Effect of pensions and disability benefits on retirement in the UK

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1. Introduction

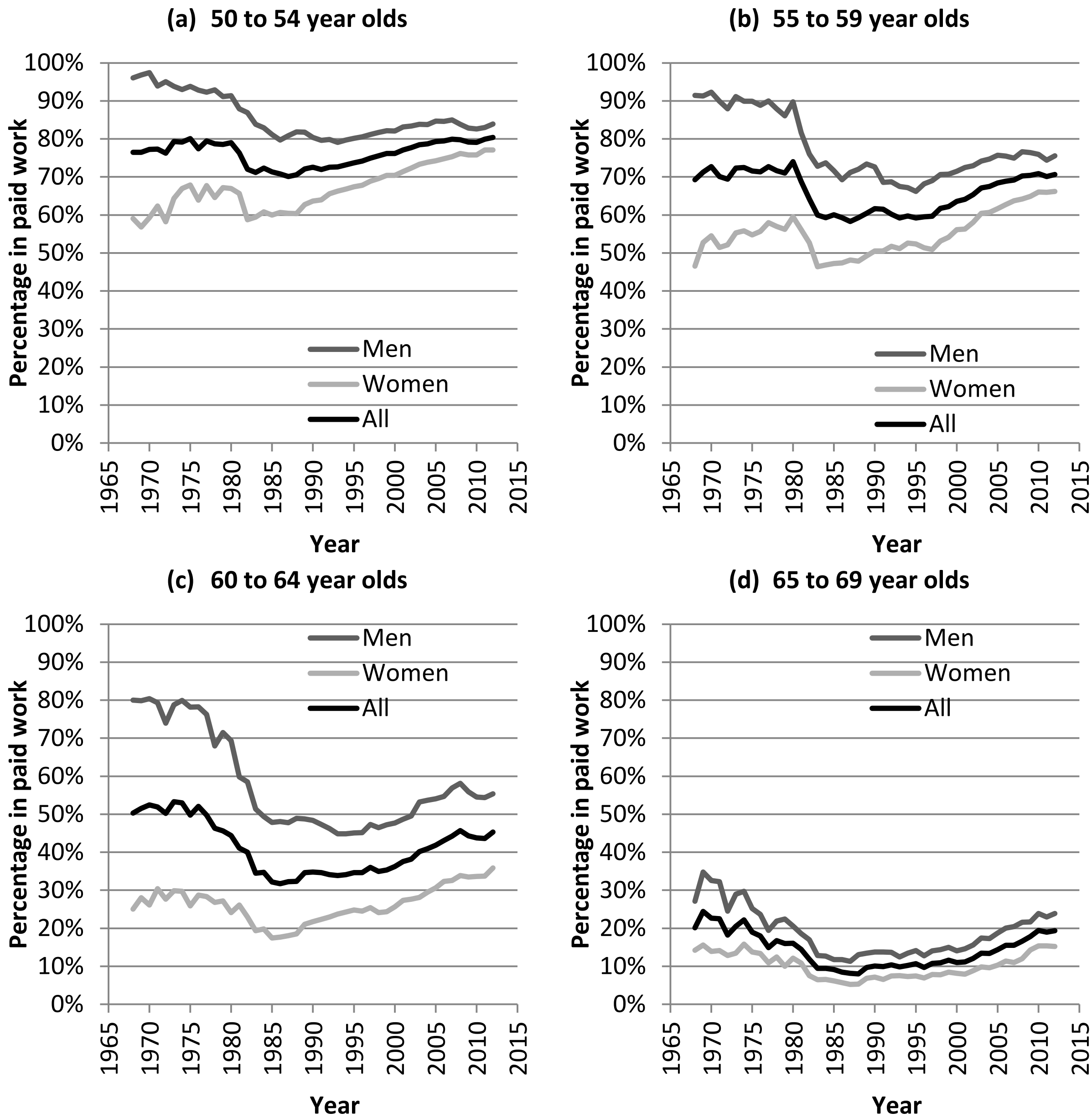
Employment rates of older workers in the UK fell sharply during the 1980s but have been increasing steadily since the mid-1990s. As Figure 1.1 shows, the employment rate of men aged between 55 and 59 fell from over 90% in the late 1960s to just 67% by 1995 before increasing again to 77% just prior to the most recent recession. Employment rates of older men are now similar in the UK to the levels seen in, for example, Canada but are somewhat higher than those seen in France and lower than those in Denmark and Sweden. Among older women, employment rates fell sharply during the recession of the early 1980s but have increased steadily since then and are now at the highest levels that have ever been seen in modern times. 66% of women aged 55–59 and 35% of those aged 60–64 are now in employment. This is still lower than the employment rates of older women in Denmark and Sweden but higher than those seen in France and the Netherlands.

Employment rates differ substantially between those in better and worse health. As Figure 1.2 shows, over 80% of men aged 50–59 who are in the best three health quintiles are in employment, compared to only around 25% of those in the worst health. A slightly less steep health gradient is seen for women aged 50–69 in Figure 1.3. For both men and women, the health gradient diminishes with age. For example, while there is roughly a 20 percentage point drop in employment rates between the 55–59 age group and the 60–64 age group for men in the top three health quintiles, among men in the worst health quintile employment rates fall between the same ages by only around 10 percentage points . (The definition of health used here is explained in detail in Section 3.2.)

In this chapter, we examine how far these differences in employment rates across health groups (and, within a health group, between the UK and other countries) can be explained by the availability of publicly-funded disability insurance (DI) and financial incentives provided by other retirement income schemes in the UK. Unlike in many other countries, publicly-funded DI in the UK provides a flat-rate payment to qualifying individuals, rather than a payment which depends on the level of previous earnings. The financial disincentives to work provided by the system therefore differ substantially across individuals with different potential labour market earnings.

We estimate a reduced form model of retirement behaviour in the UK, including measures of the option value of remaining in paid work emanating from state and private pensions and the publicly-funded DI system. The model is estimated using data from the first five waves of the English Longitudinal Study of Ageing (ELSA) covering the period from 2002–03 to 2010–11. We define "retirement" as any movement out of paid work. We find that the financial incentives from retirement income schemes – as described by an option value measure – are significantly related to individuals' retirement decisions. The estimated impact of these financial incentives is found to be robust to the different specifications that we consider: a one standard deviation increase in the option value of remaining in work leads to a 2.7–3.1 percentage point reduction in the probability of retiring over the next year (depending on the specification used); this compares to a mean retirement rate of 17.9% among our sample as a whole. We also find no statistically significant evidence that responsiveness to these financial incentives varies either by an individual's health or by their education.

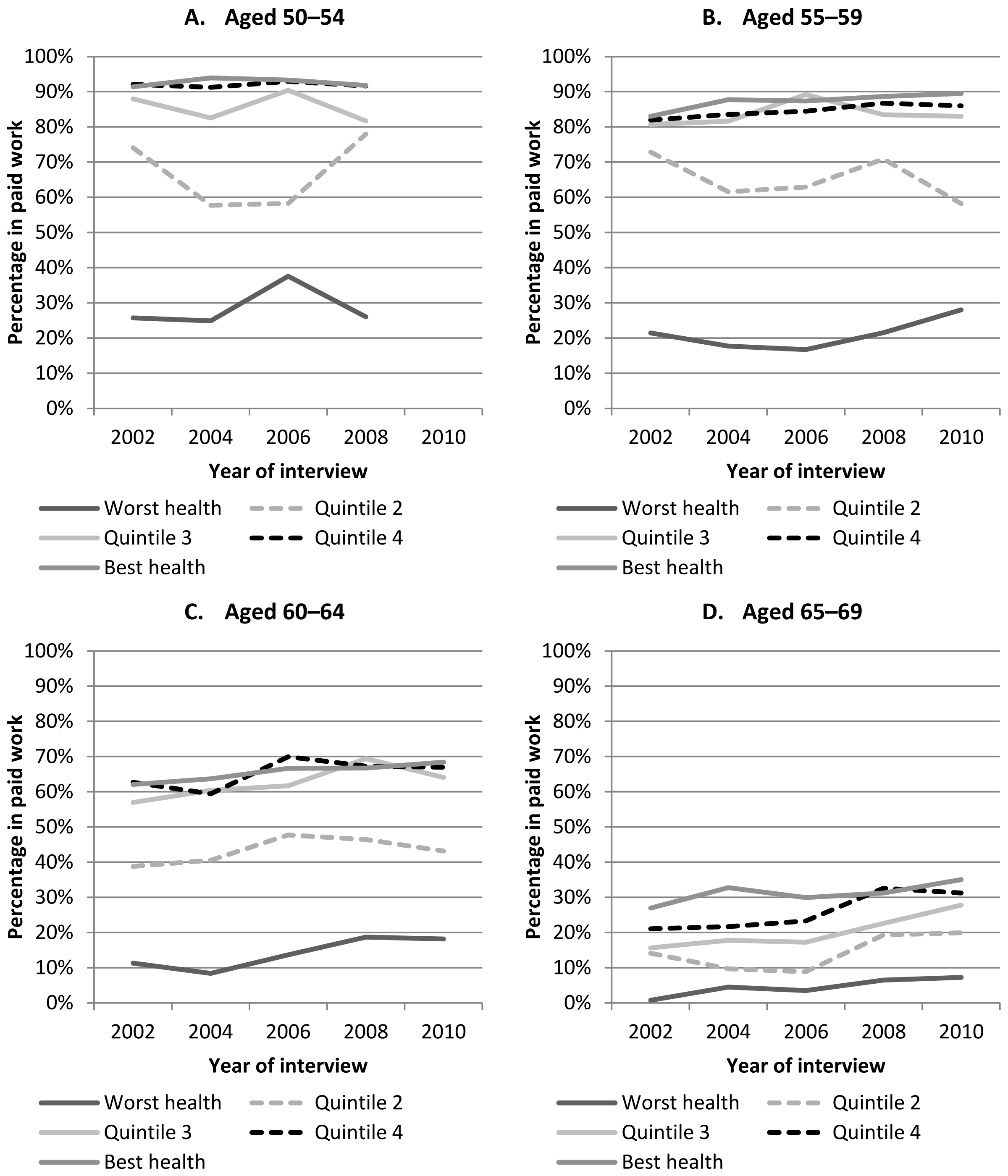
Figure 1.1. Employment rates of older men and women, 1968–2012



Note: Tables A.1–A.3 in the Appendix provide the figures underlying these graphs and also provide figures for the overall employment rate of 50–69 year old over time.
Source: Family Expenditure Survey (1968–1982) and Labour Force Survey (1983–2012).

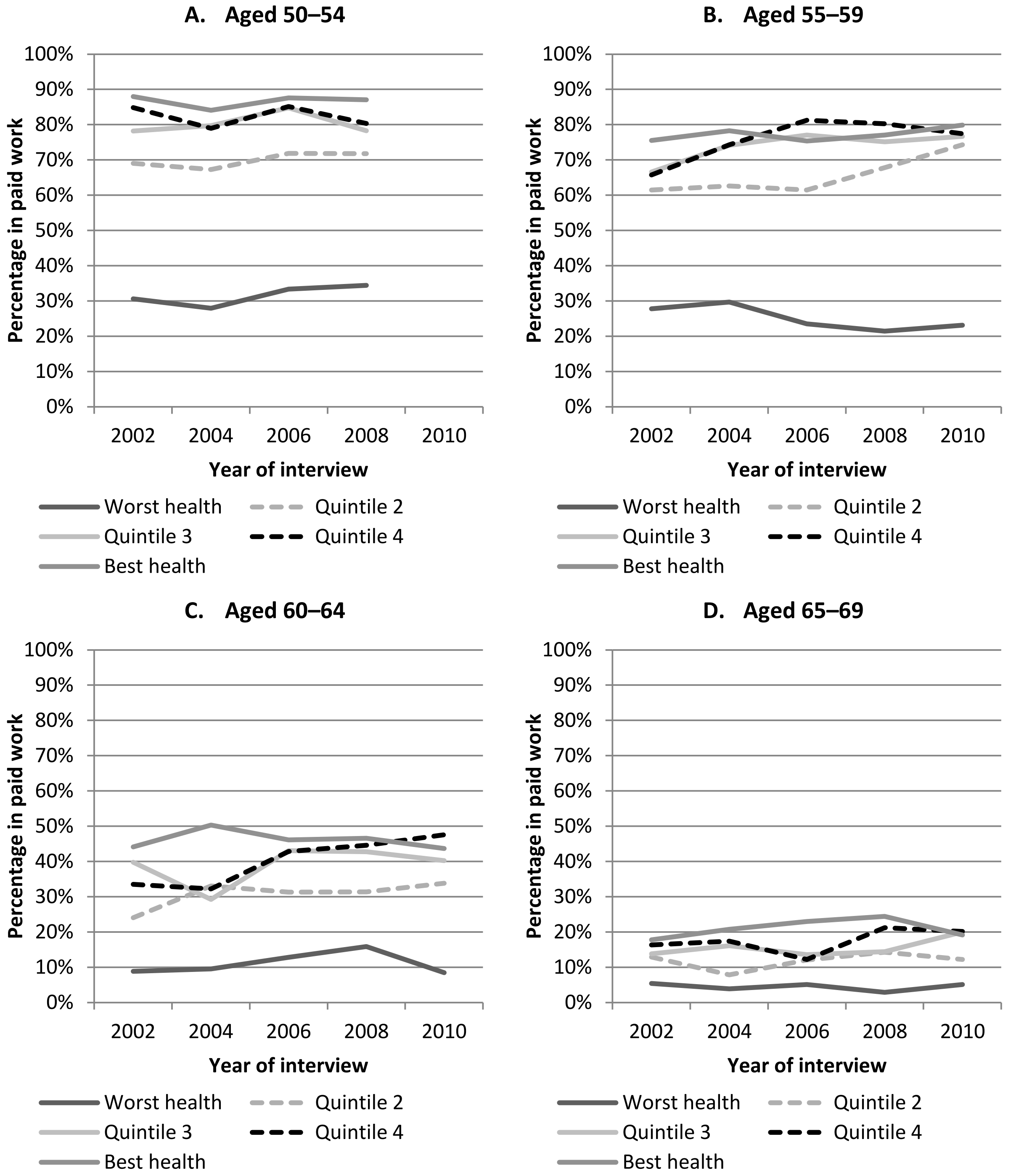
Given the nature of the UK's disability insurance program, most of this financial incentive is driven by state and private pensions rather than by the availability of the DI benefits. Simulations in which we change the stringency of the DI system suggest that a complete relaxation of DI eligibility criteria would reduce the average number of years worked between the ages of 50 and 69 by 0.6 years (or a 7% reduction) for both men and women. Meanwhile abolishing the DI system altogether would increase the average number of years worked by just 0.1 years (or less than 1%). However, the effects would be somewhat larger for those who are most likely to claim DI. For example, among the subsample of individuals who are observed to retire using the DI pathway, we estimate that a complete relaxation of the stringency criteria would reduce the number of years worked by 8.5%.

Figure 1.2. Employment rates of men by health, 2002–03 to 2010–11



Notes: In 2002, 2006 and 2008, the ELSA sample is representative of those aged 50+. However, in 2004 and 2010, it is only representative of those aged 52+. The sample size of 50–54 year old men in 2010 is too small to allow us to report employment rates separately by health quintile for this group.
Source: English Longitudinal Study of Ageing, waves 1–5. Weighted using cross-sectional weights.

Figure 1.3. Employment rates of women by health, 2002–03 to 2010–11



Notes: In 2002, 2006 and 2008, the ELSA sample is representative of those aged 50+. However, in 2004 and 2010, it is only representative of those aged 52+. The sample size of 50–54 year old women in 2010 is too small to allow us to report employment rates separately by health quintile for this group.
Source: English Longitudinal Study of Ageing, waves 1–5. Weighted using cross-sectional weights.

Section 2 describes key features of the UK pension and social insurance systems that affect incentives to remain in work at older ages. Section 3 describes our empirical methodology, including outlining how we incorporate real-life retirement incentives into our reduced form model and describing the data used. Section 4 presents the results of our retirement regressions, showing how responsive individuals' labour force participation is to the financial incentives they face and how this differs across those with different levels of health and education. Based on the results presented in Section 4, Section 5 provides some illustrative simulations of employment rates under alternative assumptions about the stringency of the DI regime and focussing on different subgroups of the population; in particular, we simulate retirement rates assuming that everyone/no-one is able to qualify for DI and we show the effect of these assumptions both for the sample as a whole and for the subsample who are observed to claim DI at some point. Section 6 concludes.

Throughout this chapter, all monetary values are expressed in Euros in 2012 prices, using the sterling/Euro exchange rate prevailing at the time of writing and adjusting cash amounts measured at different points in time using the Consumer Price Index.

2. Institutional background

In the UK individuals potentially have access to four sources of income after retirement. First, they may be eligible to receive a state pension. Second, they may also get income from a private pension – either one provided by a previous employer or a scheme that they set up on their own. Third, if individuals are judged to have sufficiently poor health, they may qualify for disability-related benefits. Finally, people who are out of work may also qualify for income-tested benefits. Each of these different income sources potentially provides incentives for individuals to remain in or leave work as they get older. This section provides a brief description of each of these elements in turn, in particular focussing on where there is variation across individuals and over time in the incentives to move out of paid work, which can be used to analyse the impact of these incentives on actual retirement behaviour.

2.1 State pension system

The UK state pension consists of two parts.[1] The first-tier pension (known as the basic state pension, BSP) is based on the number of years (but not on the level) of contributions made. A full BSP in 2012–13 was worth £107.45 a week (17% of average full-time weekly earnings, or around €130). This amount is currently indexed each year by the greatest of inflation, earnings growth or 2½%, and is payable from the state pension age onwards.[2]

People receive the full amount of the BSP if they have at least 30 years during their working lives (that is, from age 16 up to state pension age) in which they have made a "contribution".[3] Contributions include (among other things) being employed or self-employed, caring for children or disabled adults, and receiving unemployment or disability benefits. These contribution conditions are sufficiently broadly defined that most men and women now reaching the state pension age can qualify for the full award.

The second-tier pension, now known as the state second pension (S2P), is related to earnings across the whole of working life (from 1978 onwards); enhancements are also awarded for periods since April 2002 spent out of work due to some formal caring responsibilities. The second-tier pension scheme replaces 20% of earnings within a certain band. The maximum total weekly benefit that

[1] A full description of the UK state pension system can be found in Bozio, Crawford and Tetlow (2010).

[2] Individuals can choose to defer receipt of their state pension; they receive a 10.4% uplift to their pension income for each year that they defer receipt.

[3] Men (women) who reached the state pension age before 2010 – some of whom are included in our sample – needed 44 (39) years of contributions to qualify for the full award.

could have been received from the second-tier pension by someone reaching the state pension age in 2012–13 was about £160 (€190). However, historically, the majority of employees have opted out of this second-tier pension and instead built up a private pension (of approximately equal value) in return for paying a lower rate of payroll tax (National Insurance Contributions, NICs). Therefore, the majority of pensioners receive far less than £160 a week in second-tier pension income from the state.

In the UK a state pension can be received once an individual has reached the state pension age but not before. Importantly, there is no earnings test for receipt of the state pension; that is, the amount received is not reduced if the individual also has earned income.[4] Between 1948 and April 2010, the state pension age was 65 for men and 60 for women. Since April 2010 the state pension age for women has been rising[5] and the intention is that by 2018 it will be equalised at age 65 for both men and women. Thereafter the state pension age for both men and women is set to rise further, reaching age 66 in 2020 and age 68 by the middle of this century.

Effect of state pensions on incentives to work or retire

The UK state pension system does not, for the majority of individuals, have a large impact on the marginal financial incentive to remain in, or to leave, paid work. There is some incentive for individuals to continue "contributing" to the system until they reach the state pension age, as additional contributions will increase the amount of state pension income that they will receive. However, once an individual has accrued 30 years of BSP entitlement, the marginal accrual of additional pension declines. Furthermore, individuals can potentially accrue extra state pension entitlement not only through paid work but also through non-work activities. The fact that the same amount of state pension can be received from the state pension age regardless of whether the individual has actually left the labour market means that there is no financial incentive from the state pension system to leave the labour market at this point. While the state pension age is the single most common age for men and women to withdraw from the labour market, most leave at some other age.

The UK state pension system does not, therefore, provide sharp financial incentives for specific individuals to retire at a particular point in time. However, previous legislation (passed in 1975, 1986, 1995 and 2000) has changed the generosity of the state pension significantly, with the changes varying by individuals' date of birth, sex, caring responsibilities and earnings. The first and last of these four reforms significantly increased the average generosity of the state pension system, while the intermediate two significantly reduced it. These changes have generated differences in the lifetime wealth of individuals born at different points in time and therefore potentially induced differences in retirement ages across cohorts.[6] The state pension system has been increasingly generous to low earners and some groups not in paid work in more recent years but the generosity of the system to higher earners peaked among those reaching state pension age in 2000. Our data

[4] The earnings test was abolished in 1989.

[5] Cribb, Emmerson and Tetlow (2013) find that the rise in the female state pension age from 60 to 61 between April 2010 and April 2012 led to a significant increase in labour supply among both the women directly affected by the reform and among men married to those directly affected by the reform.

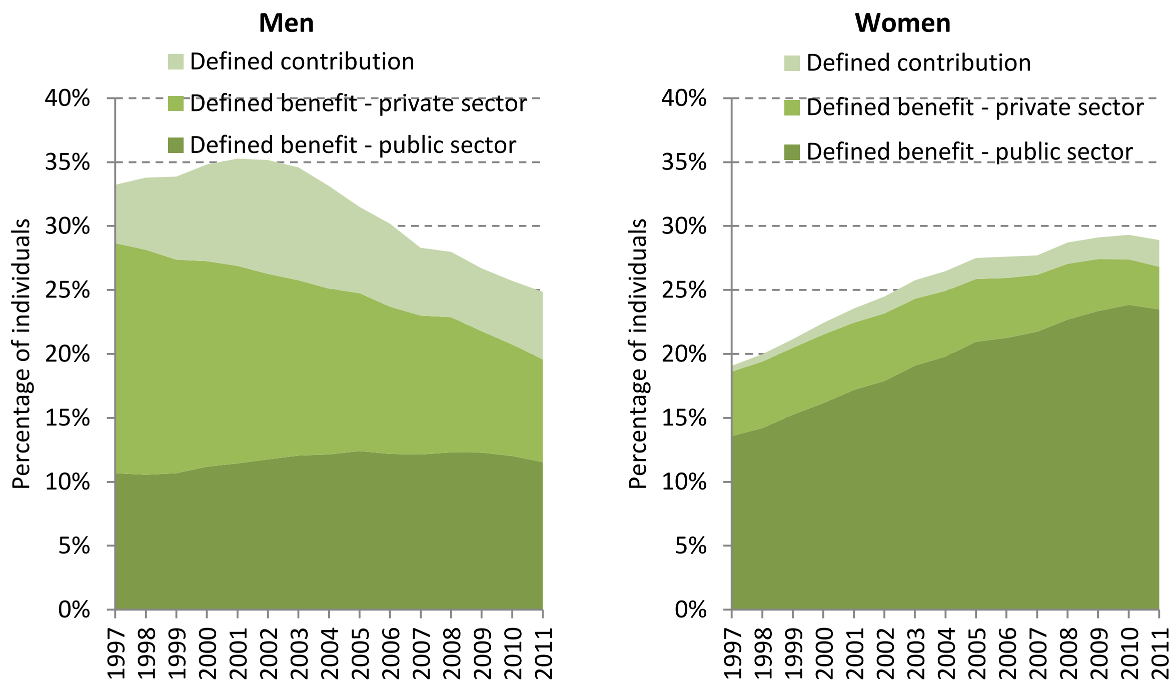
[6] See Disney and Emmerson (2005) for details of the reforms and the change in income at the SPA for individuals from different cohorts and different earnings and employment histories.

cover cohorts born between 1933 and 1958, who will reach state pension age between 1993 and 2024 and have all faced slightly different state pension legislation.

2.2 Private pension system

More important in terms of its impact on financial incentives to work at older ages is the private pension system. Because of the relatively low level of state pension provision in the UK, private pension saving has always played an important role. In 2011–12, 60% of employees aged between 55 and 59 had some form of private pension coverage, with 53% of employees having an employer-sponsored scheme (either defined benefit or defined contribution) and 12% having an individually-arranged (defined contribution) personal pension; 5% of employees aged 55 to 59 have both types of scheme.[7]

Figure 2.1. Contracting-out in private sector second-tier pensions among 50-59 year old employees, by sex and year



Note: Figures relate to main coverage during the financial year.
Sources: Department for Work and Pensions tabulation tool (http://tabulation-tool.dwp.gov.uk/NIRS/live/tabtool.html). Human Mortality Database.

For some of these individuals, part of this private pension provision will be a direct substitute for state pension provision since, as mentioned above, many individuals choose to opt out of the second-tier state pension and instead save in a private pension. This has been possible for members of defined benefit schemes since 1978 and was also possible for defined contribution scheme members between 1987 and 2012. Figure 2.1 shows the numbers of 50 to 59 year old employees contracted out into different types of private sector pension arrangements each year since 1997. The figure shows the gradual decline in defined benefit pension scheme membership among private

[7] Source: Chapter 6 of Department for Work and Pensions, *Family Resources Survey 2011/12*, July 2013, (https://www.gov.uk/government/publications/family-resources-survey-201112).

sector employees and the increasing numbers covered by public sector defined benefit schemes, which was due to the growth in public sector employment over this period.

Many employees have additional private pension saving, either in defined benefit or defined contribution pensions, above the minimum required second-tier pension coverage.[8]

Effect of private pensions on incentives to work or retire

Different types of private pension arrangements can and do lead to significant differences in the financial incentives that those in paid work face to start drawing their pension at particular ages. Those in defined contribution pensions can typically expect to see the value of their pension rise if they choose to remain in paid work and contribute to their pension, with this increase depending on their rate of contributions, the expected investment return earned and the annuity rate expected in future. This increase in value is relatively smooth across different ages, although individuals will face an incentive to draw the pension rather than wait any longer if the expected return on the fund is not sufficient to offset worsening annuity rates with age.

In contrast, defined benefit pensions typically provide sharp incentives to draw the pension at the normal pension age for the scheme. Defined benefit schemes provide a pension that is related to some measure of salary, the number of years in the scheme, and an accrual rate. Most schemes impose an actuarial reduction to pension income if an individual chooses to draw it before the normal pension age but they typically do not offer any actuarial increase for late drawing. This provides an incentive to draw the pension at exactly the normal pension age. How strong this incentive is depends on the precise parameters of the pension scheme, how long an individual has been a member for and (in final salary schemes) expected future earnings growth, which vary across individuals and over time. For example, the normal pension age is typically 60 for schemes that provide pensions to public sector employees, while it is typically 65 in schemes that offer pensions to private sector workers (and for many who joined public sector schemes after around 2005).

Until April 2006, employees were not legally allowed to draw a pension from an employer while continuing to work for that same employer. Therefore, up to this point, these incentives to draw a pension at a particular time translated quite directly into incentives to leave work (or at least leave one's current employer) at that point as well. However, since April 2006 it has been possible for an individual to continue working for an employer while also drawing a pension from them. Therefore, from that point onwards the incentive to draw a private pension at a particular age continued to exist but it became (in theory, at least) disconnected from the decision about whether or not to remain in paid work. In the empirical analysis below we include time dummies in our regressions to allow for behaviour to differ over time, potentially as a result of this and other policy reforms.

2.3 Disability benefits

Other features of the benefit system also affect the financial incentives that different individuals face to be in paid work at particular ages. Potentially the most important of these is the system of out-of-work support for those deemed to be in poor health. This subsection provides a brief

[8] In the UK, until December 2012, people were required to annuitise at least 75% of all pension funds by the age of 75. This requirement covers not only occupational pensions but also individually-arranged personal pensions. Therefore, in this chapter we treat all defined contribution pensions as providing a retirement income stream, rather than treating them as a standard financial asset. This is different from the approach used in the analysis of the United States, where IRAs are treated as financial assets.

summary of the key features of the UK disability benefit system and some trends over time in the numbers claiming these benefits and the generosity of the system. Further details of reforms to the disability benefits in the UK over the period since 1948 can be found in Banks et al (2012), with a brief summary (taken from that publication) provided in Box 2.1.

A notable feature of the disability benefit system in the UK is the weak link between the benefits that an individual can receive and the contributions they have paid in the past. Or, in other words, the relatively small amount of disability insurance that the state provides to many employees. Although eligibility for certain types of disability benefits is dependent on past social insurance contributions, the amount received is a flat rate, regardless of the level of previous earnings. As a result, there is very little disability insurance provided by the state for those on average or high earnings, since the flat-rate of benefit is much lower than the amount they could have expected to earn. In addition those on low incomes may qualify for means-tested support, if they do not meet the contribution conditions. The amount of insurance provided was reduced further in April 2012 by a reform which limited the amount of time that some claimants could receive non-means-tested disability benefits for to one year. However, the data we use in this chapter only cover the period up to 2011.

The low level of disability benefits, relative to earnings, for most workers is shown in Figure 2.2. This shows the level of the principal disability benefit[9] over time, both after inflation (as measured by the Retail Price Index, RPI) and relative to average earnings. Until 1974, the level of these benefits was uprated on an ad hoc basis. From 1974 to 1980 the increase was formally linked to the greater of price inflation and earnings growth. This led to the value of these benefits peaking relative to earnings in the late 1970s at 25% of average earnings. This was still a relatively low level of disability insurance for those on average and above average earnings by international standards; for example, the systems in place in the Netherlands, Spain and the United States all provide a higher level of earnings replacement to higher earners than is available in the UK. Since the late 1970s, the level of these benefits has been formally linked to inflation (as measured by the RPI up until April 2010, and by the Consumer Price Index (CPI, which tends to increase less quickly than the RPI) from April 2011 onwards). This has meant that, in real terms, the benefit has remained at about £100 (€120) per week but, as average earnings have in the UK tended (until recently) to increase more quickly than prices, the value of disability benefits has fallen to around 15% of average earnings.

[9] Figure 2.2 shows the "long-term" rate of disability benefit, which is the rate that has been payable to individuals who have been receiving disability benefit for at least 52 weeks. For much of this period lower rates of benefit were payable for shorter claim durations.

Box 2.1. Reforms to the UK Disability Insurance system, 1948 to present day	
1948	Introduction of Sickness Benefit. Flat rate benefit, no distinction by duration of claims.
1966	Introduction of earnings-related Sickness benefit.
1971	Introduction of Invalidity Benefit (IVB). Higher rate for duration above 6 months.
1972 reform	Introduction of Invalidity Allowances. Supplements for becoming disabled at younger age.
1980	Abolition of earnings-related Sickness benefit.
1983/1986	Introduction of Statutory Sick Pay.
1995 reform	Incapacity Benefit (IB) replaces IVB. New claimants receive less generous IB, which is taxable (unlike IVB). “Own occupation” test replaced by “Any occupation” test. Regional medical test instead of personal doctor. No longer paid to people over state pension age.
2001 reform	Increased contribution requirement to qualify for IB. Introduction of means-testing with regard to pension income.
Pathways–to-Work expansion 2003-2008	Piloting of a package of reforms consisting in increased conditionality, increased support and increased financial incentives to return to work.
2008 reform	Employment support allowance (ESA) replaces IB for new claimants.
2010 reform	ESA is applied to all existing IB claimants.

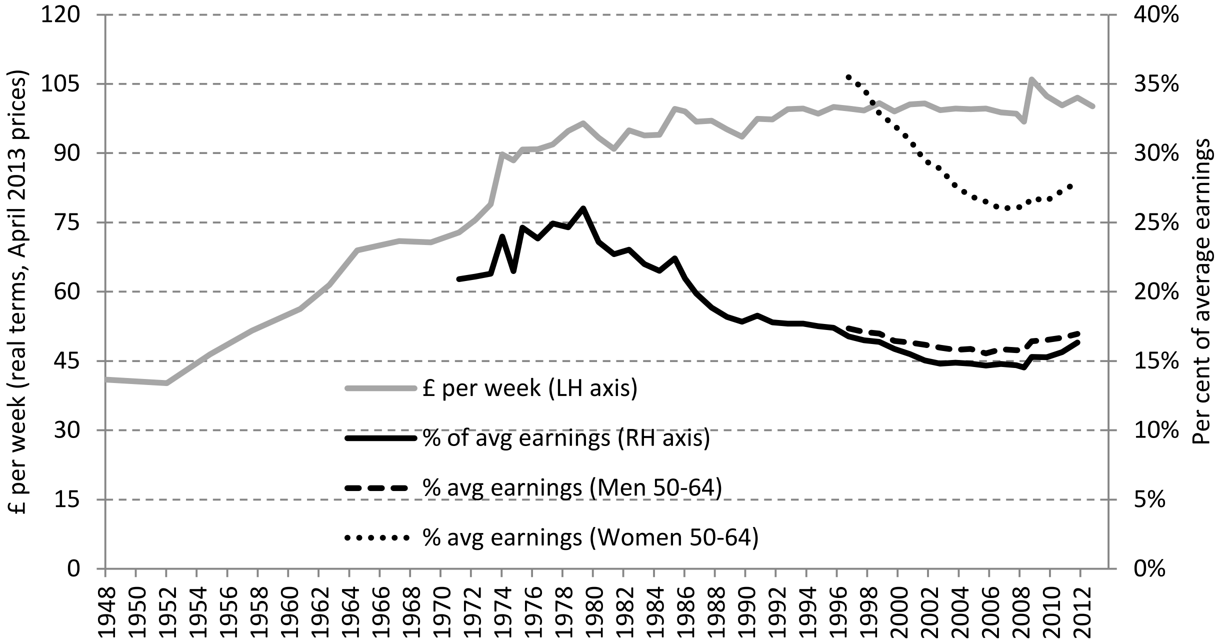
Source: Banks, Blundell, Bozio and Emmerson (2012).

The last forty years have also seen dramatic changes in the numbers of individuals receiving disability benefits. This is shown, by both sex and age group, in Figure 2.3. The proportion of older men receiving disability benefits increased substantially between 1970 and the mid-1990s, with strong growth among those aged 60 to 69 throughout this period and among those aged 50 to 59 over the period from 1985 to 1995. The proportion of women aged 50 to 64 receiving disability benefits also increased substantially between 1985 and 1995. These trends are largely unrelated to trends in health and disability but have instead been driven both by economic factors and changes in the stringency of the system; Banks et al (2012) provide more analysis of the drivers of these trends.

Another striking trend, not shown in Figure 2.3, is the nature of health problems among disability benefit claimants. In May 1995, 19% of working age men who were receiving disability benefits were receiving them because of mental or behavioural conditions; the equivalent figure for women was

28%. These percentages increased continuously over time so that by November 2012 they stood at 43% for men and 45% for women.[10]

Figure 2.2 Disability benefit rates for claims of 52 weeks or longer, over time



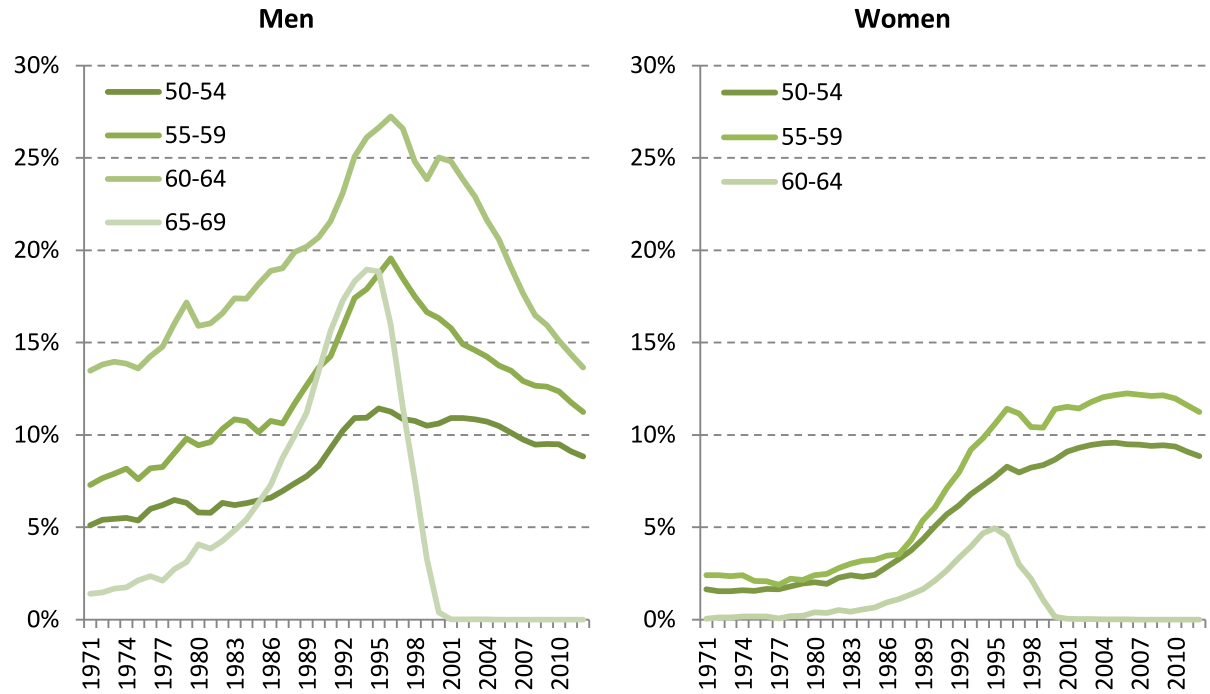
Note: Rates shown are for sickness benefit (July 1948 to October 1972), invalidity benefit (IVB, October 1973 to April 1994), incapacity benefit (IB, April 1995 to April 2008) and employment and support allowance (ESA, October 2008 to April 2013). Rate shown is applicable from the 52 week of claim, without any dependent additions, and for ESA (i.e. post October 2008) includes the Work Related Activity addition. Average earnings for men and women aged 50–64 are calculated excluding the top and bottom 1% of earners.
Source: Department for Work and Pensions, Annual Abstract of Statistics 2012, July 2013, London: Department for Work and Pensions (https://www.gov.uk/government/publications/abstract-of-statistics-2012). Labour Force Survey, 1997–2012.

Reforms have been implemented since 1995 with the objective of reducing the numbers receiving disability benefits, both through reducing the on-flow to these benefits and increasing the off-flow. Perhaps the single most significant reform to disability benefits was probably that which came into force in 1995, which saw the replacement of invalidity benefit with incapacity benefit. For new claimants this stopped their eligibility when they reached the state pension age (hence the sharp drop in male claimants aged 65 to 69, and female claimants aged 60 to 64, after 1995 in Figure 2.3), made the health test tighter (so that it applied to an individual's ability to do any paid work as opposed to suitable work), and moved the administration of this test from personal doctors to medical staff working at the regional level. A further tightening of eligibility criteria, making it harder for individuals to move directly from unemployment benefit to disability benefit, was implemented in 2001. The replacement of incapacity benefit with employment support allowance from October 2008 saw a further attempted tightening in the eligibility criteria; this involved a change in the

[10] Figures cited refer to the primary health condition, as recorded under the International Classification of Diseases summary code, for each disability benefit recipient. Source: Authors' calculations using the Department for Work and Pensions Tabulation tool (http://tabulation-tool.dwp.gov.uk/100pc/tabtool.html).

medical test and greater requirements and support for some of those receiving ESA to seek to manage their health condition and to prepare for a return to the labour market. As Figure 2.3 shows, from 1995 onwards the proportion of older working age men receiving disability benefits has declined sharply, with particularly large falls at older ages, while the proportion of older working age women receiving these benefits has stopped increasing.

Figure 2.3 Proportion receiving disability benefits over time, by sex

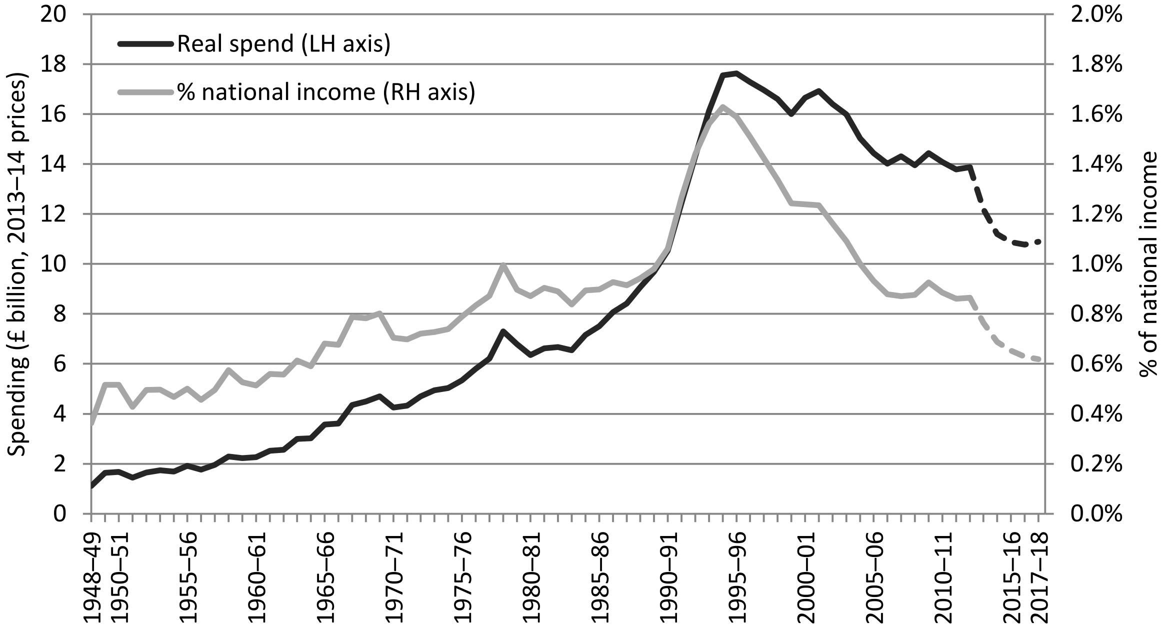


Note: Figures show the percentage claiming IVB, IB or ESA.
Sources: Authors' calculations using data on numbers of disability benefit claims from Anyadike-Danes and McVicar (2007) and Department for Work and Pensions tabulation tool (http://tabulation-tool.dwp.gov.uk/NIRS/live/tabtool.html) and data on population by age group from the Office for National Statistics.

The combination of changes in the generosity of disability benefits (shown in Figure 2.2) and the change in the numbers in receipt of these benefits (shown in Figure 2.3) have led to large changes in public spending on these benefits. This is shown in Figure 2.4. In 1948–49, less than 0.4% of national income was spent on disability benefits; this rose to 1.0% of national income at the start of the 1990s before peaking at 1.6% of national income in the mid-1990s. Since then, spending on disability benefits has fallen as a share of national income (and fallen relative to economy-wide inflation); it is now projected that by 2017–18, the UK government will spend 0.6% of national income on these benefits, which would be the lowest level of spending as a share of national income on disability benefits since the mid-1960s.[11]

[11] Figures relate to spending on sickness benefit, invalidity benefit, severe disablement allowance, income support on grounds of disability, incapacity benefit and employment and support allowance. Source: Department for Work and Pensions, Benefit Expenditure and Caseload Tables, March 2013 (https://www.gov.uk/government/publications/benefit-expenditure-and-caseload-tables-2013).

Figure 2.4 Total spending on disability benefits in the UK, 1948–49 to 2017–18



Note: Figure shows spending on sickness benefit, invalidity benefit, severe disablement allowance, income support on grounds of disability, incapacity benefit and employment and support allowance.
Source: Department for Work and Pensions, Benefit Expenditure and Caseload Tables, March 2013 (https://www.gov.uk/government/publications/benefit-expenditure-and-caseload-tables-2013).

Effect of disability benefits on incentives to work or retire

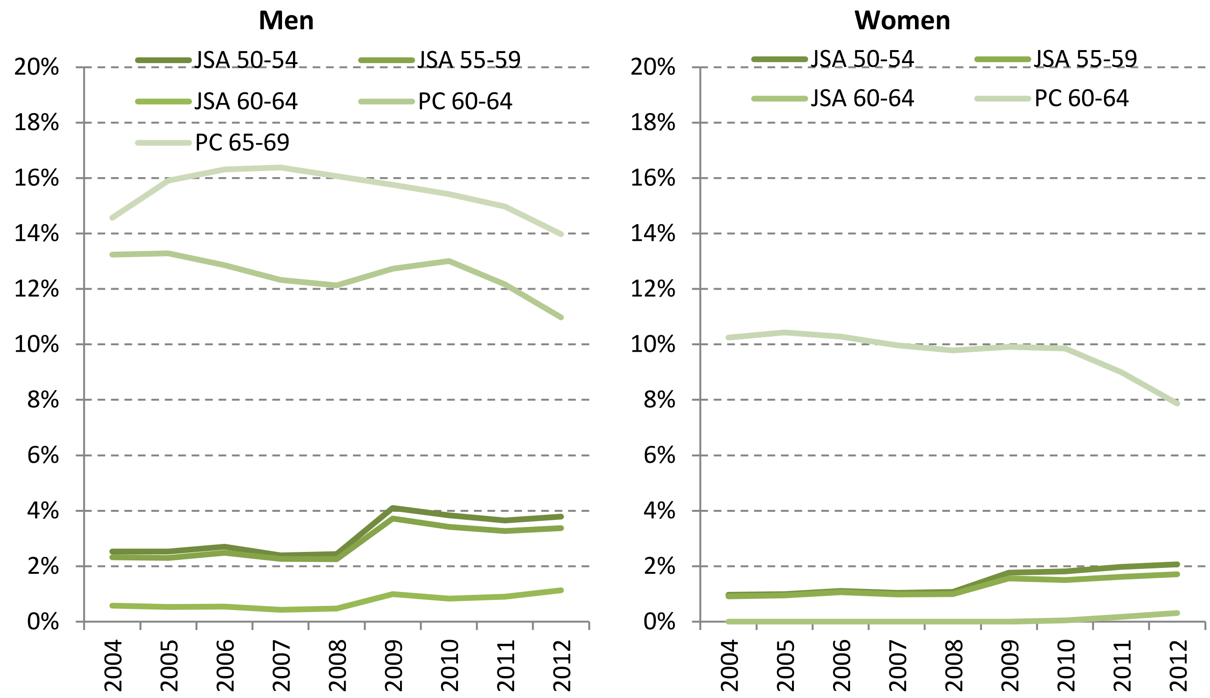
Disability benefits will provide a disincentive to remain in paid work for those whose health is sufficiently poor that they are likely to qualify for these benefits. However, the level of disability benefits provided by the state in the UK is so low that the financial return to moving out of paid work onto disability benefits will be fairly minimal for all but the lowest earners. Therefore, for moderate and higher earners, the availability of disability benefits may not serve as a strong disincentive to remaining in paid work in the UK, even if the (medical) test of eligibility was very weak. However, for very low earners, the flat-rate benefits could provide a reasonably high level of earnings replacement and thus the financial disincentives to working for this group could be considerable and would depend on how likely they think it is that they would qualify for these benefits if they were to leave paid work. In Section 5 we present simulations of how employment rates among different groups would change if the qualification criteria for disability benefits were relaxed/tightened.

2.4 Unemployment benefits and means-tested support

The final policies directly affecting financial incentives around retirement age are those coming from the rest of the tax and benefit system. Most of these do not vary, or exhibit relatively little variation, by age. The key one that does vary by age and could be significant for some groups is the system of means-tested support for those on low incomes and not in paid work.

Those not in poor health who are aged below the female state pension and are actively seeking paid work can be eligible for Jobseeker's Allowance (JSA), which in 2013–14 is paid at £71.00 (€80) per week. Those who have made sufficient contributions are able to receive this for up to six months, while a means-tested payment of the same amount is available beyond this point (and is available immediately for those who have not made sufficient contributions). For those who are aged above the female state pension age (or with a partner aged over the female state pension age) the means-tested payment (known as Pension Credit) is more generous: the weekly amount is much higher (£142.70 per week, or around €170) and there is no requirement for recipients to be actively seeking paid work. As Figure 2.5 shows, only a small proportion of older men and women receive JSA but a greater number of individuals aged over the female state pension age are in receipt of the means-tested Pension Credit.

Figure 2.5 Proportion receiving Jobseeker's Allowance and Pension Credit over time, by sex



Note: Figures show the percentage claiming Jobseeker's Allowance (JSA) and Pension Credit (PC).
Sources: Authors' calculations using claims data from Department for Work and Pensions tabulation tool (http://tabulation-tool.dwp.gov.uk/NIRS/live/tabtool.html) and data on population by age group from the Office for National Statistics.

Effect of means-tested out of work benefits on incentives to work

Out of work benefits will reduce the financial incentive to work. The relatively low level of JSA available before the state pension age, which is limited to 6 months' duration, in addition to the job search requirements will mean that this financial disincentive to work will be small for many workers; this is reflected in the relatively low numbers of men and women receiving these benefits. For those aged above the female state pension age – or with a partner aged above the female state pension age – the more generous Pension Credit will provide a stronger financial disincentive to be in paid work and one that is potentially important at least for lower wage workers.

2.5 Other institutional factors affecting employment rates of older people

Until 1 October 2006, it was possible for employers in the UK to make a worker redundant (or refuse to hire them) purely on the grounds of their age, although the government had made cautious efforts to discourage such practices.[12] New legislation in 2006 prevented employers doing this to workers aged under 65.[13] This new legislation was, however, quickly challenged by older workers in the European Court of Justice. Although the ECJ (and subsequently the UK High Court) ruled the legislation was lawful, the UK government reviewed the policy and eventually abolished the ability to impose compulsory retirement ages altogether. Since April 2011, employers have no longer been able to make employees redundant on the grounds of age alone.[14]

3. Empirical approach

The next section presents the results of regressions in which the dependent variable is an indicator of whether or not an individual ceases to doing any form of paid work ("retires") and the main explanatory variable of interest is a measure of the option value of remaining in work rather than retiring (along the lines of the measure suggested by Stock and Wise (1990a, 1990b)). We control carefully for health status in order to examine how financial incentives affect labour force participation decisions after controlling for differences in health. We estimate these regressions using data from the first five waves of ELSA, which cover the period from 2002–03 to 2010–11.

3.1 Defining option values

The model of retirement estimated in this paper is based on the option value retirement model (Stock and Wise, 1990a; 1990b), which assumes that individuals compare the value of retiring in the current period with the expected value of retiring at all possible points in the future.

In the option value model, the value to an individual of retiring in period *r* is assumed to depend on, among other things, the discounted utility that he expects to derive from earnings up to the point of retirement plus the discounted utility that he expects to derive from the income he will receive from that retirement date until he dies (in period *S*). This is set out in equation 1.

(1) $$V_t(r) = \sum_{s=t}^{r-1} \frac{1}{(1+\delta)^{s-t}} \pi_{st} Y_s^{\gamma} + \sum_{s=r}^{S} \frac{1}{(1+\delta)^{s-t}} \pi_{st} \big(kB_s(r)\big)^{\gamma}$$

We assume that, due to the disutility of work, utility from one unit of income whilst working (Y_s) is lower than utility from one unit of income in retirement (B_s): specifically, we assume that *k* takes the value 1.5. We also assume that the coefficient of relative risk aversion (γ) is 0.75, which picks up the diminishing marginal utility of additional income (either in retirement or during working life). We assume that δ is equal to 0.03 and that there is a probability (π_{st}) that an individual who is alive in period *t* survives to period *s*, which depends on an individual's age and sex.

The option value at time *t* is the difference between the maximum utility ($V_t(r^*)$) that can be obtained from retirement in the future (in period *r**) and the utility that can be derived from retirement in the current period ($V_t(t)$), shown in equation 2.

(2) $$OV_t(r^*) = V_t(r^*) - V_t(t)$$

[12] See Wunsch and Raman (2010) for a more detailed discussion.

[13] Employment Equality (Age) Regulations 2006, http://www.legislation.gov.uk/uksi/2006/1031/contents/made.

[14] There are a small number of exceptions to this where employers can prove that a compulsory retirement age is objectively justified by the demands of the job.

The value of retiring at a particular point in time will depend on what set of benefits an individual expects to be able to receive after he retires. In this chapter, we are specifically interested in distinguishing between the stream of benefits that would be received if an individual qualified for disability benefits and the stream of benefits that would be received otherwise. We calculate the option value for each of these "pathways" separately and then construct a combined measure of the option value, which is equal to the weighted sum of the option values of the individual pathways. The weights used depend on the likelihood of an individual choosing (and being allowed to choose) a particular pathway. This weighted option value measure, summarised in equation 3, is the variable that we then include in our regression models. Sub-section 3.3 describes in more detail the pathways that we consider and the weights we use.

(3) $$\overline{OV_t(r^*)} = \omega OV_t^1(r^*) + (1-\omega)OV_t^2(r^*)$$

3.2 Data

We use data from ELSA, which provides detailed information on a range of individual circumstances that are essential for our estimation strategy. In particular, the survey contains detailed information on individuals' participation in paid work, their private pension scheme membership, their current health status, and information on family structure and partner's income and wealth (which affect entitlement to means-tested benefits).

Our base sample is all those who were aged between 50 and 69 and doing some paid work in any of the first four waves of ELSA, which were collected between 2002–03 and 2008–09. The outcome of interest is whether these individuals moved out of paid work over the next two years, that is between wave *t* and wave *t+1*; in other words, we examine exits from paid work that happened between 2002–03 and 2010–11. Our pooled sample comprises 10,290 person-year observations on 4,909 unique individuals.

ELSA provides detailed information on accrued rights to private pensions, including: the accrued value of and current contributions to defined contribution pensions, and existing tenure in and detailed rules of defined benefit schemes. This information allows us to calculate the financial incentives to leave paid work that are provided by these schemes, which (as described in Section 2) are a very important component of the financial incentives facing (both healthy and unhealthy) older workers in the UK, given the relatively ungenerous state pension and publicly funded disability insurance systems, particularly to moderate and higher earners.

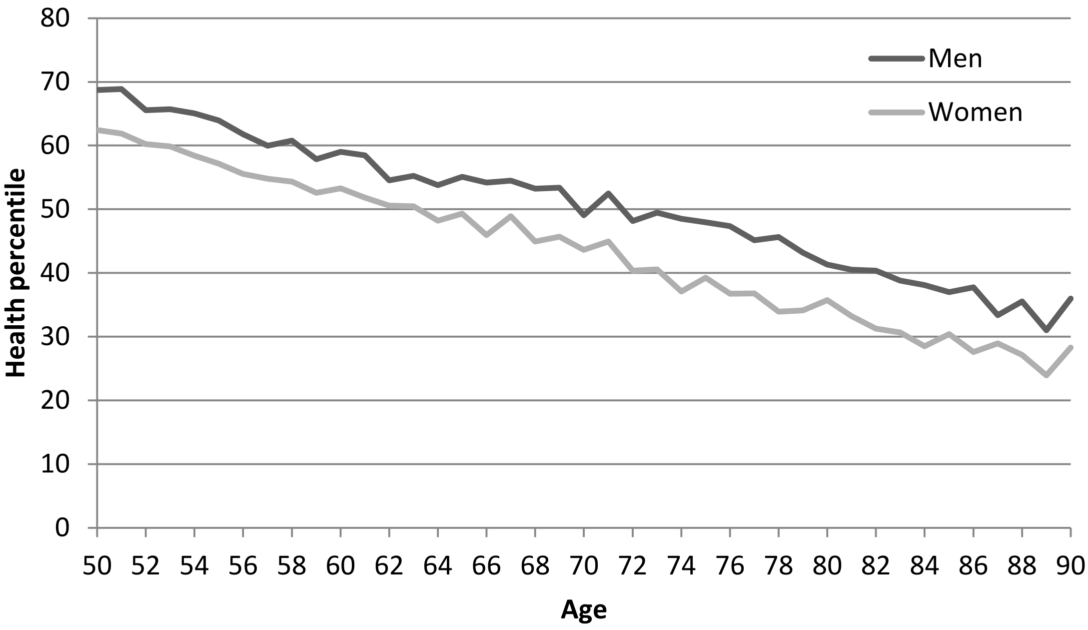
ELSA also measures a wide range of indicators of individuals' health, covering both subjective and objective measures. Based on a range of measures of health, we estimate a health index for each wave of the survey using a principal components analysis, similar to that suggested by Poterba, Venti and Wise (2011, 2013; henceforth PVW). The continuous index that we use is the first principal component of 23 health indicators from ELSA data. The indicators chosen are those that most closely approximate the measures used by PVW. However, we are unable to include measures of back problems, hospital and nursing home stays and doctor visits, which are not asked about in a comparable way in ELSA. Table 3.1 sets out the results of estimating this index for each of the first five waves of ELSA. The index estimated varies across individuals and over time for the same individuals, since it is based on measured health at each wave.

Table 3.1. First principal component index for the UK

	2002–03	2004–05	2006–07	2008–09	2010–11
Has difficulty:					
walking quarter of a mile	0.284	0.295	0.299	0.304	0.297
lifting or carrying	0.278	0.279	0.284	0.284	0.284
pushing or pulling	0.274	0.277	0.275	0.276	0.279
climbing several flights of stairs	0.266	0.276	0.273	0.276	0.275
stooping/kneeling/crouching	0.263	0.272	0.273	0.269	0.273
getting up from a chair	0.255	0.264	0.265	0.265	0.266
reaching/extending arms	0.203	0.197	0.204	0.200	0.204
sitting for two hours	0.211	0.212	0.216	0.208	0.215
picking up a 5p piece	0.149	0.150	0.159	0.152	0.155
with any ADL	0.272	0.275	0.273	0.272	0.277
Receives help at home	0.156	0.169	0.180	0.185	0.175
Self-rated health: fair, bad, very bad	0.253	–	0.236	–	–
Self-rated health: fair, poor	0.255	0.241	–	0.246	0.244
Ever been diagnosed with:					
Arthritis	0.200	0.213	0.212	0.205	0.210
Psychological conditions	0.049	0.060	0.065	0.061	0.059
Stroke	0.080	0.093	0.091	0.094	0.090
Hypertension	0.083	0.171	0.162	0.148	0.136
Lung disease	0.092	0.093	0.096	0.102	0.096
Cancer	0.033	0.038	0.042	0.044	0.039
Heart problems	0.114	0.116	0.123	0.125	0.120
Diabetes	0.071	0.079	0.084	0.086	0.080
BMI	0.070	0.091	0.110	0.119	0.099
BMI^2	0.079	0.097	0.106	0.117	0.101
BMI missing	0.054	0.043	-0.031	-0.028	0.004
Any pain	0.253	0.255	0.239	0.235	0.249
Moderate/severe pain	0.259	0.263	0.246	0.248	0.258

Notes: The wording of the question about self-rated health differs across the waves of ELSA. In all waves except wave 3 respondents were asked to rate their health on a five-point scale from “excellent” to “poor”; this is the same wording that is used in the Health and Retirement Survey (HRS). In wave 3, respondents were asked to rate their health on a five-point scale from “very good” to “very bad”; this version of the question was also included in wave 1. In the principal components analysis, we define as in “bad health”, those who reported “fair” or “poor” on the HRS scale, or “fair”, “bad” or “very bad” on the scale used in wave 3.

Figure 3.1. Average health percentile, by age and sex

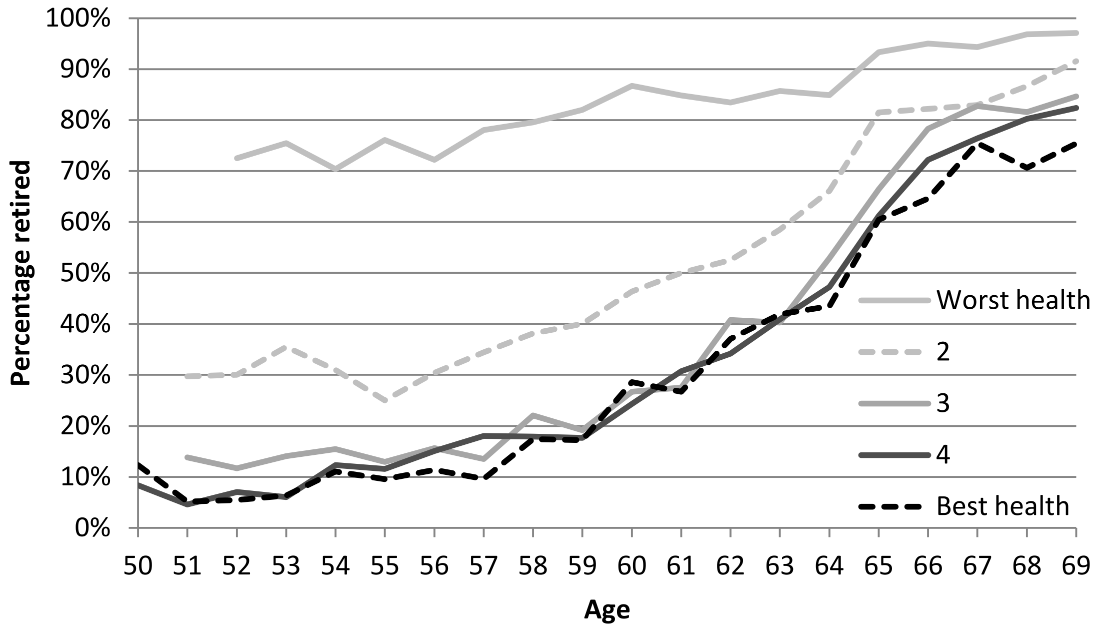


Source: English Longitudinal Study of Ageing, waves 1–5. Unweighted.

The health measures included in the index are deliberately chosen – from among a large range of other possible measures – because they are closely associated with labour force participation. The strong relationship between this measure of health and employment rates for both men and women is shown in Figures 1.2 and 1.3 respectively. However, the mix of indicators used is such that women are on average assessed to have "worse" health than men at each age using this measure – as shown in Figure 3.1, which shows the average percentile of the distribution of this health index for men and women of different ages. Figure 3.1 also demonstrates that health declines on average with age.

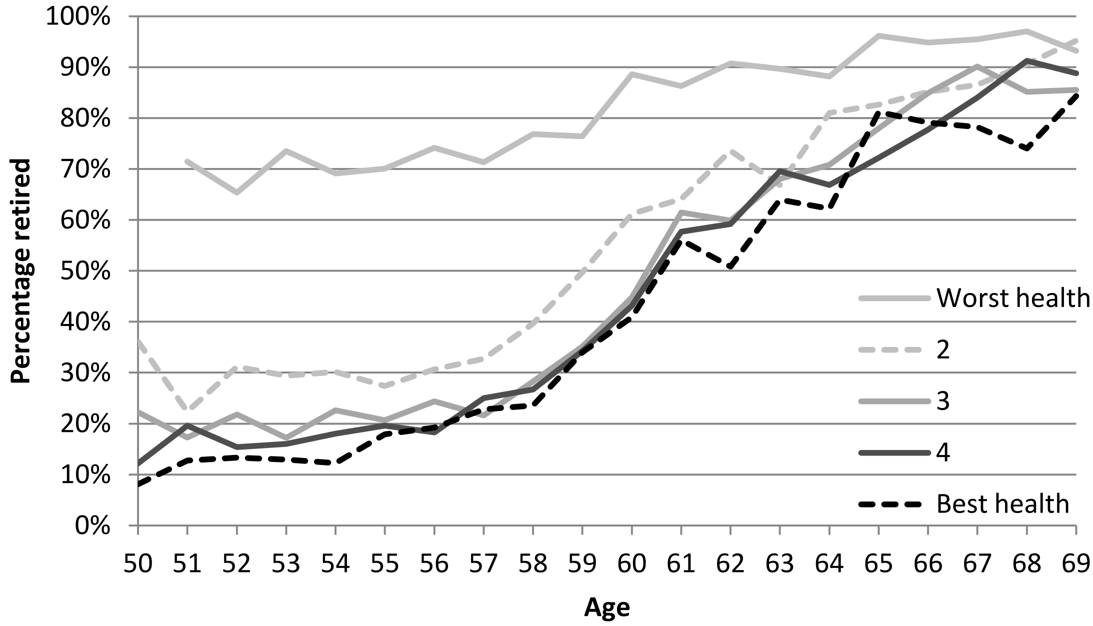
Employment rates by health are documented in Figure 3.2. This takes all individuals aged 50 and over and presents the proportion in work by health quintile. Even at the age of 50 more than half of men and women who are in the worst health quintile are not in paid work; this compares to only around 10% of those in the best health. As a result, the analysis presented in this chapter cannot explain the factors underlying labour force exits for many of those in the worst health who have already withdrawn from paid work at younger ages (or have never entered the labour market in the first place). The sample we use (of those who are in work at age 50 or above) will be biased towards a relatively healthy group of individuals within the cohorts we study.

Figure 3.2a. Prevalence of retirement among older men, by health



Notes: Employment rates for some age/health groups are not shown due to small sample sizes (<30 observations).
Source: ELSA waves 1–5. Unweighted.

Figure 3.2b. Prevalence of retirement among older women, by health



Notes: Employment rates for some age/health groups are not shown due to small sample sizes (<30 observations).
Source: ELSA waves 1–5. Unweighted.

Our regression analysis also includes a number of other covariates derived from the ELSA data. In particular, we divide individuals into three groups based on the age that they left full-time education: left school at or before the age of 15, post-15 but no college, some college.[15] We also include indicators of whether an individual is in a couple and whether their partner was working at baseline, whether the individual was self-employed at baseline, and we include a measure of the family's net non-pension wealth. Net non-pension wealth includes the value of financial, housing and other physical assets, less the value of any outstanding secured and unsecured debts.

3.3 Pathways to retirement

To calculate the option value of remaining in work, we need to examine the stream of income that individuals receive from the age that they appear in the survey until they die. This income stream will depend on the age at which they retire and the pathway that they retire through.

In this chapter we consider two pathways to retirement. The first pathway we refer to as the "DI pathway" and entails individuals claiming disability benefits as soon as they retire; the other ("non-DI") pathway assumes that individuals will not be eligible for disability-related benefits when they retire. Along both pathways, individuals are assumed to claim any private pension to which they are entitled at the point they retire and any state pension to which they are entitled at the state pension age.[16] We also assume that families claim any means- and asset-tested benefits that they are entitled to in each year. Along the DI pathway we also assume that individuals qualify for and claim disability-related benefits. Although there is a contributory condition for receipt of working-age DI benefits, this is minimal and virtually all those who are working in our baseline sample would satisfy it.

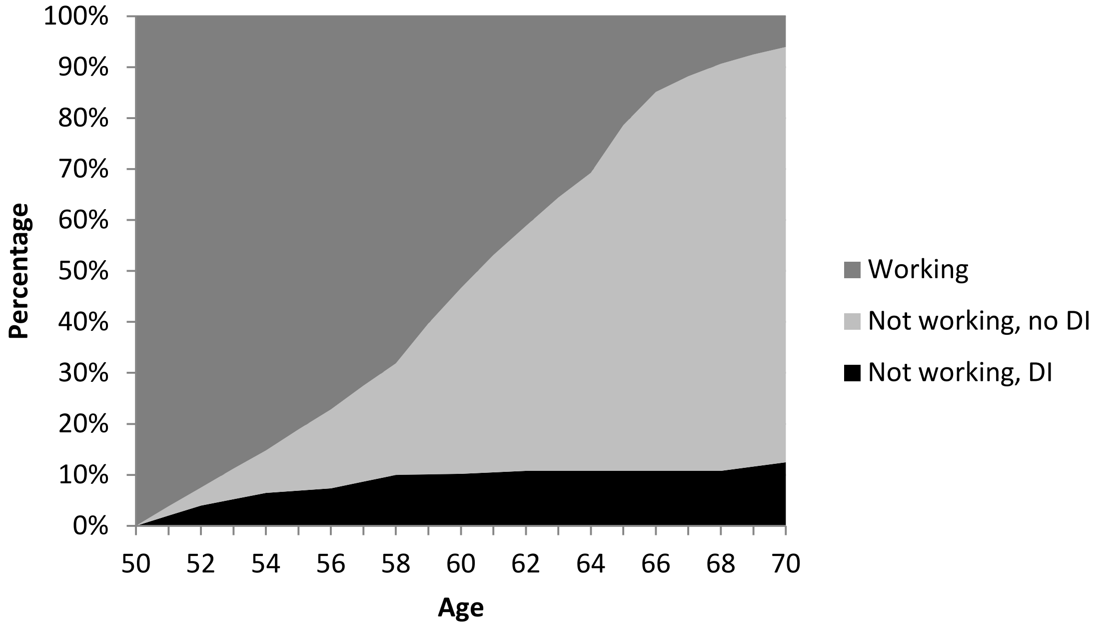
Figure 3.3 shows how use of the two pathways evolves with age, starting from a population who are all in work at age 50. Since the ELSA data do not yet contain a long enough panel to follow any one cohort from age 50 to age 70, this figure is constructed by patching together two-year transition probabilities observed among different cohorts within the ELSA sample.

To construct the weighted option value measure, we need an estimate of how likely it is that the DI pathway will be open to an individual if he or she chooses to retire. Following the approach used throughout this volume, we weight the DI pathway by a measure of the prevalence of DI among the stock of individuals in the relevant age range. Specifically, we calculate the fraction of men aged 50–64 (and women aged 50–59) in each education group who are receiving disability benefits. We do this separately for each year of the survey, thus allowing the weight on the DI pathway to vary over time. As shown in Figure 2.3, the proportion of older men receiving DI has been declining since 1995 (while the increase among older women has been stemmed), at least in part as a result of reforms over the last two decades aimed at reducing the on-flow and increasing the off-flow from these benefits.

[15] For the cohorts considered here, schooling was compulsory up to the age of 15.

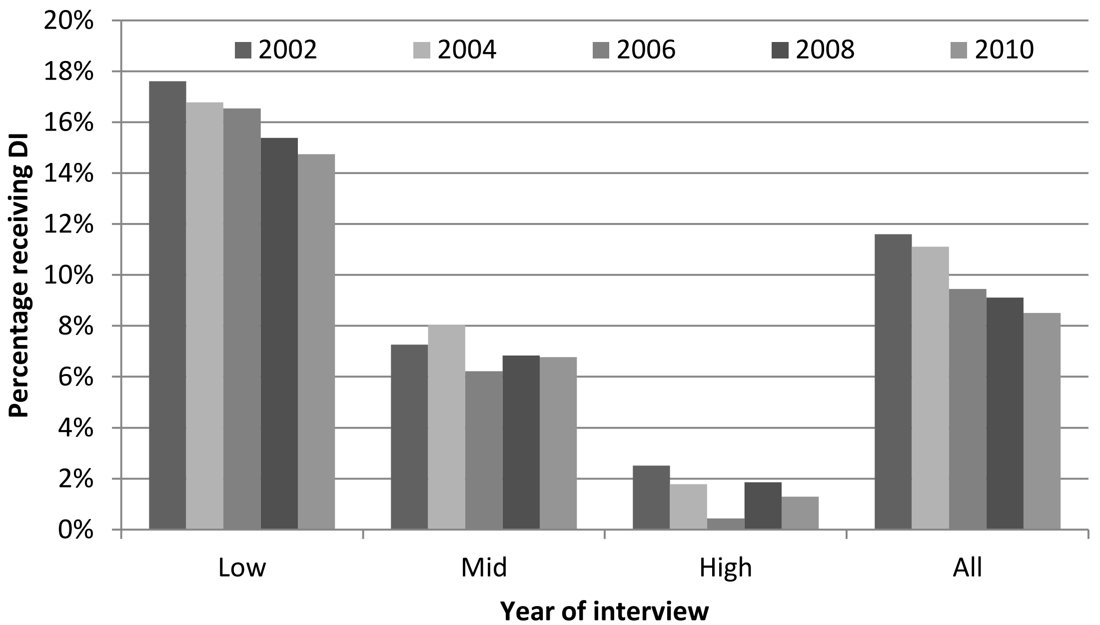
[16] If an individual retires before the age at which they can first claim their private pension (before the state pension age), they are assumed to have to wait and claim their private (state) pension at the earliest possible age.

Figure 3.3. Prevalence of pathways to retirement among those in work at age 50



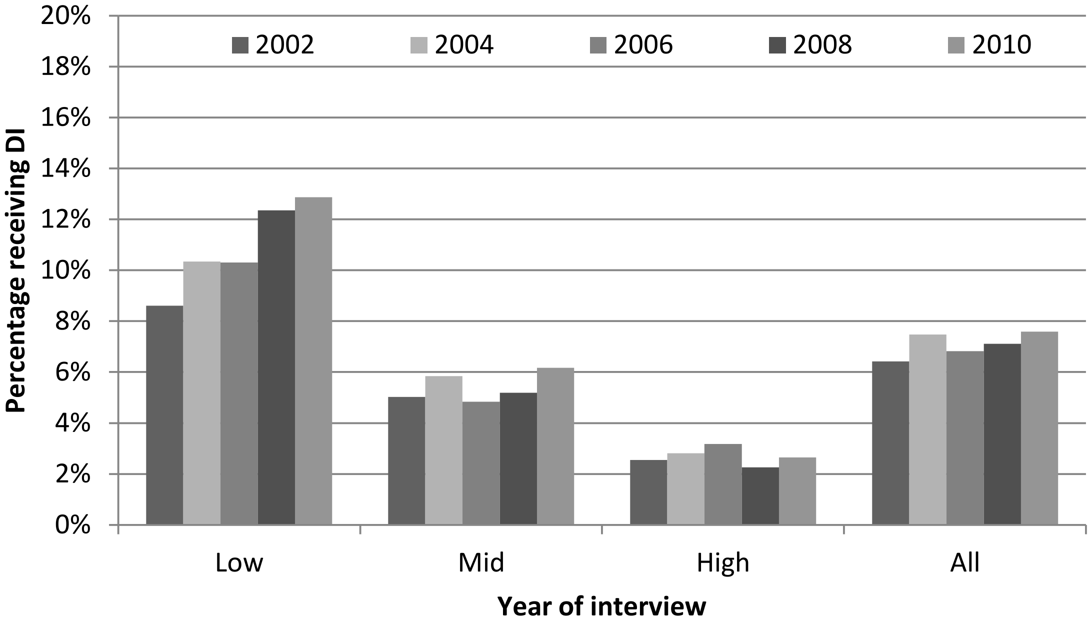
Notes: Prevalence of pathways is calculated by aggregating two-year transition probabilities calculated from the sample at each age who were initially working.
Source: ELSA waves 1–5, pooled. Unweighted.

Figure 3.4a. Prevalence of DI receipt among men aged 50–64, by education level



Notes: In 2002, 2006 and 2008, the ELSA sample is representative of those aged 50 and over. However, in 2004 and 2010, it is only representative of those aged 52 and over.
Source: English Longitudinal Study of Ageing, waves 1–5. Weighted using cross-sectional weights.

Figure 3.4b. Prevalence of DI receipt among women aged 50–59, by education level



Notes: In 2002, 2006 and 2008, the ELSA sample is representative of those aged 50+. However, in 2004 and 2010, it is only representative of those aged 52+.
Source: English Longitudinal Study of Ageing, waves 1–5. Weighted using cross-sectional weights.

The same time trends are visible in the ELSA data, shown in Figures 3.3a and 3.3b. The decline in DI receipt among men is particularly pronounced among those with the lowest levels of education, although DI receipt remains much more prevalent among this group than among those with higher levels of education. For example, in 2002, 17.6% of low educated men aged 50–64 who were not in paid work were receiving disability benefits; this compares to 7.2% among the middle education group and just 2.5% among the most highly educated. Among women, overall rates of DI receipt have been quite stable between 2002 and 2010. However, this overall pattern hides an upward trend among the lowest education group, among whom the rate of DI receipt rose from 8.6% in 2002 to 12.9% in 2010.

The prevalence rates shown in Figures 3.4a and 3.4b are the weights we use in constructing our weighted option value measure.

3.4 Constructing option values

As described in Subsection 3.1, the (utility) value to an individual of retiring at a particular point in time is a function of the earned income that he will receive until he retires and the retirement income he receives thereafter. We estimate the value of retiring at each age from 50 to 69, using the formula outlined in equation 1. The option value is then calculated as the difference between the value of retiring at the age that maximises this value function and the value of retiring immediately. A number of assumptions are required to estimate earned income in the future and the future stream of retirement income that would be received from state and private pensions and disability benefits, conditional on the year of retirement. This subsection outlines the main assumptions we have made.

Future earnings

In the ELSA data we observe current earnings for our baseline sample. In constructing the option value measures, we assume that those who remain in paid work will receive the same real terms income in every future year; the exception to this is that we assume individuals receive 2.5% a year real earnings growth between the ages of 50 and 54.

State pension income

As described in Section 2, state pension entitlements depend on an individual's contributions to the system over the whole of their working life. The measures of state (and private) pension rights that we use in this paper are described in more detail in Crawford (2012). Here we provide a brief summary of the main assumptions.

The ELSA data do not contain a full record of respondents' labour market behaviour.[17] Therefore, we have had to make some assumptions about past behaviour and earnings in order to impute state pension rights. We assume that all sample members have continuously been in paid work since leaving full-time education. Previous earnings are calculated by assuming that individuals have always earned the same multiple of group-specific median earnings as they are earning when they are observed in ELSA. Median earnings profiles were estimated using repeated cross-sectional data from the Family Expenditure Survey, allowing for differences by sex, cohort and education level.[18] Given these employment and earnings histories, we calculate state pension entitlements by applying the rules of the system, which vary by date of birth, and for men and women born on the same date.

Table 3.2 shows that the men in our regression sample have on average €121,500 of accrued state pension rights, compared to €110,800 for women. Table 3.3 shows that on average these men could accrue at most a further €8,000 of state pension wealth by continuing to work, while the women in our sample could accrue on average a maximum of €4,300. However, there is considerable heterogeneity in this. For example, more than half of women in our sample cannot accrue any further state pension entitlement by working for longer – in large part this is because these women have a state pension age of 60 and so cannot accrue any further pension rights after that point.

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[17] A life history interview, including questions on labour market behaviour, was fielded in wave 3. However, only wave 3 respondents were eligible for this and not all responded. It does not, therefore, provide us with comprehensive information on all individuals in our baseline sample. Therefore, we have not made use of these data here.

[18] Our assumption that all individuals have been continuously employed since leaving full-time education is likely to overstate accrued state pension rights on average. On the other hand, our assumption about the level of past annual earnings may lead us to underestimate accrued state pension rights. This is because, if individuals have cut their hours of work or taken on a less demanding, lower-paid job in the run-up to retirement, we have assumed that the pay in this job (observed in ELSA) is indicative of their earlier earnings. Bozio, Crawford, Emmerson and Tetlow (2010) compared figures for state pension wealth estimated using the method we use here to those estimated from administrative data and found that the median error, for those interviewed in the first wave of ELSA, was an over-estimation of 7.1%. The median error was larger for women (12.5%) than for men (3.4%). Given that maximum entitlement to the basic state pension is capped after 30 years of contributions, this overstatement of accrued rights will also tend to result in an underestimation of potential future accrual (and thus option values).

Table 3.2 State and private pension wealth (thousands of €, 2012 prices)

	Men	Women	All
State pension wealth			
Mean	121.5	110.8	116.4
25th percentile	81.6	73.6	78.8
Median	111.3	111.6	111.4
75th percentile	154.6	145.2	149.8
Private pension wealth			
Mean	233.6	107.5	173.1
25th percentile	32.7	0.0	10.3
Median	136.3	35.5	76.8
75th percentile	325.8	142.7	238.7
Total pension wealth			
Mean	355.1	218.2	289.4
25th percentile	158.4	106.3	126.3
Median	265.1	162.0	206.5
75th percentile	448.9	271.6	364.0
Sample size	5,353	4,937	10,290

Source: ELSA, waves 1–4 pooled.

Private pension income

In order to calculate the current value and potential future accrual of private pensions in the ELSA sample, less information is required on past earnings and employment than was required to calculate state pension rights. The vast majority of defined benefit pension schemes in the UK (at least during the period covered by the data we use here) were final salary schemes. Therefore, current salary combined with information on scheme tenure and rules (which are asked directly in the survey) are sufficient to estimate defined benefit pension wealth. In order to calculate the potential value of future accrual, we also need to use the aforementioned assumption about future earnings growth. We also assume that all defined benefit pensions provide a survivor benefit to the surviving spouse equal to 50% of the original beneficiary's pension. The value of this stream of income is assumed still to be of value to the original beneficiary, even though it will be paid after he or she has died.

The current value of defined contribution pension funds is also asked directly in the ELSA survey. Future accrual of defined contribution pension rights will depend on the level of future contributions (from both the employee and their employer), the investment return on the fund and any changes in annuity prices.

Table 3.2 shows that on average men in our regression sample have €233,600 of private pension wealth – or nearly twice as high as their accrued state pension wealth. Women, on the other hand, have a similar level of average private pension wealth (€107,500) as state pension wealth (€110,800). Potential future accrual of private pension wealth is higher on average than potential accrual of state pension wealth, as shown in Table 3.3.

Table 3.3 Maximum accrual of state and private pension wealth (thousands of €, 2012 prices)

	Men	Women	All
State pension accrual			
Mean	8.0	4.3	6.2
25th percentile	0.0	0.0	0.0
Median	6.3	0.0	2.4
75th percentile	11.5	6.7	9.9
Private pension accrual			
Mean	16.4	11.4	14.0
25th percentile	0.0	0.0	0.0
Median	1.1	0.0	0.0
75th percentile	19.6	15.1	17.1
Total pension accrual			
Mean	24.1	15.7	20.0
25th percentile	4.1	0.0	0.1
Median	13.5	7.7	10.8
75th percentile	28.9	22.1	25.4
Sample size	5,353	4,937	10,290

Notes: This table shows the change in the (gross) present discounted value of state/private/total pension rights that individuals could expect to get if they continued to work after the year of interview.
Source: ELSA, waves 1–4 pooled.

Disability benefit income

Along the DI pathway, individuals are also assumed to be able to receive disability-related benefits. During the time period covered by our data (2002 to 2011), these benefits included Incapacity Benefit and (from 2008) Employment Support Allowance for working age individuals; these are worth around £100 (or €120) a week in current prices. These benefits can be claimed up to, but not beyond, the state pension age. From the state pension age onwards, those in poor health may qualify for disability additions to the main means-tested benefits. We allow for this in the calculation of our option value measures.

Unemployment benefits, means-tested support

As described in Section 2, non-means-tested unemployment insurance payments are only available prior to the State Pension Age for a maximum of six months in the UK. We do not factor these into our option value measures, as they do not provide any significant financial incentives to individuals to leave paid work permanently. Much more important – to low earners, at least – is the availability of (non-time-limited) means-tested benefits, which we factor into the value of both retirement pathways.

Entitlement to means-tested benefits depends on total family income (and assets). Therefore, in order to calculate how much means-tested benefit income an individual might receive if they were not working, we need to make some assumptions about their partner's earnings and other income as well. To calculate family means-tested benefit income, if the individual's partner is in work at baseline, we assume that he/she remains in work until their state pension age. If the partner is not working at baseline, we assume they remain out of work.[19]

For each future year along each pathway to retirement we calculate the means-tested benefit income that the family would be entitled to by applying the rules of the benefit system to the income (from state and private pensions and disability benefits) that the family would have in a particular year under each possible assumption about the timing of retirement. There is also an asset test for receipt of means-tested benefits in the UK – that is, assets above a certain threshold are assumed to generate an income, which results in the withdrawal of some or all of the benefit. Therefore, we also assess the family's net financial wealth holdings against this asset test; we assume that families' wealth remains constant in real terms in future. The two main means-tested benefits that we model are Income Support (for working age individuals) and Pension Credit (for those aged over the female state pension age), as described in Section 2. Both of these benefits contain an additional payment for disabled individuals, which we allow for in our calculations of the value of the DI pathway.

Net income

We calculate sample members' net income from all of the above sources by calculating their liability to income tax and employee social insurance contributions (the latter only applies to earnings received while aged below the state pension age). This allows us to take into account that fact that additional accrual of pension rights would be valued less by someone who faced a high marginal tax rate in retirement than by someone who faced a lower marginal rate.

Survival probabilities

The value of future income depends on the probability that an individual (or their partner, in the case of survivor benefits in defined benefit schemes) survives long enough to receive the income. We use official period life tables to calculate these survival probabilities.[20] For single individuals, we weight income in future years by the probability that the individual survives to that age (π_{st} in equation 1). For couples, the income that is received will depend on whether one or both of the partners survives. We, therefore, augment equation 1 to allow for two states of the world: respondent and spouse alive, respondent only alive. The weight (π_{st}) applied to income in each state is shown in equation 4. We assume that individuals place no weight on income received by their spouse after they die – that is, we exclude survivor benefits from our analysis.

(4) $$\pi_{st} = \begin{cases} \pi_{st}^{R}\pi_{st}^{P} & \text{both alive} \\ \pi_{st}^{R}(1-\pi_{st}^{P}) & \text{respondent only alive} \end{cases}$$

Where π_{st}^{R} denotes the probability that the respondent survives from period *t* to period *s* and π_{st}^{P} denotes the probability that their spouse survives.

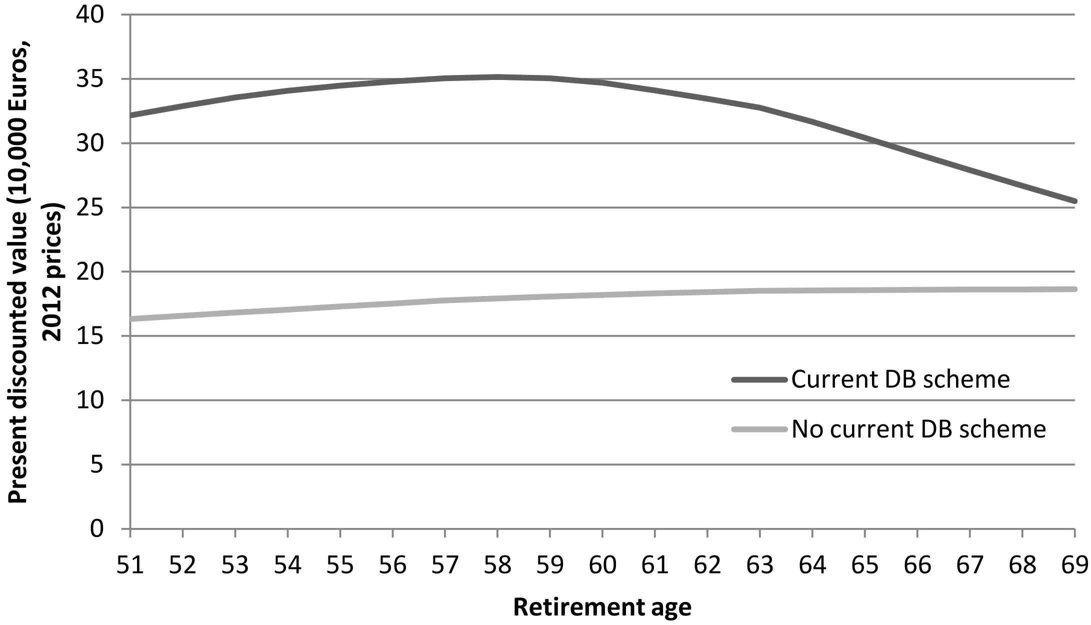
[19] This assumption reduces the computational complexity of the problem. However, it should be noted that the partner retiring at the state pension age may not be the utility (or income) maximising choice for the couple.

[20] Source: Office for National Statistics, Interim Life Tables, England – 2007–2009, http://www.ons.gov.uk/ons/rel/lifetables/interim-life-tables/2009-2011/rft-england.xls.

Describing option values

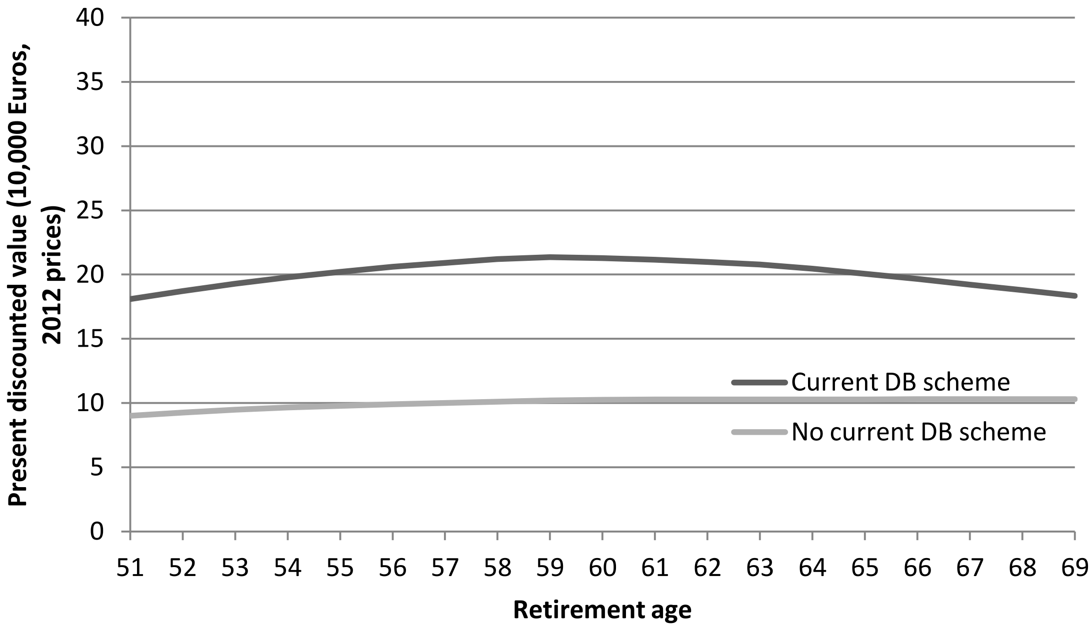
The incentives to remain in, or leave, paid work induced by different retirement income schemes depend on the precise rules of the scheme. The option value of retirement will also depend on the earnings that an individual could receive if they carried on working.

Figure 3.5a. Evolution of present discounted value of pension income with age, men aged 51



Notes: Sample is men age 51 in ELSA wave 1. Sample sizes: 68 with DB schemes and 87 without.
Source: ELSA wave 1. Weighted.

Figure 3.5b. Evolution of present discounted value of pension income with age, women aged 51



Notes: Sample is women age 51 in ELSA wave 1. Sample sizes: 68 with DB schemes and 114 without.

Source: ELSA wave 1. Weighted.

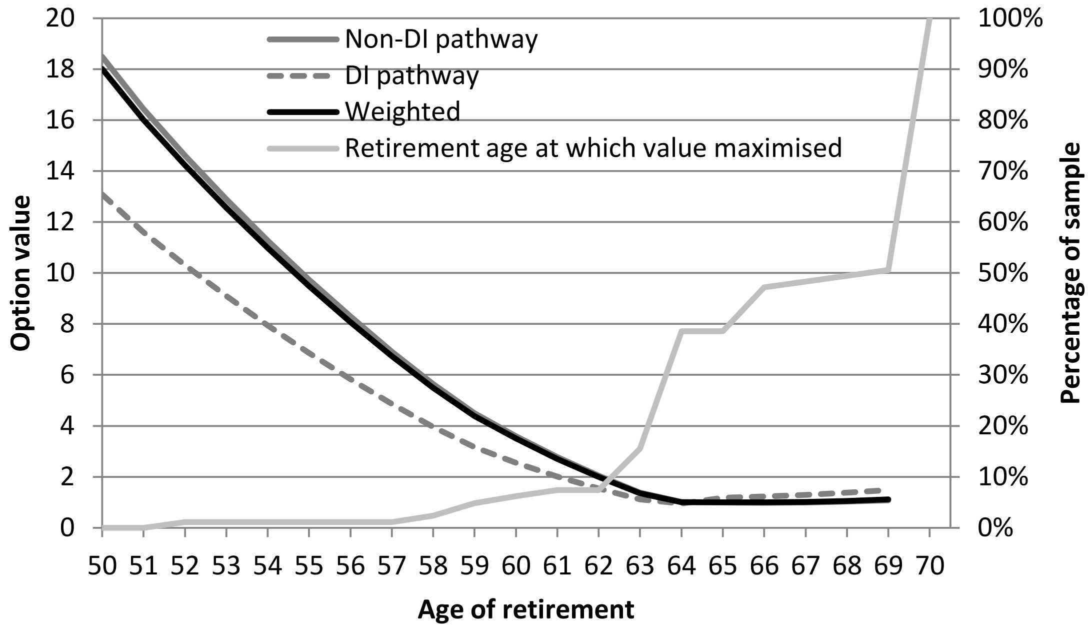
As described in Section 2, defined benefit pensions typically incentivise members to remain in the scheme until the normal pension age but to leave thereafter, as such schemes usually apply an actuarial reduction to benefits drawn before the normal pension age but do not offer an uplift for late drawing. In contrast, defined contribution pensions tend to provide smoother and for most of those in our sample – given the assumptions we have made about investment returns, contributions and annuity rates – upward sloping accrual profiles. To illustrate this, Figures 3.5a and 3.5b show how the average present discounted value of future state and private pension income varies with retirement age for men and women (respectively) who were aged 51 in the first wave of ELSA.

Figures 3.6a and 3.6b show, for men and women respectively, how the average option value of remaining in work is estimated to evolve with age – starting from a sample of individuals who were aged 50 in the first wave of the survey. The option value is – by definition – always non-negative. However, it can fall to zero before the age of 70 if retirement income is sufficiently high (and/or the disutility of work is sufficiently large) that an individual values retirement at least as highly as continued work, despite missing out on additional years of earnings. To illustrate this, Figures 3.4a and 3.4b also show the cumulative distribution function of the age at which the value of retiring peaks for this cohort of men and women.

For 49% of our sample of men and 33% of women, the option value of continuing to work remains positive until the age of 69. (As described above, we have – by construction – prevented individuals from considering retirement beyond this age.) For a further 23% of men the value of retirement peaks for retirement at the state pension age (i.e. working until age 64). The spike in the value of retirement at the state pension age for women is less pronounced in Figure 3.4b; this is because this cohort of women are affected by the gradual increase in the female state pension age and so the sample described here have state pension ages that range from 61 years to 61 years and 11 months. Working until (but not beyond) the age of 60, 61 or 62 maximises the option value for 25% of women in this sample.

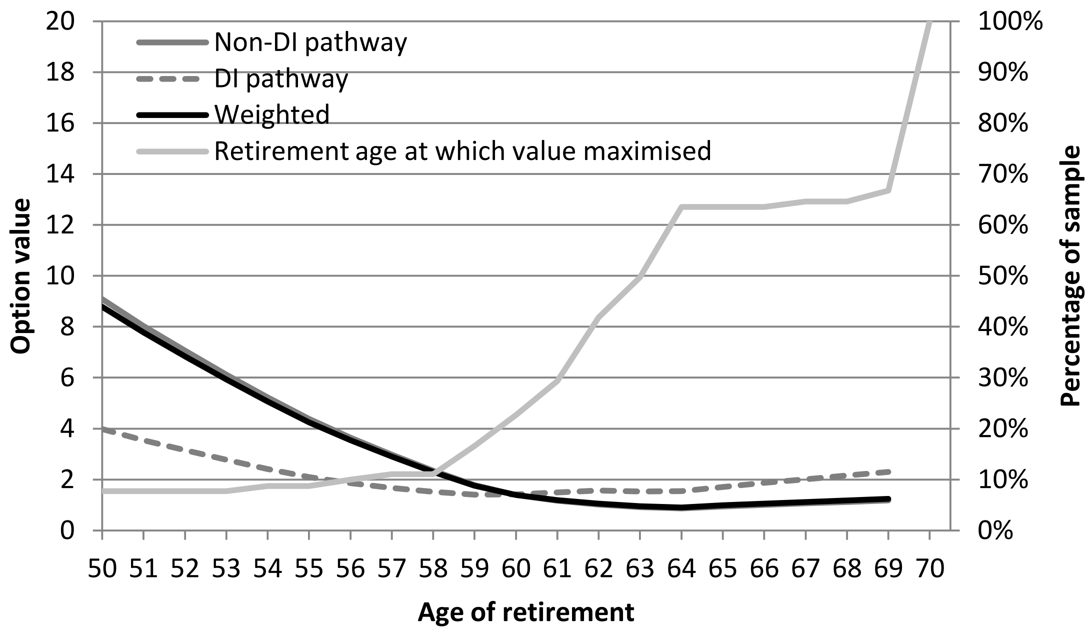
Table 3.4 shows the distribution of option values among our regression sample for both the pathways we consider and also shows the distribution of the inclusive option value measure. Option values are higher on average for men than women but there is considerable variation in option values among both men and women: the mean inclusive option value is 9.1 for men and 5.9 for women, with a standard deviation of 10.4 and 7.4 respectively. Table A.6 in the Appendix provides descriptive statistics on the other covariates included in our regressions for the regression sample.

Figure 3.6a. Evolution of option values with age, men initially aged 50 in 2002–03



Notes: Sample is men age 50 in ELSA wave 1. Sample size = 77.
Source: ELSA wave 1. Weighted.

Figure 3.6b. Evolution of option values with age, women initially aged 50 in 2002–03



Notes: Sample is women age 50 in ELSA wave 1. Sample size = 87.
Source: ELSA wave 1. Weighted.

Table 3.4 Distribution of option values

	Men	Women	All
Option value: non-DI pathway			
Mean	9.4	6.0	7.8
25th percentile	2.1	0.7	1.3
Median	7.3	4.1	5.5
75th percentile	13.6	8.9	11.4
Standard deviation	10.5	7.5	9.4
Option value: DI pathway			
Mean	6.4	3.7	5.1
25th percentile	0.4	0.0	0.1
Median	4.0	1.5	2.5
75th percentile	9.2	5.0	7.2
Standard deviation	9.3	6.5	8.2
Inclusive option value			
Mean	9.1	5.9	7.5
25th percentile	1.9	0.7	1.2
Median	6.9	3.9	5.3
75th percentile	13.1	8.6	11.0
Standard deviation	10.4	7.4	9.3
Sample size	5,353	4,937	10,290

Notes: Option values are calculated based on monetary figures measured in thousands of euros in 2012 prices.
Source: ELSA, waves 1–4 pooled.

4. Results

This section presents the results from estimating reduced form models of retirement. These examine the impact of the calculated option value (which are in 1,000s of utils, based on monetary figures measured in euros in 2012 prices) on the likelihood of moving out of paid work between consecutive waves of ELSA – i.e. over a two-year period.[21] The estimates are produced using a probit model and we report in the tables the mean marginal effect of the option value, and the other controls of interest, taken across all the individuals in the sample. As set out above, the data used are from the first five waves of ELSA, and our standard errors (reported in parentheses in the tables in this section) allow for clustering at the individual level.

Table 4.1 reports our main estimates of the impact of option value on the likelihood of an individual moving out of paid work over the subsequent two years for eight different specifications. The first column includes, alongside the estimated option value, controls for the estimated health quintile (which are defined across all individuals in paid work unlike those in Section 3 which were defined across all individuals) and linear age. A one unit increase in option value is found to reduce the likelihood of an individual leaving paid work over the next two years by 0.7 percentage points (ppts) and this effect is statistically different from zero at the 1% level. Those in the worst quintile of health are found to be 6.9ppts more likely to leave the labour market than those in the middle quintile of

[21] The results from alternative specifications which includes the percentage increase in utility from delaying retirement, rather than the absolute increase in value, on the right hand side can be found in Appendix Tables A.7 to A.9.

the estimated health distribution. The second column contains a more flexible set of controls for age (with age dummies interacted by sex being included in the model instead of controlling just for age linearly) but this is found to have very little effect on the other coefficients of interest.

Columns three and four are equivalent to columns one and two except these also include a richer set of controls for other characteristics. Those who are married and whose spouse is not working are found to be more likely to retire than single individuals, while those who are married with a spouse who is working are found to be the least likely to retire. Financial (non-pension) wealth is not found to have a statistically significant effect on retirement, while those with lower levels of education qualifications are found to be less likely to retire than those with higher levels of qualifications. Finally, self-employed people are found to be nearly 4ppts less likely to retire than employees. The estimated impact of option value, and of different health quintiles, on retirement rates are not affected by the inclusion of these additional controls.

Columns five, six, seven and eight are analogous to the first four columns except instead of controlling for the estimated health quintile they instead control directly for the estimated health index (linearly). Those with higher values of the health index – i.e. those with better health – are found to be less likely to retire. The estimated marginal effect of option value on retirement – and indeed the estimated impact of the other controls included in columns seven and eight – are unaffected by controlling for the estimated health index in this different way.

Each of the specifications presented in Table 4.1 suggest that, on average, a one unit increase in the option value leads to a reduction in the likelihood of an individual retiring over the next two years by 0.6– 0.7ppts. In order to quantify this better, the table presents, in square brackets, the impact on retirement of a one standard error change in the estimated option value.[22] Depending on the specification this suggests that such a one standard error change in the option value is associated with retirement probabilities over the next two years being reduced by between 5.3ppts and 6.2ppts (i.e. column 6 and column 3). This is a large impact – the mean retirement probability across the sample is 17.9%. Converting these to the chances of retiring over the next year this is suggesting that a one standard deviation change in the option value would reduce retirement probabilities by between 2.7ppts and 3.1ppts, relative to a 9.4% average retirement probability.

[22] This is calculated by taking the mean difference between the simulated retirement probability across our sample under the scenario where every individual's option value is reduced by half the standard error of the option value (0.5 * 9.269) and the scenario where every individual's option value is increased by half the standard error.

Table 4.1. Effect of inclusive option value on retirement [Template Table 1a]

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Option value	–0.007***	–0.006***	–0.007***	–0.006***	–0.006***	–0.006***	–0.007***	–0.006***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
	[0.061]	[0.054]	[0.062]	[0.056]	[0.060]	[0.053]	[0.061]	[0.055]
	{0.031}	{0.027}	{0.031}	{0.028}	{0.030}	{0.027}	{0.031}	{0.028}
Worst health	0.069***	0.072***	0.070***	0.072***				
	[0.011]	[0.011]	[0.011]	[0.011]				
Health quintile 2	0.015	0.015	0.017	0.017				
	[0.011]	[0.011]	[0.011]	[0.011]				
Health quintile 4	–0.014	–0.012	–0.015	–0.013				
	[0.012]	[0.012]	[0.012]	[0.012]				
Best health	–0.003	–0.002	–0.005	–0.004				
	[0.012]	[0.012]	[0.012]	[0.012]				
Health index					–0.020***	–0.020***	–0.020***	–0.020***
					[0.002]	[0.002]	[0.002]	[0.002]
Age	0.016***	Dummies	0.016***	Dummies	0.016***	Dummies	0.016***	Dummies
	[0.001]		[0.001]		[0.001]		[0.001]	
Female	0.018**		0.015*	0.004			0.014*	
	[0.008]		[0.008]	[0.055]			[0.008]	
Married			0.027***	0.028***			0.028***	0.028***
			[0.009]	[0.009]			[0.009]	[0.009]
Spouse working			–0.043***	–0.042***			–0.042***	–0.041***
			[0.008]	[0.008]			[0.008]	[0.008]
Net wealth			0.002	0.003			0.002	0.002
			[0.004]	[0.004]			[0.004]	[0.004]
Low education			–0.020**	–0.021**			–0.023**	–0.024**
			[0.010]	[0.010]			[0.010]	[0.010]
Mid education			–0.015	–0.015			–0.015	–0.016
			[0.010]	[0.010]			[0.010]	[0.010]
Self-employed			–0.039***	–0.037***			–0.039***	–0.037***
			[0.010]	[0.010]			[0.010]	[0.010]
Sample size	10,290	10,290	10,290	10,290	10,290	10,290	10,290	10,290

Notes: * p<0.1; ** p<0.05; *** p<0.01. Coefficients are marginal effects from probit models. Standard errors are shown in parentheses and are clustered at the individual level. Age dummies are interacted with sex. Dummies also included for interview wave. Figures in square brackets show the effect on retirement of a one standard deviation change in option value; figures in curly brackets show the 1-year retirement probability counterparts to these figures. The mean two-year retirement rate for the regression sample is 17.9%; the mean option value is 7.545 and the standard deviation of the option value is 9.269.

Table 4.2 presents the impact of option value on retirement estimated separately for each health quintile. Columns one to four are equivalent to the first four columns of Table 4.1. Option value is found to have a statistically significant impact on retirement among all five health quintiles, but there is no evidence that the size of this impact varies across any of the quintiles: i.e. we have not found evidence that, for example, those in better health respond more strongly to the financial incentives to retire than those in the worst health. Again there is no evidence that the estimated impact of the option value varies across the four models.

The same pattern is found using the four models reported in Table 4.3. Instead of estimating the impact of option value on retirement separately by health quintile the results reported in Table 4.3 instead pool all of the data but include an interaction between the estimated option value with the estimated health quintile. A one unit increase in option value is found to reduce the chances of an individual retiring over the next two years by 0.5–0.6ppts (very slightly below the 0.6–0.7ppts reported in Table 4.1) , with no evidence found that this effect varies by estimated health. The estimated marginal effects are once again found to be stable across the four specifications reported in Table 4.3.

Table 4.2. Effect of inclusive option value on retirement, by health quintile [Template Table 2a]

Variables	(1)	(2)	(3)	(4)	Sample size	Mean ret. rate	Mean OV	S.d. of OV
OV: Worst health	–0.009***	–0.009***	–0.008***	–0.008***	2,120	0.260	5.829	7.474
	(0.002)	(0.003)	(0.002)	(0.002)				
	[0.064]	[0.066]	[0.060]	[0.062]				
	{0.033}	{0.034}	{0.030}	{0.031}				
OV: 2nd quintile	–0.006***	–0.005***	–0.007***	–0.006***	2,054	0.185	6.653	7.050
	(0.002)	(0.002)	(0.002)	(0.002)				
	[0.045]	[0.038]	[0.047]	[0.040]				
	{0.023}	{0.019}	{0.024}	{0.020}				
OV: 3rd quintile	–0.005**	–0.003	–0.006***	–0.003*	2,067	0.167	7.152	8.479
	(0.002)	(0.002)	(0.002)	(0.002)				
	[0.040]	[0.023]	[0.047]	[0.030]				
	{0.020}	{0.012}	{0.024}	{0.015}				
OV: 4th quintile	–0.005***	–0.005***	–0.005***	–0.005***	2,031	0.139	8.853	10.398
	(0.002)	(0.002)	(0.002)	(0.002)				
	[0.056]	[0.052]	[0.054]	[0.050]				
	{0.028}	{0.026}	{0.027}	{0.025}				
OV: Best health	–0.007***	–0.006***	–0.007***	–0.007***	2,018	0.141	9.341	11.725
	(0.002)	(0.002)	(0.002)	(0.002)				
	[0.082]	[0.074]	[0.087]	[0.081]				
	{0.042}	{0.038}	{0.044}	{0.041}				
Linear age	✓		✓					
Age dummies		✓		✓				
Health quintiles	✓	✓	✓	✓				
Other covariates			✓	✓				

Notes: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Coefficients are marginal effects from 20 separate probit models. Standard errors are shown in parentheses and are clustered at the individual level. Other covariates in each specification are as described in Table 4.1. Figures in square brackets show the effect on retirement of a one standard deviation change in option value; figures in curly brackets show the 1-year retirement probability counterparts to these figures.

Table 4.3 Effect of inclusive option value on retirement, interacting option value with health quintile [Template Table 2c]

Variables	(1)	(2)	(3)	(4)
Option value	–0.006***	–0.005***	–0.006***	–0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
OV*health index	–0.000	–0.000	–0.000	–0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Health index	–0.018***	–0.018***	–0.018***	–0.018***
	(0.003)	(0.003)	(0.003)	(0.003)
Linear age	✓		✓	
Age dummies		✓		✓
Health quintiles	✓	✓	✓	✓
Other covariates			✓	✓
Sample size	10,290	10,290	10,290	10,290
Mean ret. rate	0.179	0.179	0.179	0.179
Mean OV	7.545	7.545	7.545	7.545
S.d. of OV	9.269	9.269	9.269	9.269

* p<0.1; ** p<0.05; *** p<0.01

Notes: Coefficients are marginal effects from probit models. Standard errors are shown in parentheses and are clustered at the individual level. Age dummies are interacted with sex. Dummies also included for interview wave.

We also estimate separate models by level of education. The results are reported in Table 4.4 and show that higher option values are associated with lower retirement rates in each of the three education groups. We also find that the retirement decisions of those with middle levels of education – that is, those who completed some post-compulsory education, but did not go on to do a degree – appear, if anything, to be more responsive to the option value that they face than either those with lower or those with higher levels of education. (In some cases the impact on retirement probabilities of a one standard deviation change in the option value is found to be larger for those with high education, but this arises because the distribution of option values is more dispersed among this group than among the other education groups.) Once again we find that the estimated impact of the option value is not sensitive to which of the four models is used.

The predicted retirement hazards using the results from column 4 of Table 4.4 are shown in Figure 4.1a for men and in Figure 4.1b for women. This shows that retirement in the two years from age 59/60 is more common for highly education men than men with lower levels of education and that the reverse is true over the two years from age 64. In contrast, among women there is little difference in the retirement probabilities over the two years from age 59/60 by education group

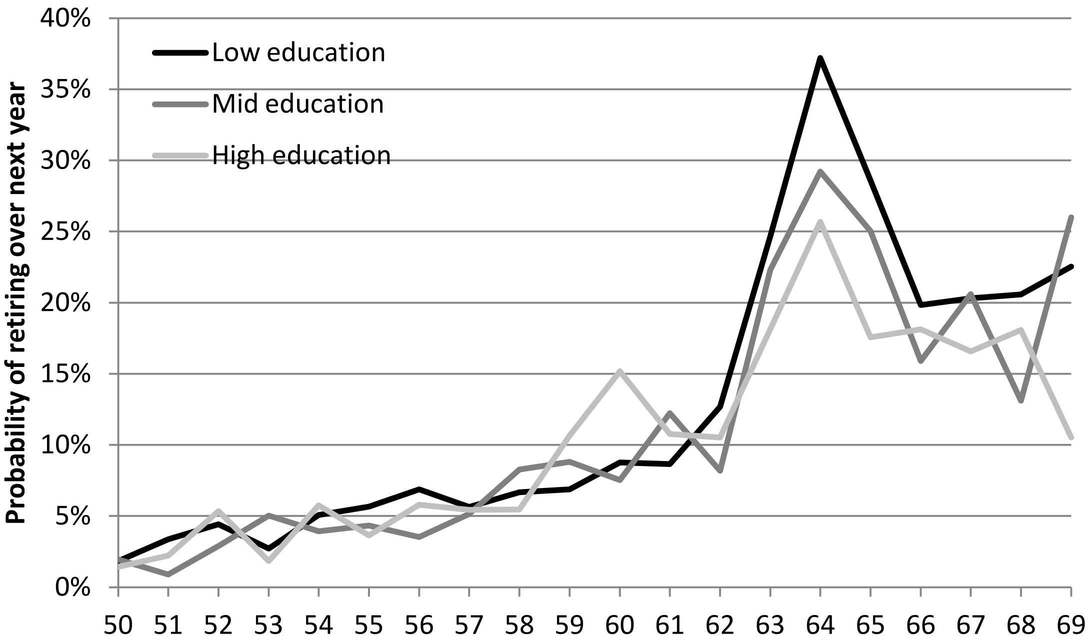
Finally, Table 4.5 presents the results from estimating the model including an interaction between the option value and education group. Again higher option values lead to a lower chance of an individual leaving the labour market over the next two years but, while the estimated marginal effect of option value for the middle education group (relative to the high education group) is negative, it is not statistically significantly different from zero at conventional levels of confidence.

Table 4.4 Effect of inclusive option value on retirement, by education level [Template Table 3a]

Variables	(1)	(2)	(3)	(4)	Sample size	Mean ret. rate	Mean OV	S.d. of OV
OV: Low education	–0.006***	–0.005***	–0.006***	–0.005***	4,045	0.197	5.801	7.236
	(0.002)	(0.002)	(0.002)	(0.002)				
	[0.047]	[0.038]	[0.045]	[0.036]				
	{0.024}	{0.019}	{0.023}	{0.018}				
OV: Mid education	–0.008***	–0.008***	–0.008***	–0.008***	4,005	0.172	7.587	8.165
	(0.002)	(0.001)	(0.001)	(0.001)				
	[0.067]	[0.065]	[0.069]	[0.067]				
	{0.034}	{0.033}	{0.035}	{0.034}				
OV: High education	–0.006***	–0.005***	–0.005***	–0.005***	2,240	0.161	10.618	12.886
	(0.001)	(0.001)	(0.001)	(0.001)				
	[0.071]	[0.064]	[0.071]	[0.064]				
	{0.036}	{0.033}	{0.036}	{0.033}				
Linear age	✓		✓					
Age dummies		✓		✓				
Health quintiles	✓	✓	✓	✓				
Other covariates			✓	✓				

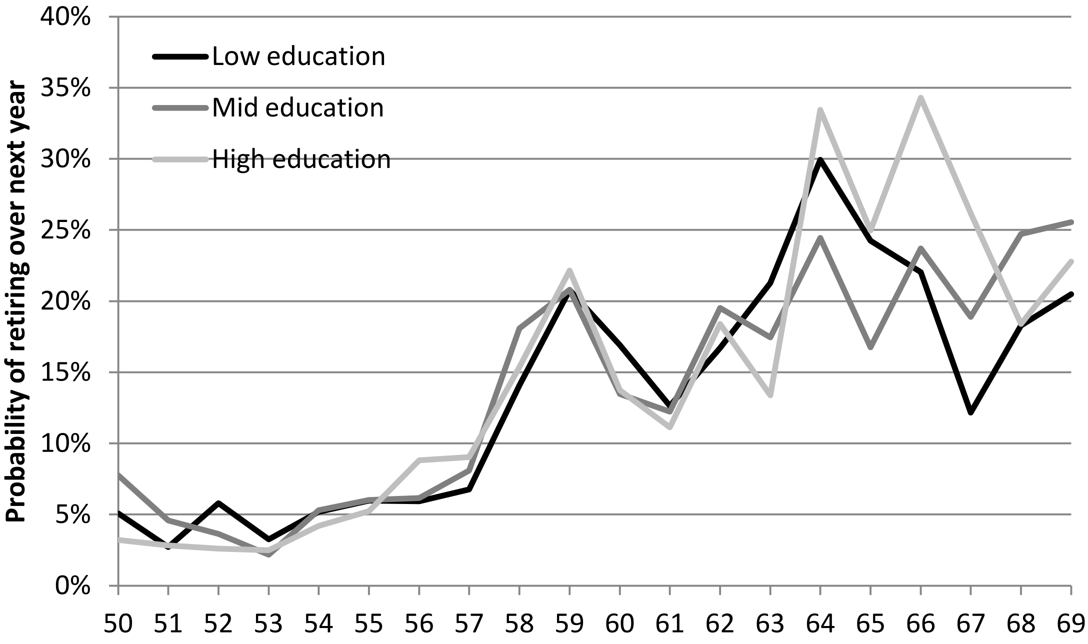
Notes: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. Coefficients are marginal effects from 12 separate probit models. Standard errors are shown in parentheses and are clustered at the individual level. Other covariates in each specification are as described in Table 4.1. Figures in square brackets show the effect on retirement of a one standard deviation change in option value on the 2-year retirement probability; figures in curly brackets show the 1-year retirement probability counterparts to these figures.

Figure 4.1a Predicted retirement hazards, by education level (men)



Notes: These retirement hazards are calculated using the regression coefficients reported in specification (4) in Table 4.4.

Figure 4.1b Predicted retirement hazards, by education level (women)



Notes: These retirement hazards are calculated using the regression coefficients reported in specification (4) in Table 4.4

5. Simulating alternative disability insurance programs

In order to provide a clearer sense of how the probability of being able to receive disability benefits affects individuals' retirement behaviour, this section examines predicted retirement rates under alternative scenarios for the likelihood of receiving disability benefits. All the simulations presented in this section are based on the estimates from the fourth (i.e. the richest) specification in Table 4.1.

Under the current system our model suggests that those in work at age 50 will, on average, work for a further 10.9 years before retiring. On average men in work at age 50 are predicted to work longer before retiring (12.0 years) than women (10.0 years).The first two situations we compare are, in one dimension, the extreme possibilities: first a system in which everyone would be able to retire onto the DI pathway – i.e. regardless of health, everyone not in paid work is able to receive disability benefits – and second a system under which no-one is able to retire onto the DI pathway. Since disability benefits can only be received up to the state pension age these systems will only affect the likelihood of men leaving the labour market up to age 65, and the likelihood of women leaving the labour market up to age 60. The estimated employment levels of older men and women, by age, under these two different systems are shown in Figures 5.1a and 5.1b respectively, with pooled results shown in Figure 5.1c.

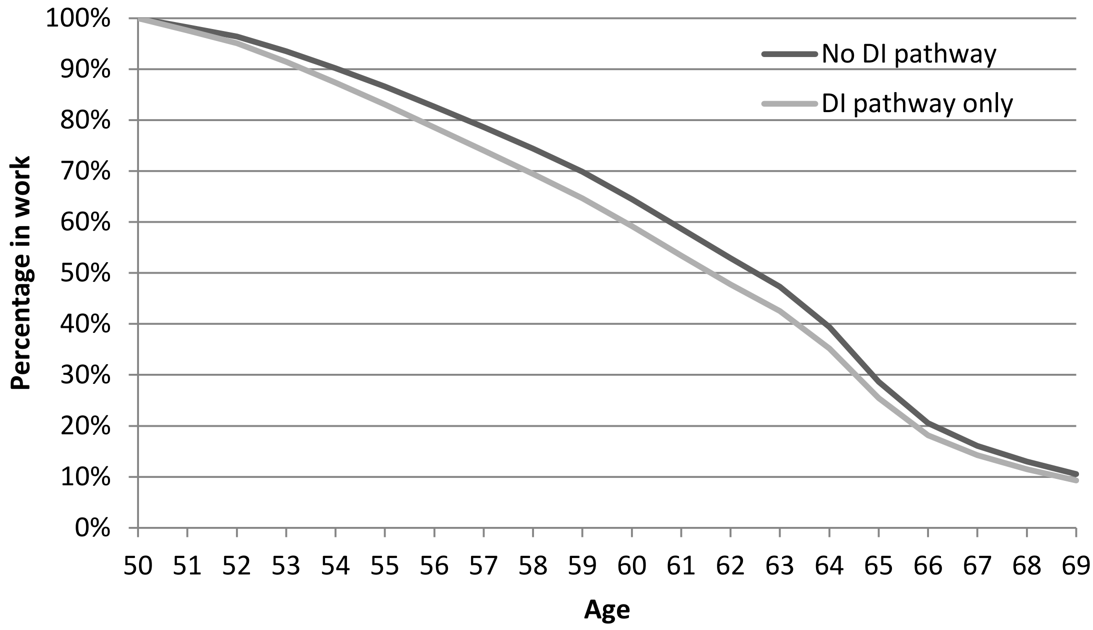
For men, moving to the system where no one can retire onto the DI pathway makes no apparent difference to the average number of years worked (it stays at 12.0 years). But under the alternative extreme where everyone is able to retire onto the DI pathway, it falls to 11.4 years. In other words, moving from a system where everyone is able to move onto DI to one where no one is able to is estimated to increase the average number of years that men will work for by 5.5%.

If all women in work at age 50 were able to retire onto the DI pathway then the average predicted number of years of work from age 50 would fall (to 9.5 years from 10.0 years under the baseline system). If no women were able to take this option then the average predicted number of years of work from age 50 would increase slightly (to 10.1 years). In other words, there is an estimated 6% increase in the average number of years worked by older women when moving from the system where no one is able to receive DI to one where all women not in paid work are able to receive DI.

Combining men and women together (shown in Figure 5.1c) we find that moving from a system where no-one could receive DI to one where everyone not in paid work could receive DI would reduce average years worked from 11.0 years to 10.4 years (or a 5.9% reduction). This is much smaller than, for example, the estimates produced in this volume for the US (17.3%) or Belgium (12.2%). This difference reflects the much less generous level of DI benefits in the UK compared to either the US or Belgium (rather than that individuals in the UK are less responsive to financial incentives than individuals in these other countries).

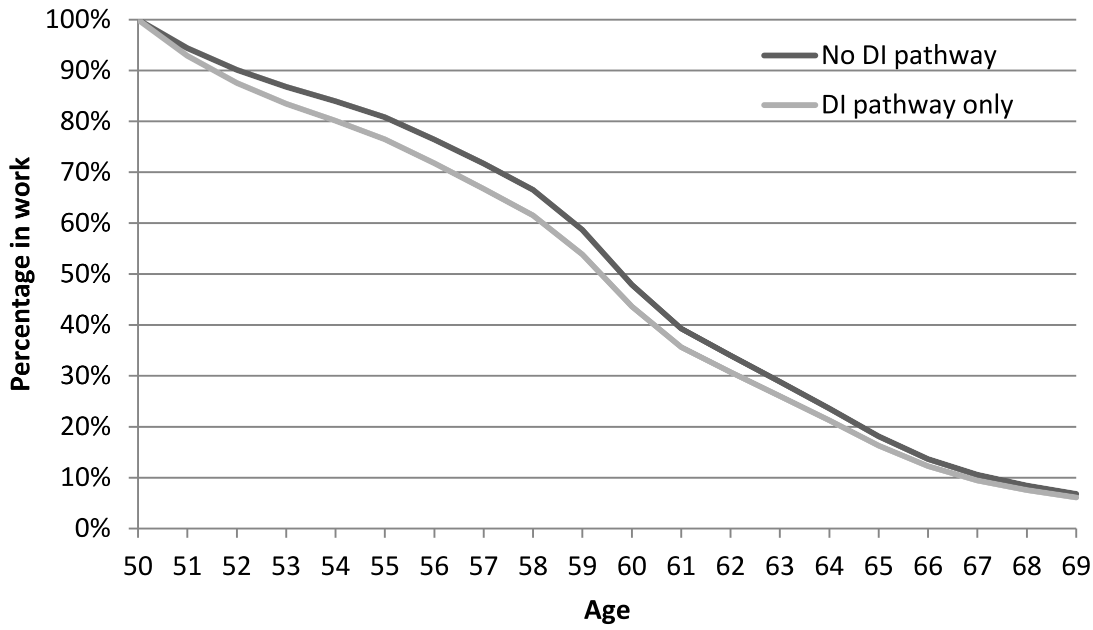
Figure 5.2 shows the change in the number of years worked (the darker series and the left hand axis), and the percentage change in the number of years worked (the lighter series and the right hand axis), for all possible likelihoods of individuals being able to take the DI pathway into retirement. For example, this shows that an 8% chance of being able to receive disability benefits would leave the average number of years worked between ages 50 and 69 unchanged.

Figure 5.1a Employment survival curve for men, assuming there is only one pathway



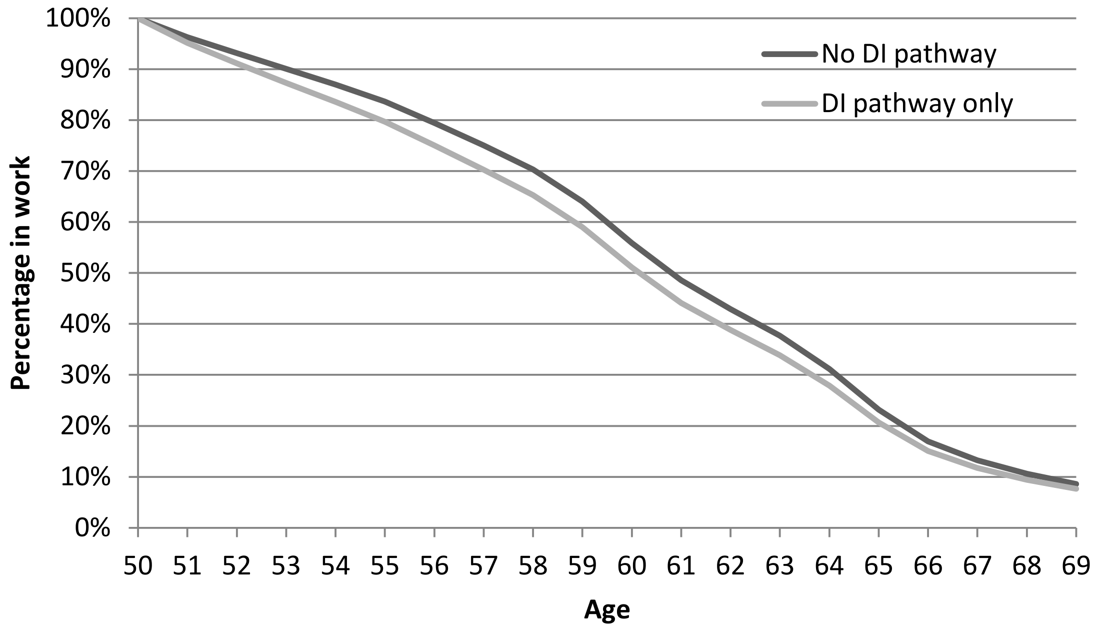
Notes: These survival curves are calculated using the coefficients from Specification (4) in Table 4.1.

Figure 5.1b Employment survival curve for women, assuming there is only one pathway



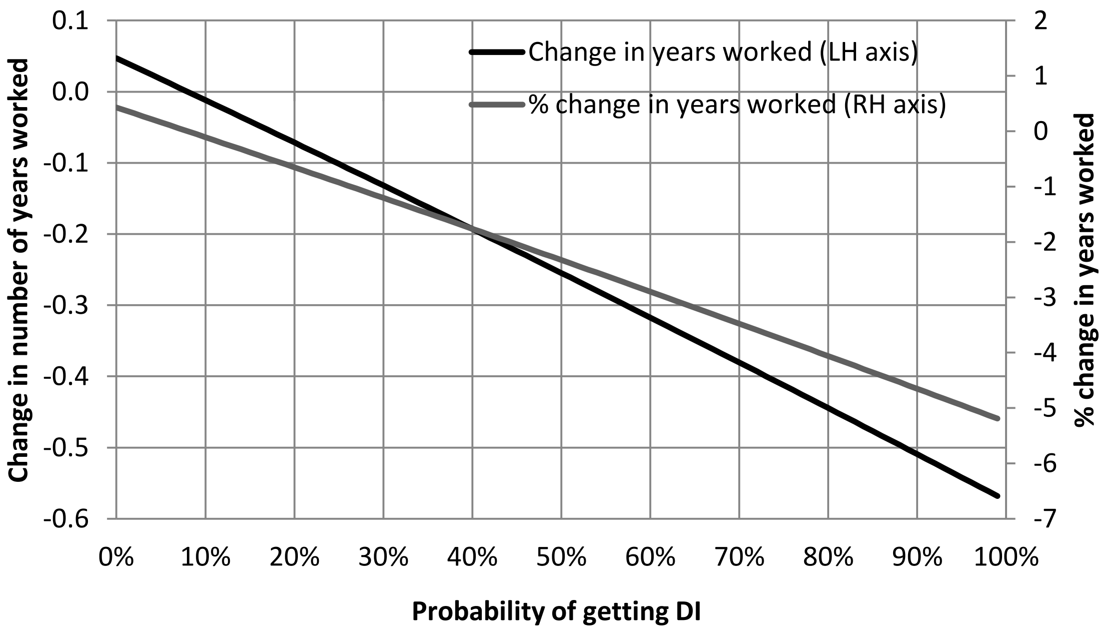
Notes: As Figure 5.1a.

Figure 5.1c Employment survival curve (men and women), assuming there is only one pathway



Notes: As Figure 5.1a.

Figure 5.2 Relationship between probability of getting DI and number of years worked between ages 50 and 69: all individuals

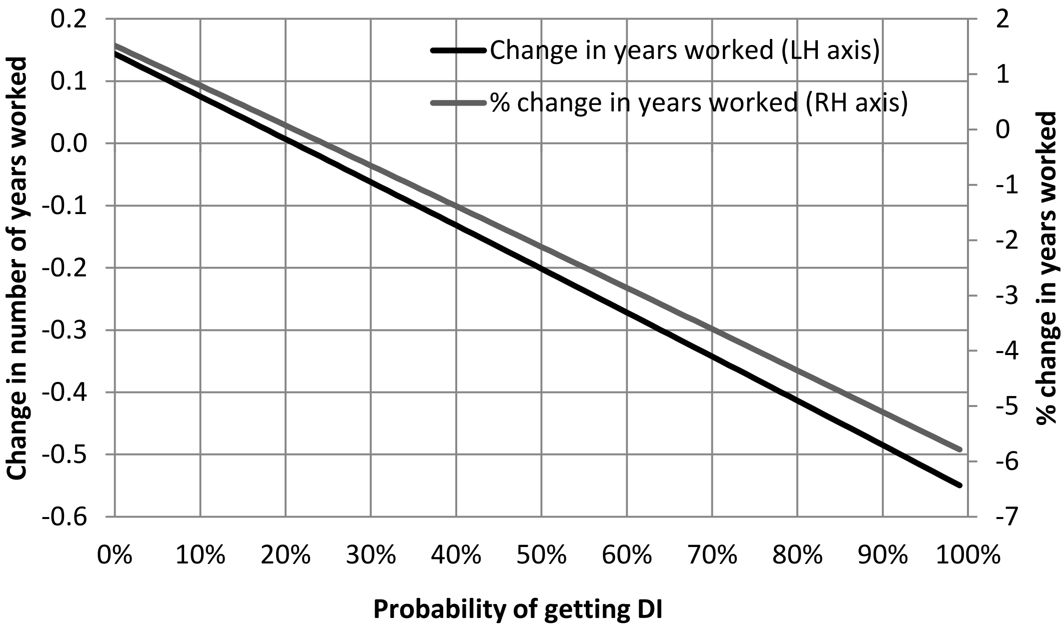


Notes: As Figure 5.1a. Percentage change in years worked is calculated relative to the predicted employment rates using the actual DI probability.

Finally we explore whether there are groups of individuals for whom varying the availability of the DI pathway has a particularly large impact on their labour market behaviour. Specifically we vary the likelihood with which individuals would be able to receive disability benefits were they to move out of paid work, but look at the outcomes only among those who are observed to receive disability benefits at some point in our sample.

Figure 5.3 shows the number of years worked, and the percentage change in the number of years worked, for all possible likelihoods of individuals being able to take the DI pathway into retirement. For this group of individuals – that is those who are observed to receive disability benefits at some point in our data – a 20% likelihood of being able to take the DI pathway would leave the average number of years worked between ages 50 and 69 unchanged.

Figure 5.4 Relationship between probability of getting DI and number of years worked between ages 50 and 69: DI recipients only



Notes: As Figure 5.2.

6. Conclusions

This chapter has documented differences in employment rates of men and women aged between 50 and 69 by health and explored how these employment rates are affected by financial incentives to leave the labour market. The measure of financial incentives builds on the existing literature by incorporating potential income from disability benefits alongside that from both state and private pension income. A particular focus of the chapter is to examine the importance of the disincentive to remain in paid work from the disability benefit system, which has been shown by comparing simulated retirement rates under the current UK pension and disability benefit system to the simulated outcomes under alternative systems where access to disability benefits is significantly loosened or tightened.

The option value measure of financial incentives is found to help explain the retirement decisions of men and women aged 50 to 69. A one unit increase in the option value is found to reduce the likelihood of an individual retiring over the next two years by 0.6–0.7ppts. This is a large effect in that it suggests the variation in financial incentives across different individuals in the UK is explaining a significant proportion of retirements. A one standard deviation change in the option value would reduce the likelihood of an individual leaving the labour market in the next year by between 2.7ppts and 3.1ppts, relative to an average retirement probability of 9.4%. However we find no evidence that individuals with different levels of health respond to our measure of financial incentives differently: so, for example, we do not find evidence that those in poor health are less responsive to the financial incentives that they face than those with better health.

Under the current system our model suggests that men in work at age 50 would work, on average, for a further 12.0 years while women in work at age 50 would work, on average, for a further 10.0 years. The simulations we present vary the likelihood that an individual in work would be able to receive disability benefits were they to leave the labour market. Moving from a system where everyone in paid work would be able to take the DI route into retirement to one where no-one would be able to take this route (i.e. regardless of their actual health) is estimated to increase the average numbers of years worked by men by 5.5% (from 11.4 years to 12.0 years) and by women by 6.0% (from 9.5 years to 10.1 years). These are not large differences and even among the sample of individuals who are observed to receive disability benefits at some point we do not, on average, find big differences in employment rates between these extremely different counterfactual systems. But this is not to say that individuals are not, on the whole, responsive to the financial incentives that they face. Rather it reflects the fact that for many individuals in the UK the level of disability benefits they might be able to receive are low relative to the amount they could earn and therefore large changes in rates of eligibility do not induce large effects on overall employment.

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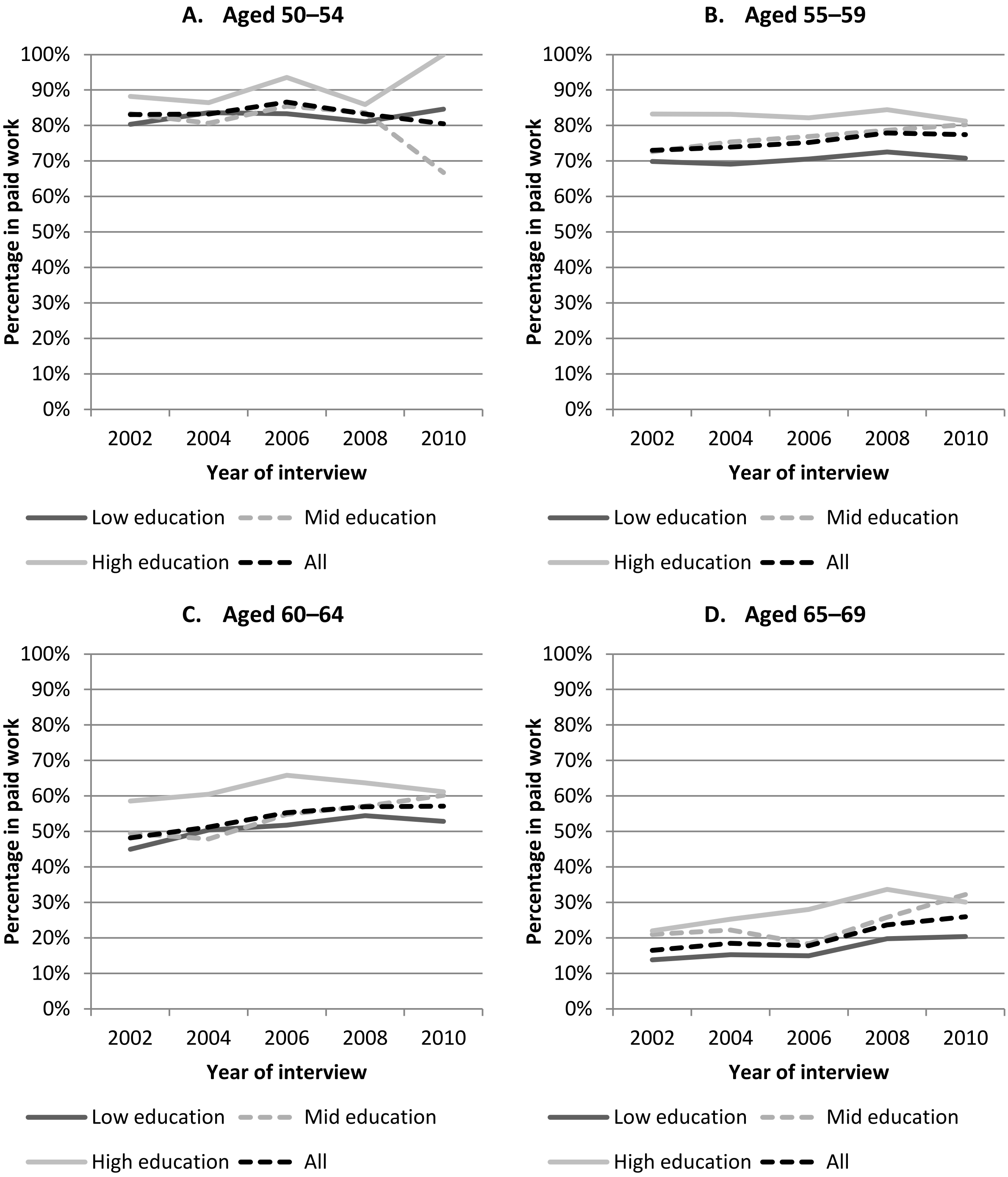
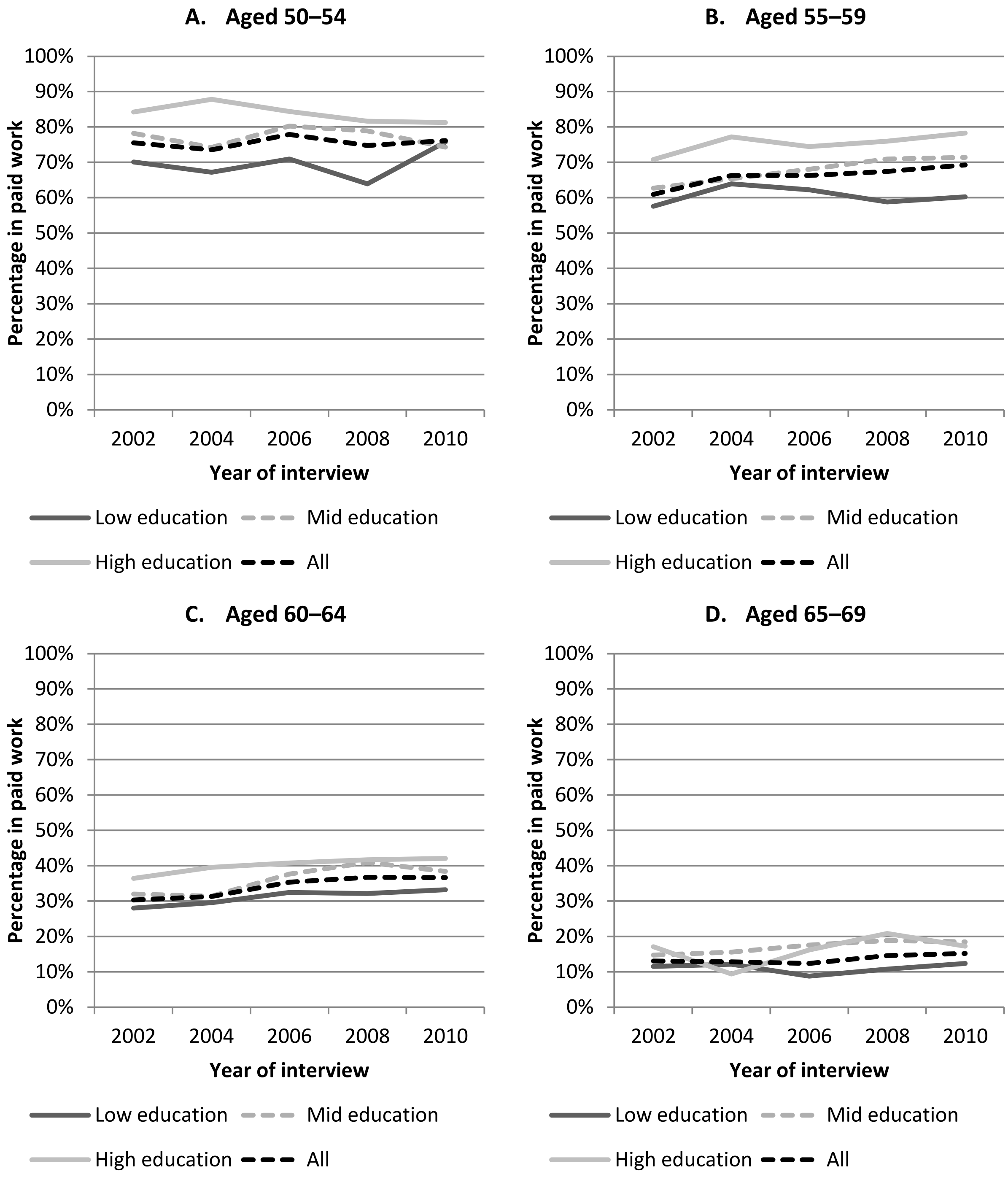
Appendix: Additional tables and figures

Figure A.1. Employment rates of men by education level, 2002–03 to 2010–11



Notes: In 2002, 2006 and 2008, the ELSA sample is representative of those aged 50+. However, in 2004 and 2010, it is only representative of those aged 52+.
Source: English Longitudinal Study of Ageing, waves 1–5. Weighted using cross-sectional weights.

Figure A.2. Employment rates of women by education level, 2002–03 to 2010–11



Notes: In 2002, 2006 and 2008, the ELSA sample is representative of those aged 50+. However, in 2004 and 2010, it is only representative of those aged 52+.
Source: English Longitudinal Study of Ageing, waves 1–5. Weighted using cross-sectional weights.

Table A.1. Employment rates of older men over time, by age

	50-54	55-59	60-64	65-69	All 50-69
1968	96.1	91.4	80.0	27.1	77.0
1969	96.8	91.3	79.9	34.8	77.5
1970	97.4	92.3	80.4	32.6	77.4
1971	93.9	89.9	79.3	32.2	75.7
1972	95.1	87.9	74.0	24.5	73.4
1973	93.8	91.2	78.8	29.0	75.2
1974	93.0	89.9	80.0	29.7	74.4
1975	93.8	89.9	78.1	25.2	73.5
1976	92.8	88.8	78.3	23.7	72.6
1977	92.3	90.0	76.2	19.4	70.7
1978	92.9	87.9	68.0	21.9	70.0
1979	91.2	86.1	71.5	22.5	68.8
1980	91.4	89.8	69.3	20.6	68.6
1981	88.0	81.6	59.8	18.6	63.3
1982	86.9	76.0	58.5	16.9	61.8
1983	83.9	72.8	51.4	12.9	58.1
1984	82.9	73.7	49.3	12.7	58.2
1985	81.2	71.7	47.8	11.8	57.0
1986	79.7	69.3	48.0	11.8	55.0
1987	80.9	71.2	47.8	11.3	53.9
1988	81.9	72.0	48.9	13.0	53.9
1989	81.8	73.4	48.8	13.5	54.6
1990	80.4	72.6	48.4	13.8	55.2
1991	79.6	68.6	47.3	13.7	54.9
1992	79.9	68.7	46.2	13.7	52.7
1993	79.1	67.5	44.9	12.4	53.1
1994	79.7	67.2	44.8	13.4	53.8
1995	80.2	66.2	45.1	14.1	54.5
1996	80.5	68.1	45.2	12.7	56.0
1997	81.2	69.0	47.3	14.1	57.1
1998	81.7	70.6	46.4	14.4	57.7
1999	82.2	70.7	47.2	15.0	57.6
2000	82.1	71.5	47.7	14.1	58.3
2001	83.1	72.5	48.7	14.6	59.0
2002	83.4	73.0	49.5	15.6	60.5
2003	83.8	74.2	53.2	17.5	60.3
2004	83.8	74.7	53.7	17.3	61.5
2005	84.7	75.7	54.1	18.8	61.6
2006	84.6	75.4	54.7	20.0	61.5
2007	85.0	74.9	56.9	20.5	61.9
2008	83.9	76.6	58.1	21.6	60.8
2009	82.9	76.4	55.9	21.7	60.9
2010	82.6	76.0	54.5	23.9	59.8
2011	83.0	74.4	54.4	22.9	60.5
2012	83.9	75.6	55.4	23.9	58.1

Source: Family Expenditure Survey (1968–1982) and Labour Force Survey (1983–2012).

Table A.2. Employment rates of older women over time, by age

	50-54	55-59	60-64	65-69	All 50-69
1968	59.1	46.5	25.0	14.2	37.3
1969	56.8	52.8	28.0	15.6	38.7
1970	59.3	54.5	26.1	13.9	39.4
1971	62.3	51.5	30.4	14.1	40.2
1972	58.2	52.1	27.6	12.8	39.1
1973	64.3	55.3	29.9	13.4	41.1
1974	66.9	55.8	29.7	15.8	42.9
1975	67.9	54.7	25.9	13.7	41.3
1976	63.9	55.6	28.7	13.4	41.1
1977	67.8	57.9	28.3	10.9	41.8
1978	64.6	57.0	26.8	12.5	41.0
1979	67.2	56.2	27.2	10.0	40.9
1980	66.9	59.5	24.1	12.1	41.0
1981	65.6	56.1	26.1	10.8	39.6
1982	58.7	52.6	23.0	7.5	36.5
1983	59.4	46.4	19.4	6.5	33.3
1984	60.8	46.9	19.8	6.6	34.1
1985	60.0	47.2	17.4	6.2	32.7
1986	60.6	47.4	17.7	5.7	32.7
1987	60.5	48.1	18.1	5.2	32.8
1988	60.4	47.8	18.5	5.3	32.4
1989	62.7	49.2	21.1	6.8	34.5
1990	63.6	50.5	21.7	7.2	35.5
1991	63.9	50.6	22.4	6.6	35.7
1992	65.6	51.7	23.0	7.5	37.8
1993	66.3	51.2	23.7	7.5	38.7
1994	66.8	52.6	24.2	7.3	39.8
1995	67.4	52.4	24.8	7.5	39.7
1996	67.8	51.4	24.5	6.9	40.8
1997	68.9	50.9	25.4	7.8	42.0
1998	69.6	53.1	24.1	7.8	42.9
1999	70.4	54.2	24.3	8.5	43.5
2000	70.4	56.2	25.6	8.2	44.2
2001	71.4	56.3	27.3	7.9	45.1
2002	72.3	58.1	27.6	8.8	45.8
2003	73.3	60.4	28.1	9.8	46.1
2004	73.8	60.6	29.5	9.6	47.1
2005	74.3	61.7	30.6	10.3	48.1
2006	74.8	62.7	32.4	11.4	47.8
2007	75.4	63.8	32.6	11.0	48.2
2008	76.2	64.2	33.9	12.0	48.4
2009	75.8	64.9	33.5	14.3	48.8
2010	75.8	66.0	33.6	15.3	48.9
2011	77.1	66.0	33.7	15.3	49.5
2012	77.1	66.2	35.9	15.2	44.2

Source: Family Expenditure Survey (1968–1982) and Labour Force Survey (1983–2012).

Table A.3. Employment rates over time (men and women), by age

	50-54	55-59	60-64	65-69	All 50-69
1968	76.5	69.3	50.3	20.1	56.1
1969	76.4	71.3	51.6	24.4	57.0
1970	77.3	72.7	52.5	22.7	57.5
1971	77.3	70.1	51.9	22.5	56.7
1972	76.3	69.4	50.2	18.2	55.6
1973	79.3	72.3	53.3	20.5	57.5
1974	79.2	72.4	53.0	22.2	57.7
1975	80.1	71.5	49.8	19.0	56.3
1976	77.4	71.4	52.1	18.0	55.8
1977	79.5	72.7	49.8	14.9	55.2
1978	78.7	71.6	46.3	16.7	54.8
1979	78.6	71.1	45.6	15.9	54.0
1980	79.0	74.0	44.4	16.1	54.0
1981	76.3	68.8	41.1	14.4	50.8
1982	72.0	64.2	40.0	11.8	48.5
1983	71.2	59.9	34.5	9.4	45.2
1984	72.3	59.3	34.7	9.4	45.6
1985	71.3	60.1	32.2	9.1	44.2
1986	70.8	59.3	31.7	8.4	43.3
1987	70.1	58.3	32.3	8.2	42.9
1988	70.6	59.3	32.3	8.0	42.7
1989	72.1	60.4	34.7	9.7	44.1
1990	72.5	61.7	34.8	10.1	44.9
1991	72.0	61.5	34.6	9.9	44.9
1992	72.6	60.2	34.1	10.4	45.0
1993	72.6	59.2	33.9	9.8	45.7
1994	73.2	59.7	34.1	10.2	46.6
1995	73.7	59.2	34.6	10.7	46.9
1996	74.1	59.5	34.6	9.7	48.2
1997	74.9	59.7	36.0	10.8	49.4
1998	75.5	61.7	34.9	10.9	50.0
1999	76.2	62.2	35.4	11.6	50.3
2000	76.1	63.6	36.2	11.0	51.0
2001	77.1	64.1	37.6	11.1	51.8
2002	77.7	65.3	38.2	12.1	52.9
2003	78.5	67.1	40.1	13.5	53.0
2004	78.7	67.5	40.9	13.4	54.0
2005	79.3	68.5	41.8	14.4	54.6
2006	79.5	68.9	43.1	15.5	54.4
2007	79.9	69.2	44.2	15.5	54.8
2008	79.8	70.2	45.7	16.6	54.3
2009	79.2	70.4	44.3	17.9	54.7
2010	79.1	70.8	43.7	19.4	54.1
2011	79.9	70.1	43.6	19.0	54.8
2012	80.4	70.7	45.3	19.3	51.0

Source: Family Expenditure Survey (1968–1982) and Labour Force Survey (1983–2012).

Table A.4. Percentage of men aged 50–64 receiving disability insurance, by education and health quintile

	Health quintile					
Education	Worst	2	3	4	Best	All
Low	58.88	22.84	6.02	1.68	1.16	16.55
Mid	48.49	14.98	4.15	0.90	0.57	6.85
High	18.18	3.55	2.27	0.61	0.21	1.56
All	53.74	17.67	4.59	1.12	0.65	9.85

Source: English Longitudinal Study of Ageing, waves 1–5 pooled. Unweighted.

Table A.5. Percentage of women aged 50–59 receiving disability insurance, by education and health quintile

	Health quintile					
Education	Worst	2	3	4	Best	All
Low	41.84	6.44	2.26	1.46	0.74	10.94
Mid	29.29	6.81	1.64	0.68	0.32	5.42
High	25.86	8.13	2.06	1.54	0.00	2.70
All	36.46	6.80	1.96	1.15	0.36	7.15

Source: English Longitudinal Study of Ageing, waves 1–5 pooled. Unweighted.

Table A.6. Descriptive statistics on regression sample

% (except where otherwise stated)	Men	Women	All
Age (years)	57.6	57.1	57.4
	(4.5)	(4.3)	(4.4)
Married	73.1	61.5	67.5
	(44.4)	(48.7)	(46.8)
Spouse working	62.9	56.3	59.7
	(48.3)	(49.6)	(49.0)
Low education	40.4	38.1	39.3
	(49.1)	(48.6)	(48.8)
Mid education	35.6	42.6	38.9
	(47.9)	(49.4)	(48.8)
High education	24.0	19.3	21.8
	(42.7)	(39.5)	(41.3)
Self-employed	23.5	13.1	18.6
	(42.4)	(33.8)	(38.9)
Net wealth (thousands)	225.4	177.5	202.4
	(1131.4)	(707.9)	(952.3)
Sample size	5,353	4,937	10,290

Notes: Standard deviations are shown in parentheses.

Table A.7. Effect of percentage gain in value from delaying retirement [Template Table 1b]

Variables	(1)	(2)	(3)	(4)
% gain in OV	–0.171***	–0.157***	–0.162***	–0.148***
	[0.023]	[0.022]	[0.023]	[0.022]
Linear age	✓		✓	
Age dummies		✓		✓
Health quintiles	✓	✓	✓	✓
Other covariates			✓	✓
Sample size	10,290	10,290	10,290	10,290
Mean ret. rate	0.179	0.179	0.179	0.179
Mean % gain	0.281	0.281	0.281	0.281
S.d. of % gain	0.338	0.338	0.338	0.338

* p<0.1; ** p<0.05; *** p<0.01

Notes: Coefficients are marginal effects from probit models. Standard errors are shown in parentheses and are clustered at the individual level. Other covariates are as described in Table 4.1.

Table A.8. Effect of percentage gain in value from delaying retirement, by health quintile [Template Table 2b]

Variables	(1)	(2)	(3)	(4)	Sample size	Mean ret. rate	Mean % gain	S.d. of % gain
% gain: Worst health	–0.175***	–0.178***	–0.163***	–0.166***	2,120	0.260	0.243	0.341
	(0.054)	(0.053)	(0.053)	(0.053)				
% gain: 2nd quintile	–0.123**	–0.098*	–0.120**	–0.094*	2,054	0.185	0.260	0.291
	(0.050)	(0.050)	(0.050)	(0.050)				
% gain: 3rd quintile	–0.197***	–0.159***	–0.179***	–0.141***	2,064	0.167	0.263	0.318
	(0.053)	(0.050)	(0.053)	(0.051)				
% gain: 4th quintile	–0.154***	–0.146***	–0.130***	–0.121***	2,031	0.139	0.318	0.361
	(0.048)	(0.045)	(0.048)	(0.046)				
% gain: Best health	–0.208***	–0.183***	–0.207***	–0.184***	2,018	0.141	0.325	0.365
	(0.052)	(0.050)	(0.052)	(0.050)				
Linear age	✓		✓					
Age dummies		✓		✓				
Health quintiles	✓	✓	✓	✓				
Other covariates			✓	✓				

Notes: * *p*<0.1; ** *p*<0.05; *** *p*<0.01. Coefficients are marginal effects from 20 separate probit models. Standard errors are shown in parentheses. Standard errors are clustered at the individual level. Other covariates in each specification are as described in Table 4.1.

Table A.9 Effect of percentage gain in value from delaying retirement, by education level [Template Table 3b]

Variables	(1)	(2)	(3)	(4)	Sample size	Mean ret. rate	Mean % gain	S.d. of % gain
% gain: Low education	–0.195***	–0.173***	–0.179***	–0.159***	4,045	0.197	0.249	0.297
	(0.041)	(0.039)	(0.041)	(0.039)				
% gain: Mid education	–0.177***	–0.167***	–0.169***	–0.161***	4,005	0.172	0.294	0.354
	(0.037)	(0.036)	(0.037)	(0.036)				
% gain: High education	–0.145***	–0.130***	–0.127***	–0.115***	2,240	0.161	0.317	0.372
	(0.042)	(0.041)	(0.041)	(0.040)				
Linear age	✓		✓					
Age dummies		✓		✓				
Health quintiles	✓	✓	✓	✓				
Other covariates			✓	✓				

Notes: * p<0.1; ** p<0.05; *** p<0.01. Coefficients are marginal effects from 12 separate probit models. Standard errors are shown in parentheses and are clustered at the individual level. Other covariates in each specification are as described in Table 4.1.