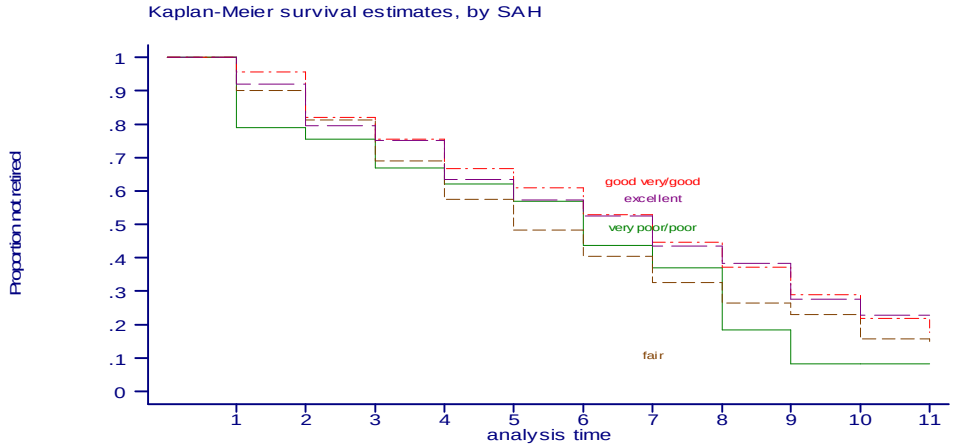


Figure A5-4: KM women not retired by health limitations -UK.

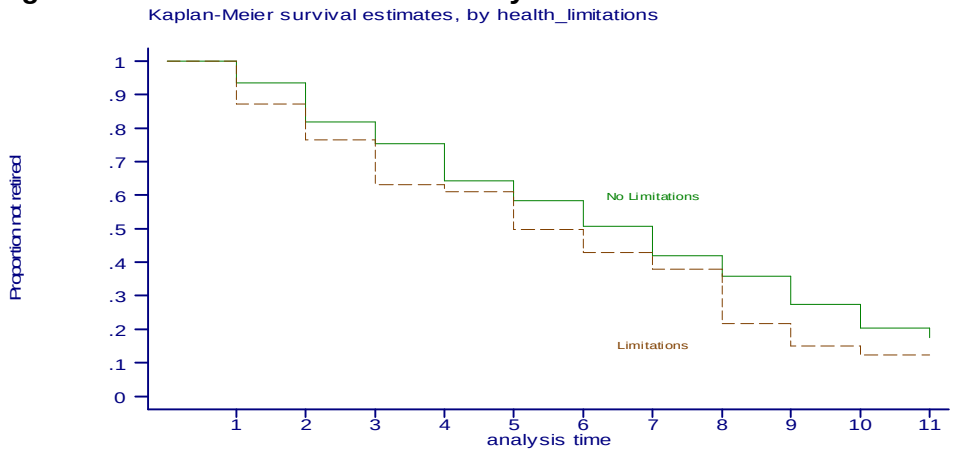


Figure A5-5: KM men not retired by SAH -Germany .

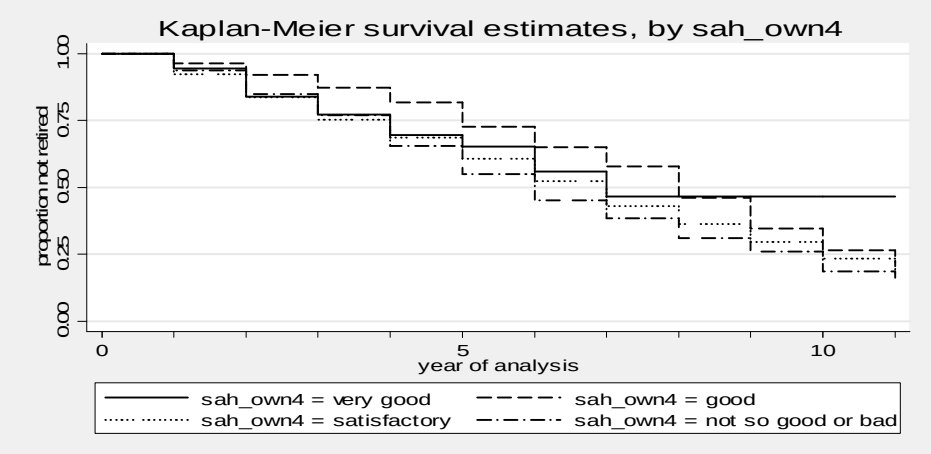


Figure A5-6: KM men not retired by official disability – Germany

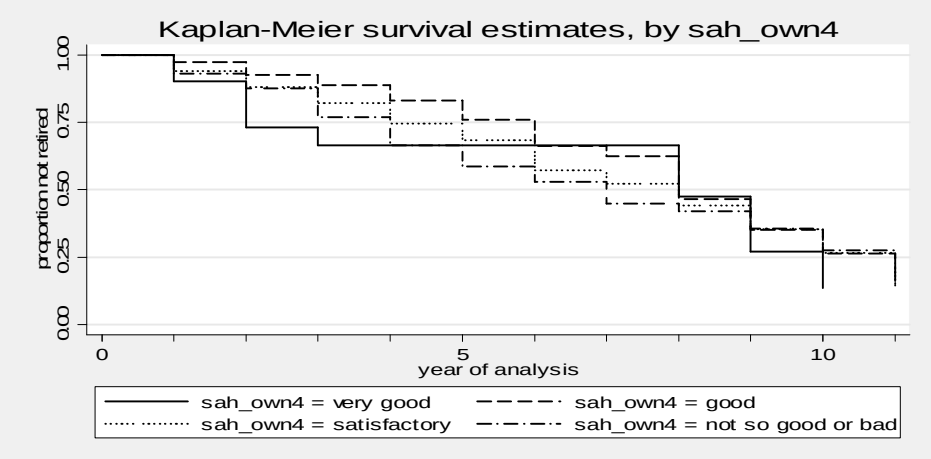


Figure A5-7: KM women not retired by SAH - Germany

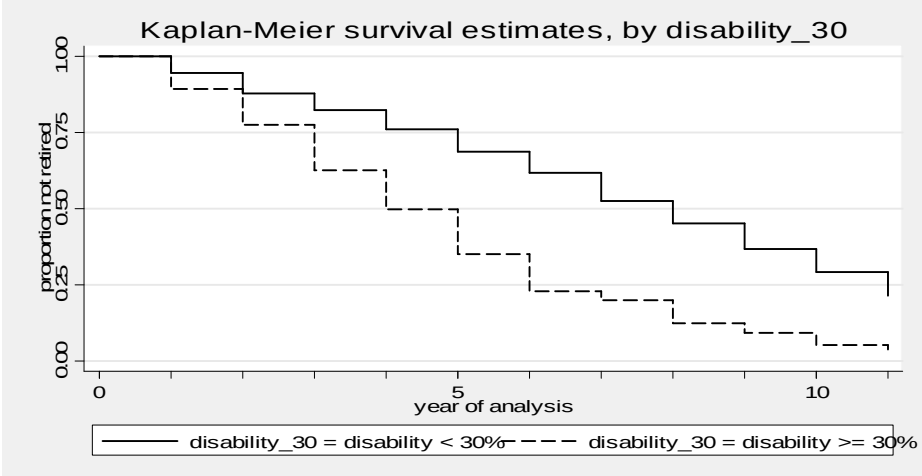
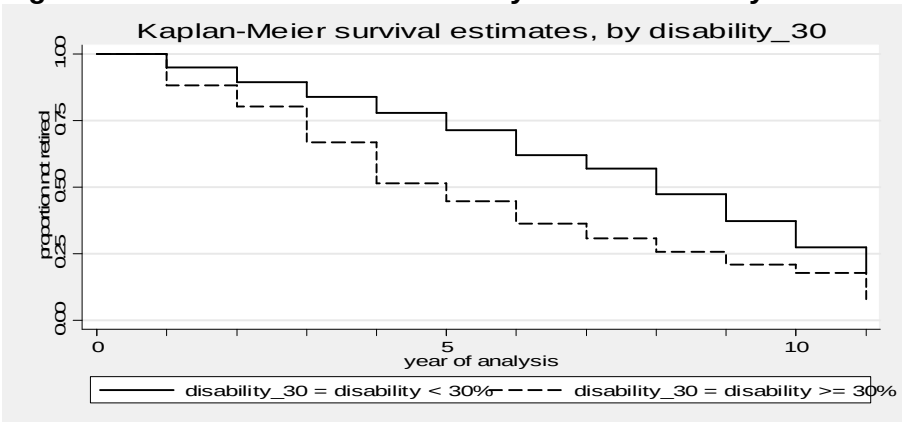


Figure A5-8:KM women not retired by official disability – Germany



Appendix 6: Causal models of the determinants of early retirement

Table A6-1: Hazard model for retirement transition in the UK - Men

MEN	Health limitations N = 2,967			General Health N = 2,475		
	Coef	S.E.	Hazard ratio	Coef	S.E.	Hazard ratio
Own Health:						
HLLT(t-1)	1.258*	0.356	3.518	--	--	--
HLLT(0)	0.914	0.668	2.495	--	--	--
LATSAH(t-1)	--	--	--	-0.422*	0.214	0.656
LATSAH(0)	--	--	--	-0.134	0.317	0.875
Spouse:						
SHLLT	0.141	0.304	1.151	--	--	--
SLATSAH	--	--	--	-0.246	0.186	0.782
SJOB(t-1)	-0.404	0.255	0.667	-0.494*	0.254	0.610
Socio-demographics:						
AGE5054	-4.645*	0.923	0.010	-4.336*	0.929	0.013
AGE5559	-4.171*	0.798	0.015	-3.863*	0.813	0.021
AGE6064	-2.778*	0.700	0.062	-2.540*	0.728	0.079
AGE6569	0.589	0.524	1.802	0.743	0.534	2.102
MARCOUP	-0.405	0.432	0.667	-0.607	0.461	0.545
DEGHDEG	-1.351*	0.658	0.259	-1.137	0.637	0.321
HNDALEV	-0.200	0.415	0.818	-0.113	0.406	0.893
OCSE	0.025	0.420	1.026	0.021	0.422	1.022
Income & Wealth :						
HSEMORT(t-1)	0.372	0.297	1.451	0.491	0.300	1.634
HSEAUTH(t-1)	-0.207	0.530	0.813	-0.039	0.531	0.961
HSERENT(t-1)	-0.094	0.601	0.910	-0.150	0.600	0.860
MLNHINC	0.477	0.351	1.612	0.475	0.360	1.609
Pensions :						
PRIVPEN	-1.240*	0.379	0.289	-1.248*	0.386	0.287
EMPPEN	0.696	0.422	2.006	0.624	0.422	1.866
PRIVCOMP(0)	1.269*	0.480	3.556	1.215*	0.481	3.369
CIVLOCGOV(0)	2.858*	0.696	17.418	2.762*	0.709	15.833
JBSECTO(0)	1.022	0.672	2.780	1.053	0.686	2.866
SOC variables:						
MANAGADMIN(0)	-0.682	0.458	0.506	-0.784	0.460	0.457
PROF(0)	-0.771	0.853	0.463	-0.871	0.838	0.418
CLERSEC(0)	-0.683	0.829	0.505	-0.969	0.848	0.379
CRAFTREL(0)	-0.311	0.506	0.732	-0.359	0.502	0.698
PERS(0)	-0.987	0.688	0.373	-0.895	0.693	0.409
SALES(0)	0.399	0.959	1.490	0.381	0.984	1.464
PLANT(0)	0.268	0.604	1.307	0.340	0.598	1.405
OTHEROCC(0)	-0.748	0.952	0.473	-0.623	0.960	0.536
Log Likelihood	-548.1			-549.0		
Chi-squared(1 df)†	29.4			24.0		
P – value	<0.001			<0.001		

* statistically significant at 5% level.

Table A6-2: Hazard model for retirement transition in the UK - Women

WOMEN	Health limitations N = 1,822			General Health N = 1,786		
	Coef	S.E.	Hazard ratio	Coef	S.E.	Hazard ratio
Own Health:						
HLLT(t-1)	0.902*	0.349	2.466	--	--	--
HLLT(0)	-0.709	0.702	0.492	--	--	--
LATSAH(t-1)	--	--	--	-0.697*	0.276	0.498
LATSAH(0)	--	--	--	0.050	0.504	1.051
Spouse:						
SHLLT	0.160	0.354	1.174	--	--	--
SLATSAH	--	--	--	-0.310	0.250	0.734
SJOB(t-1)	-0.163	0.313	0.849	-0.148	0.361	0.862
Socio-demographics:						
AGE5054	-3.863*	0.980	0.021	-4.838*	1.330	0.008
AGE5559	-3.894*	0.911	0.020	-4.959*	1.242	0.007
AGE6064	-1.517*	0.581	0.219	-2.035*	0.735	0.131
MARCOUP	-0.173	0.472	0.841	-0.451	0.627	0.637
DEGHDEG	0.076	0.850	1.079	-0.063	1.124	0.939
HNDALEV	0.444	0.635	1.559	0.302	0.879	1.353
OCSE	-0.327	0.437	0.721	-0.343	0.561	0.710
Income & Wealth :						
HSEMORT(t-1)	-0.689*	0.358	0.502	-0.707	0.458	0.493
HSEAUTH(t-1)	0.294	0.550	1.342	0.234	0.749	1.264
HSERENT(t-1)	-0.816	0.738	0.442	-0.827	0.884	0.437
MLNHINC	-0.091	0.447	0.913	0.077	0.594	1.080
Pensions :						
PRIVPEN	-1.929*	0.696	0.145	-2.659*	0.993	0.070
EMPPEN	0.681	0.442	1.975	0.814	0.617	2.257
PRIVCOMP(0)	-0.246	0.731	0.782	-0.558	1.078	0.572
CIVLOCGOV(0)	-0.584	0.898	0.558	-1.360	1.352	0.257
JBSECTO(0)	-0.657	0.804	0.519	-1.154	1.132	0.315
SOC variables:						
MANAGADMIN(0)	0.631	0.722	1.880	0.699	0.958	2.012
PROF(0)	0.819	0.927	2.267	1.126	1.199	3.084
CLERSEC(0)	-0.176	0.832	0.839	-0.719	1.159	0.487
CRAFTREL(0)	0.716	1.036	2.046	0.548	1.371	1.729
PERS(0)	-0.781	0.780	0.458	-1.054	1.068	0.349
SALES(0)	0.669	0.987	1.953	0.607	1.235	1.835
PLANT(0)	0.233	1.397	1.262	0.036	1.701	1.036
OTHEROCC(0)	-0.286	0.975	0.751	-0.892	1.401	0.410
Log Likelihood	-533.7			-517.9		
Chi-squared(1 df)†	16.0			27.5		
P – value	<0.001			<0.001		

* statistically significant at 5% level.

Table A6-3: Hazard model for retirement transition in Germany - Men

MEN	SAH (direct) N=5,523			Latent Health with Disability and Satisfaction with Health N=5,428		
	Coef	S.E.	Hazard Ratio	Coef	S.E.	Hazard Ratio
Own Health:						
SAHFAIR(t-1)	-0.333*	0.109	0.717	--	--	--
SAHGOODt-1)	-0.442*	0.128	0.643	--	--	--
SAHEXC(t-1)	-0.616*	0.286	0.540	--	--	--
SAHFAIR(0)	-0.204	0.133	0.815	--	--	--
SAHGOOD(0)	-0.245	0.143	0.783	--	--	--
SAHEXC(0)	-0.208	0.211	0.812	--	--	--
LATHEALTH1(t-1)	--	--	--	-0.163*	0.041	0.849
LATHEALTH1(0)	--	--	--	-0.066	0.040	0.936
Spouse:						
SSAHPOOR(t-1)	0.326	0.325	1.386	--	--	--
SSAHFAIR(t-1)	0.334	0.325	1.396	--	--	--
SSAHGOOD(t-1)	0.319	0.328	1.375	--	--	--
SSAHEXC(t-1)	0.273	0.434	1.313	--	--	--
SLATHEALTH1	--	--	--	0.038	0.037	1.039
SJOB(t-1)	-0.091	0.094	0.913	-0.109	0.094	0.897
Socio-demographics:						
AGE5054	-3.250*	0.258	0.039	-3.241*	0.257	0.039
AGE5559	-2.418*	0.142	0.089	-2.413*	0.143	0.090
AGE6064	-1.030*	0.121	0.357	-1.034*	0.123	0.356
MARCOUP	0.269	0.344	1.309	0.360	0.246	1.433
HIGHERED	0.107	0.136	1.113	0.118	0.133	1.126
Income & wealth:						
M2LNHINC	-0.515*	0.064	0.598	-0.503*	0.062	0.605
OWNER	-0.113	0.092	0.893	-0.097	0.093	0.908
SUBSID	-0.188	0.174	0.829	-0.119	0.171	0.888
Pensions						
CIVSERV(0)	0.193	0.187	1.213	0.212	0.186	1.237
Industry Sector:						
AGRICULTURE(0)	-0.529	0.309	0.589	-0.521	0.326	0.594
ENERGY(0)	0.042	0.404	1.043	0.109	0.414	1.115
MANUFACTURING(0)	-0.140	0.248	0.869	-0.131	0.269	0.877
CONSTRUCTION(0)	-0.419	0.264	0.658	-0.412	0.284	0.662
TRADE(0)	-0.596*	0.288	0.551	-0.552	0.305	0.576
TRANSPORT(0)	0.373	0.296	1.452	0.387	0.312	1.472
BANKING(0)	-0.552	0.396	0.576	-0.494	0.404	0.610
SERVICES(0)	-0.566*	0.261	0.568	-0.542	0.280	0.582
Region of Residence:						
SOUTH	-0.140	0.236	0.869	0.110	0.112	1.116
NORTH	-0.200	0.234	0.819	0.031	0.118	1.031
Origin:						
EASTGERMAN	-0.213	0.241	0.808	--	--	--
FOREIGNER	-0.384*	0.146	0.681	-0.343*	0.146	0.709

* statistically significant at 5% level

Table A6-4: Hazard model for retirement transition in Germany - Women

WOMEN	SAH (direct) N=3,207			Latent Health with Disability and Satisfaction with Health N=3,120		
	Coef	S.E.	Hazard Ratio	Coef	S.E.	Hazard Ratio
Own Health:						
SAHFAIR(t-1)	-0.289*	0.141	0.749	--	--	--
SAHGOODt-1)	-0.455*	0.171	0.634	--	--	--
SAHEXC(t-1)	-0.686	0.411	0.504	--	--	--
SAHFAIR(0)	-0.242	0.163	0.785	--	--	--
SAHGOOD(0)	-0.251	0.179	0.778	--	--	--
SAHEXC(0)	-0.188	0.290	0.828	--	--	--
LATHEALTH1(t-1)	--	--	--	-0.171*	0.050	0.843
LATHEALTH1(0)	--	--	--	-0.136*	0.066	0.873
Spouse:						
SSAHPOOR(t-1)	0.008	0.345	1.008	--	--	--
SSAHFAIR(t-1)	-0.078	0.341	0.925	--	--	--
SSAHGOOD(t-1)	-0.107	0.348	0.899	--	--	--
SSAHEXC(t-1)	0.182	0.533	1.200	--	--	--
SLATHEALTH1	--	--	--	0.029	0.046	1.029
SJOB(t-1)	-0.329*	0.145	0.720	-0.370*	0.145	0.691
Socio-demographics						
AGE5054	-4.565*	0.552	0.010	-4.527*	0.552	0.011
AGE5559	-2.478*	0.241	0.084	-2.493*	0.244	0.083
AGE6064	-0.612*	0.213	0.542	-0.637*	0.213	0.529
MARCOUP	-0.409	0.337	0.664	-0.544*	0.229	0.581
HIGHERED	-0.062	0.140	0.940	-0.093	0.142	0.911
Income & wealth:						
M2LNHINC	0.058	0.060	1.060	0.089	0.057	1.093
OWNER	0.001	0.124	1.001	0.012	0.125	1.012
SUBSID	0.513*	0.216	1.670	0.365	0.236	1.440
Pensions						
CIVSERV(0)	-0.386	0.478	0.680	-0.315	0.477	0.729
Industry sector:						
MANUFACTURING(0)	0.119	0.181	1.127	0.081	0.186	1.085
TRADE(0)	-0.042	0.207	0.959	-0.070	0.211	0.933
SERVICES(0)	0.106	0.170	1.112	0.130	0.173	1.138
Region of residence:						
SOUTH	-0.020	0.339	0.980	0.166	0.411	1.180
NORTH	-0.284	0.346	0.752	-0.017	0.415	0.983
Origin						
EASTGERMAN	0.533	0.355	1.704	0.722	0.433	2.058
FOREIGNER	-0.360	0.186	0.698	-0.459*	0.191	0.632

* statistically significant at 5% level

Table A6-5: Verbeek and Nijman test for attrition bias.

NEXT WAVE	*b*	S.E.	z-test	p-value
BHPS				
Men				
Health limitations	.618	.416	1.48	.138
Latent self-assessed health	.819	.452	1.81	.070
Women				
Health limitations	-.169	.349	-.49	.627
Latent self-assessed health	-.130	.425	-.28	.777
GSOEP				
Men*				
Self-assessed health	-.639	.152	4.204	.000
Latent self-assessed health (disability and satisfaction)	-.607	.153	3.967	.000
Latent self-assessed health (disability alone)	-.676	.154	4.390	.000
Women				
Self-assessed health	1.299	.809	1.606	.108
Latent self-assessed health (disability and satisfaction)	1.212	.826	1.467	.142
Latent self-assessed health (disability alone)	1.225	.818	1.498	.134

*Based on a model without heterogeneity.