Pension Incentives and the Pattern of Early Retirement

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Abstract

This mix of state and private pension provision in the UK provides a rare degree of variation in pension incentives to retire. Using a sample of individuals aged 55 or older from the UK Retirement Survey, the paper models the probability of retirement in terms of the incentives underlying the individual's pension plan as well as other socio-economic factors. It follows an option value approach and allows a separate role for pension wealth, for spouse's economic and for demographic characteristics. It distinguishes between the state earnings related pension scheme and private occupational schemes and also models eligibility to disability.

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1. Introduction

Like many other OECD countries, the UK has been experiencing a trend towards earlier labour market exits among older, particularly male, workers. The proportion of men aged 60-64 in employment halved from 1968, when 80 per cent were employed, to less than 40% at the end of the 1990s. The fall in the proportion of older men who were in *full-time* employment was even greater than the fall in the proportion in any form of employment with a relative shift within the employed to self-employment and part-time employment. Female employment has not experienced the same downward trend – but this contrasts with rising participation among most other age groups across the same period. Relating these participation changes to pension and social security incentives first requires a thorough understanding of the degree to which participation choices among older workers are determined by such incentives – that is the motivation for this paper.

Compared to many other European countries, the UK stands out as having a high level of coverage of private pensions and, at least in recent years, a trend towards less generous state pension provision. This has not always been the case. In the 1970s, the trend was going the other way towards more generous state provision. The main element of the state pension system, the basic state pension, was increased each year in line with earnings or prices, whichever was the greatest. In 1978 a new second-tier earnings-related pension (the State Earnings Related Pension Scheme (SERPS)) was introduced that was originally intended to pay a pension worth 25% of an individual's best 20 years of earnings. However, SERPS was never a universal scheme for all employees. When it was introduced, workers who already belonged to a (defined benefit) occupational pension could opt out of the state scheme (and pay reduced National Insurance contributions) so long as their occupational scheme guaranteed at least the same pension as SERPS. This applied to more than half of all employees, and more than two-thirds of male employees.

Since the early 1980s successive reforms have cut back the generosity of state pension provision. The indexation of the basic state pension to earnings lasted only until 1982, since when it has been formally indexed to prices and has fallen relative to average earnings. Reforms to SERPS in 1986 and 1995 have reduced its generosity for anyone retiring after 2000. Also, the state pension age for women, currently 60, is set to increase to 65 by 2020. These reforms were coupled with further encouragement for individuals to make private pension provision. In 1988 the right to opt out of SERPS was extended to those with a defined contribution scheme. In practice this meant a growth in individual retirement accounts (personal pensions) and the development of defined contribution occupational pensions, although these are still a minority of all employer schemes. The growth in personal pensions was rapid.

By the early 1990s they covered nearly one-quarter of employees and an even higher proportion of younger workers.

The trend towards less generous state pension provision means that, in spite of an ageing population, the future cost of the state pensions is set to fall as a proportion of GDP by 2050, making the situation in the UK different to most other OECD countries.[1] However, it is worth bearing in mind that spending on pensions represents only part of total Government spending on benefits for older non-workers. In the 1980s there was a very large increase in the number of older non-workers on disability benefits[2] and spending on these benefits has more than doubled in real terms since 1990. Also, as the level of the basic state pension has now fallen below the level of means-tested benefits for pensioners, many pensioners are eligible for means-tested benefits on top of their state pension. In 2000-01 more than one-third of pensioners were receiving means-tested benefits. Means-testing is becoming an increasingly important element in state provision for pensioners with the introduction of an earnings-indexed means-tested Minimum Income Guarantee for pensioners from April 1999.

In this paper we consider a cohort of workers retiring at the beginning of the 1990s and study the impact of the incentives in public *and* private pension schemes on their retirement. This cohort was in employment when coverage of defined benefit occupational pensions was at its peak. Most men in the cohort belonged to an occupational pension scheme and this is likely to be the key financial determinant of when they retire. Previous analysis has shown clear differences in the retirement behaviour of people with and without occupational pensions (see Disney, Meghir and Whitehouse (1995) and Blundell and Johnson (1999)). As Fig. 1 shows, those with occupational pensions are more likely to remain in employment up to age 60 than those without, but more likely to leave after this age. This difference in behaviour has been attributed to the incentive structure of occupational pensions, but this has never been modelled explicitly. One contribution of this paper therefore is to increase our understanding of the incentive effects of occupational pensions on retirement.

The state pension scheme in the UK is likely to have a smaller incentive effect on retirement behaviour than that in other countries. The earnings-related element (SERPS) was adopted only in 1978 and is of relatively smaller magnitude than in other European countries. It will also be irrelevant to those people who opted out into occupational pension or personal pension schemes (and to many married women who opted out of the state pension system altogether). Only a minority of people in our sample of retirees remained in SERPS, although they form an interesting group to

[1] See Johnson (1999) for a discussion.

[2] The main benefit was invalidity benefit, which was replaced by incapacity benefit in 1995.

look at since SERPS was nearing its peak in terms of generosity at the time they were retiring.

This paper models retirement incentives for the cohort of individuals in the UK Retirement Survey. This is a two-wave panel survey of a sample of individuals born between 1919-1933. The Retirement Survey has a larger sample of individuals in the relevant age range than any general household or individual surveys in the UK and is therefore the best currently available data for analysing retirement behaviour. However, it lacks complete earnings histories and full information on the rules of individuals' occupational pension schemes. Instead we match earnings profiles from cross-section surveys on the basis of cohort, education and industry. We also model the individual's occupational pension entitlement according to the rules of the most common scheme in the sector that the individual works in.

The plan of the paper is as follows. The next section describes the UK pension system and the key elements that are likely to affect retirement behaviour. Section 3 provides further information on the UK Retirement Survey and describes the construction of earnings and pension incentive measures. Sections 4 contains the results from estimating binary response models of retirement including these incentive measures and simulates the impact of occupational pension incentives. Section 5 concludes.

2. The Policy Environment

The UK pension system is two-tiered. The first tier, provided by the state, consists of the basic state pension and a significant level of means-tested benefits (made more significant by the introduction of the Minimum Income Guarantee for pensioners in April 1999). The second tier, compulsory for all employees with earnings above a certain floor, is made up of the State Earnings-Related Pension Scheme (SERPS)[3] and a large and growing level of private provision.

2.1 The Basic State Pension

The basic state pension is a flat-rate contributory benefit payable to people aged over the state pension age (65 for men and 60 for women[4]) who have made

[3] SERPS will be replaced by the state second pension from 2002. This will effectively be a flat-rate top-up to the basic state pension, more generous than SERPS to low earners. Most workers will be encouraged to opt out into private provision.

[4]The retirement age for women will be raised by six months each year from 2010 to 2020 so that equalisation is achieved in 2020.

sufficient contributions throughout their working lives.[5] Prior to 1978 married women could opt to pay a reduced rate of National Insurance which meant they did not qualify for a basic state pension in their own right. Couples in which one partner does not qualify for the basic state pension receive a dependant addition, irrespective of whether they have ever worked or not. Since 1989 there has been no earnings test for receipt of the basic state pension,[6] although individuals who choose to defer will increase the value of their pension by 10% for each year of deferral.[7]

2.2 The State Earnings Related Pension Scheme (SERPS)

The first part of the second tier of pension provision is the State Earnings Related Pension Scheme (SERPS). Introduced in 1978, this pays a pension equal to a fraction of an individual's qualifying annual earnings (above a specified lower earnings limit) each year since 1978. When it was introduced, SERPS was intended to pay a pension worth one-quarter of an individual's best twenty years' earnings (up to a specified upper earnings limit). Subsequent reductions in the generosity of SERPS mean that it is worth only 20 per cent of average lifetime earnings to anyone retiring after 2000. Married women who opted to pay reduced rate National Insurance contributions do not qualify for SERPS. Currently widows can claim their husbands' SERPS pensions in full if they receive no additional pension in their own right.[8] After retirement the SERPS pension is uprated each year in line with prices.

2.3 Income Support and Invalidity Benefit

In addition to the basic state pension and SERPS, there are two other state benefits that are taken up widely by older non-workers – income support and incapacity benefit (formerly invalidity benefit). Income support is a flat rate, non-contributory means-tested benefit. It is paid automatically to people aged 60 or more who do not work. Unlike people in younger age groups, the over-60s do not have to show that they are actively seeking work in order to qualify. From April 1999, income support for pensioners was renamed the Minimum Income Guarantee and made more generous with an increase in the level and a commitment to uprate in line with earnings, at least for the short-medium term.

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[5] To qualify for the basic state pension, individuals need to have made or be credited with National Insurance contributions for 90 per cent of their working lives. Credits are available for periods of illness, disability or unemployment.

[6] See Disney and Smith (2000) for a discussion of the effects of the abolition of the earnings test on labour supply.

[7] Increased from 7.5% in 1995

[8] This was due to be reduced to half from April 2000. However the failure of the Government to properly inform individuals of the change in entitlement led to the reform being delayed.

Incapacity benefit (formerly invalidity benefit) is a contributory benefit paid to the long-term sick and disabled. In the case of invalidity benefit an individual qualified on the basis of medical certificates from their GP showing them to be incapable of work that was 'reasonable' to expect them to do (given their age, qualifications etc). With the introduction of incapacity benefit in 1995 this was changed to a stricter 'all work test' carried out by a doctor employed by the Benefits Agency Medical Service. The change from invalidity benefit to incapacity benefit was a response to very rapid growth in receipt during the 1980s. A key feature of iincapacity benefit (and invalidity benefit) is that, before April 2001, it was not means-tested and could be received in conjunction with private pension income (unlike income support). From April 2001, it will be means-tested against occupational pension income.

2.4 Occupational and Personal Pensions

Compared to most other European countries the UK has a high level of coverage of private pensions, including both occupational pensions and individual retirement accounts, known in the UK as Personal Pensions. Any individual can choose to contract out of SERPS, into one of these two types of secondary private pension (and from April 2001 people will also be able to choose to opt out into a stakeholder pension, which is effectively a benchmarked individual retirement account). Members of defined benefit occupational schemes pay a reduced rate of National Insurance, while those with defined contribution occupational pensions or personal pensions receive a National Insurance rebate paid directly into their fund.

Occupational pensions currently cover around 45 per cent of employees, down from a peak of over 50 per cent in the early 1980s. They are typically defined benefit schemes, although since 1988 employees have also been allowed to opt out into defined contribution occupational schemes and there has been a gradual shift from DB to DC schemes since then (see Disney and Stears (1997)). The decline in coverage of occupational pension schemes is due to a number of factors. It reflects changing employment patterns and a shift to smaller employers. Also, it reflects increasing pension choice among individuals working for employers offering occupational pensions who, since 1988, can no longer be compelled to join the scheme.

Since 1988 individuals have been able to contract out of SERPS (and leave their occupational scheme) and take out a personal pension. To kick-start these schemes when they were introduced a bonus National Insurance contribution of 2 per cent was paid by the government, in addition to the contracted-out rebate. By the mid-1990s, around 6 million people (more than one-quarter of all employees) had taken out a personal pension. Take-up was higher among younger workers as would be expected. However, there is a serious issue over the number of older workers who

were 'mis-sold' personal pensions by financial advisers who wrongly advised them that they would be better off leaving their occupational pension scheme.

Table 1 summarises labour market participation and income receipt by age using data from the Family Expenditure Survey 1994-95 (corresponding to the second wave of the Retirement Survey). It shows relatively high rates of labour market withdrawal among men before the state pension age. The two most important sources of income before state pension age are income from private (predominantly occupational) pensions and disability benefit. It is important to stress that these two sources of income are not always alternative pre-retirement income sources, but are typically received together by the same people. The fact that disability benefit was not means-tested meant that it could be received in conjunction with other forms of income. Three-quarters of people in receipt of disability benefit income also received some money from a private pension.

3. The Retirement Survey and the Measurement of Retirement Incentives

3.1 The Retirement Survey

The main data used for analysing retirement behaviour are drawn from the UK Retirement Survey (RS), a household panel survey collected by the Office for Population and Census Surveys on behalf of the Department for Social Security. This was the first large-scale panel data set in the UK to focus on individuals around the time of retirement. Two waves of data were collected on a national random sample of individuals born between 1919-1933. The first wave of the survey was conducted between November 1988 – January 1989 and collected information on 3543 'key respondents' (who were aged 55-69). The key respondents include spouses if they were in the relevant age range. In addition, information was also collected on 609 spouses outside this age range. About two-thirds of the original sample were re-interviewed in 1994. 11% of respondents disappeared in this interval due to mortality; the residual attrition is a combination of non-response and (perhaps) unreported mortality.[9]

The Retirement Survey offers a relatively large sample of people in the relevant age range, compared to more general panel surveys such as the British Household Panel Survey.[10] It also offers very rich demographic, economic and health

[9] The high attrition rate is largely due to the fact that the survey was not originally intended to be a panel survey. Hence, little attempt was made to keep in touch with respondents after the first wave.

[10] The new English Longitudinal Survey of Ageing (www.ifs.org.uk/elsa) will provide a much needed comprehensive panel survey of ageing.

information on individuals – and their spouses – in both waves. And it has employment history information and private pension history information dating right back to individuals' first jobs.[11] However, the survey does not collect earnings history information which is needed to calculate exact pension entitlements for each individual. Instead, as described below we impute earnings histories on the basis of employment history information.

The analysis of retirement behaviour in this paper is based on a sub-sample of people in the Retirement Survey. The group we look at comprises those who were

- below the state pension age in Wave 1, i.e. men aged 55-64 or women aged 55-59 in 1988/89
- working in Wave 1 with non-missing earnings information and no income from occupational pension schemes/ unemployment benefit/ income support,
- and interviewed in both waves.

Excluding people who fail to meet any one of these criteria leaves 456 individuals – 283 men and 173 women. Each of these individuals remains in the sample from 1989 until they leave employment, leaving a total sample of 1,998 person-observations. Summary sample characteristics based on all person-observations are given in Table 2.

3.2 Earnings Histories and Projections

To calculate state pension entitlements we need individual earnings profiles going back to 1978 when SERPS was introduced. These are absent in the Retirement Survey. But the survey does provide detailed work histories documenting spells in employment, whether the employment was part-time or full-time and in which industry the individual worked, which, together with information on age and education, allow us to match earnings profiles from cross-section data. There is no single dataset with consistent information on these variables going back to 1978. Instead, we combine information from two datasets to get consecutive cross-section waves of data from 1978-89 – the Family Expenditure Survey (1978-86) and the General Household Survey (1987-89). Projecting forward from 1989 we assume constant real wages.

We also exploit the earnings information that is available in the first wave of the Retirement Survey to construct an individual fixed effect, which we use to adjust

[11] For a good overview of information in the Retirement Survey see Disney, Grundy and Johnson (1998)

the individual's entire earnings profile. We assume that the wage of individual i in cohort/education/industry sub-group g in period t can be expressed as

$$W_{igt} = \theta_i W_{gt}$$

where θ_i is a constant individual fixed effect, W_{ig88}/W_{g88} where W_{ig88} is taken from the Retirement Survey and W_{g88} is calculated from the cross-section data. Our underlying assumption is that macro shocks affect everyone in the cohort/education/industry sub-group in the same way.

3.3 The pension incentive measures

Each individual's total pension wealth and pension accrual measures are built up from combining four separate elements of the pension system – the basic state pension, the state earnings related scheme SERPS, occupational pensions and invalidity benefit.[12] Here we discuss how each of these individual elements are constructed. We also discuss potential sources of variation in total pension wealth and accrual rates by which we might identify the impact of pension incentives on retirement behaviour.

The basic state pension

Calculation of basic state pension entitlement is straightforward. It depends on the total number of years' contributions and, for a married woman, on whether she opted to pay reduced rate National Insurance contributions. This latter piece of information is known directly from the Retirement Survey.

Although the basic state pension is flat rate, total wealth will vary across individuals because of the dependant's allowance and because of the fact that widows not entitled to a pension in their own right can claim their former spouse's pension in full when their spouse dies. In these cases, we need to compute husbands' total pension wealth over the life of the couple, based on the age difference between the spouses. Obviously, the larger the age difference between husband and wife, the greater the husband's total pension wealth.

State Earnings Related Pension Scheme

The precise formula for calculating an individual's SERPS pension is given by:

[12] We ignore income support since it is a universal benefit.

Earnings up to the annual upper earnings limit (*UEL*) are re-valued to the year of reaching state pension age (*R*) using an index of economy-wide average earnings (Y_R/Y_t). The lower earnings limit (*LEL*) in the year prior to the individual reaching state pension age is deducted from each year's re-valued earnings and the net of LEL earnings are multiplied by an accrual factor (χ_{Rt}).[13] For people retiring before 2000 the accrual rate was 1.25% a year.[14] Having calculated earnings profiles for each individual in the Retirement Survey, their SERPS entitlements are fairly straightforward to calculate. We assume zero SERPS pension for people who are in occupational pension schemes and for married women who have opted to pay reduced rate National Insurance contributions.

There are several potential sources of variation in SERPS pension wealth across individuals. Total wealth, but not accrual, will be affected by an individual's employment history since 1978 – both the number of years they have been in employment and their earnings, while projected earnings in the future will have an impact on expected total wealth and accrual. Another important factor for determining total wealth (but not accrual) will be the individual's age in 1978. This was when SERPS was introduced and an individual's age in that year will determine the period over which they are able to accrue rights to a SERPS pension before reaching state pension age. The maximum SERPS pension to which an individual could be entitled, for each year of retirement since 1978 is shown in Fig. 2 (and also the SERPS entitlement based on average earnings). For example, someone reaching state pension age in 1979 would receive practically no SERPS pension since they would only have been building up entitlement for one year.[15] Someone retiring in 1998 could have accrued rights to a SERPS pension of up to £5,000 a year by earning the upper earnings limit for 20 years.[16] Finally, the fact that widows can claim their former husbands' SERPS pensions if they receive no pension in their own right means that, as with the basic state pension, a man's marital status, and the age difference between them and their spouse also affects their total pension wealth and accrual.

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[13] From April 2000 this formula changes. Instead of up-rating annual earnings and then subtracting the LEL from the year prior to retirement, the lower earnings limit from the year worked is subtracted from earnings first and then the difference is uprated in line with earnings growth. Since the LEL is annually uprated in line with the Basic State Pension, i.e. with prices, this has the effect of reducing the generosity of SERPS.

[14] Details of earnings factors, upper and lower earnings limits and accrual rates are given in Blundell, Meghir and Smith (2000, Appendix A1).

[15] Individuals cease to build up entitlements once they pass the state pension age.

[16] As shown in Blundell, Meghir and Smith (2000, Appendix A1) accrual rates will change after 2000, but this reform will not affect the cohort of individuals in the Retirement Survey all of whom will have reached the state pension age before then.

When we compare our estimates of individuals' SERPS pension with the actual SERPS pension they received where this information is available[17], we under-predict, on average, individuals' SERPS pensions and while the correlation coefficient is positive and significant, it is fairly low (compared to that for occupational pensions (see below)). One possible explanation is that individuals who are in SERPS – and not therefore in occupational pension schemes – are likely to have had more variable employment histories than those who are in occupational schemes. Our method for estimating earnings profiles may be missing a lot of variation in their previous earnings, which would also matter more for SERPS than for occupational pensions which are typically determined only according to recent years' earnings.

Invalidity benefit

One possible way to treat entitlement to invalidity benefit would be to assume that only individuals who received the benefit were eligible, and that all those who satisfied the eligibility conditions received the benefit. However, given the potential for subjective evaluation of 'incapacity for work' and 'reasonable work' and in the light of significant variation in the number of people receiving the benefit over time, as well as anecdotal evidence of differences between doctors in their willingness to certify individuals as being incapable of work, this assumption is inappropriate. Instead, we calculate an individual's invalidity benefit wealth on the basis of an assigned probability that they will receive the benefit. These probabilities are derived from a probit model for receipt of invalidity benefit as a function of characteristics such as age, education, region, tenure, marital status and spouse's employment status, which we estimate using data drawn from the Family Expenditure Survey from April 1988 – March 1994. We impute probabilities for individuals in the Retirement Survey on the basis of matched characteristics. The probit results are reported in the appendix.

Occupational pensions

The pension received in a defined benefit occupational pension scheme is typically determined by a formula of the type:

$$P = \chi(PE_R - \beta LEL_{R-1})N$$

where P is the annual occupational pension, χ is the scheme-specific accrual rate, PE_R is 'pensionable earnings' at the time of retirement which are typically the individual's average earnings in the last year, or last few years, before retirement, β is the 'integration factor' and N is the number of years that the individual has belonged to

[17] i.e. for individuals who had retired by the second wave of the Retirement Survey and reported pension receipt.

the scheme. From information in the Retirement Survey, we know N, the number of years the individual has belonged to the scheme. However, we have to make reasonable assumptions about χ_{Rt}, PE_R and β.

The key distinction that we make is between individuals who work in the public sector versus those in the private sector. We assume that different typical schemes apply in the two sectors with different accrual rates, definitions of pensionable earnings and integration factors. This assumption, and the choice of parameter values that we adopt, are based on information from the 1997 National Association of Pension Funds Survey of Occupational Pension Funds which shows a clear difference between public and private sector schemes (see Blundell, Meghir and Smith (2000)).[18]

By construction, total occupational pension wealth – and accrual rates – will vary across individuals according to whether they work in the public or private sector. But there are other sources of variation in both total wealth and accrual rates. Total wealth will vary according to the number of years that the individual has belonged to the scheme, while projected earnings in the future will have an impact on expected total wealth and accrual.

Further variation in accrual rates comes from differences across occupational schemes in the age at which individuals are entitled to start drawing their pension, also asked in the Retirement Survey.[19] We assume that people can continue to accrue rights to occupational pensions beyond this age (up to a maximum of forty years), but for each year that they continue to work beyond this age they lose a year's pension. This is clearly a simplification of the actual rules of occupational pension schemes, not least because around this time many firms implemented early retirement schemes to encourage exits. With no information about the availability of these schemes in the Retirement Survey, we are almost certain not to capture the actual set of retirement incentives facing some individuals. Even so, we do appear to estimate fairly well the level of occupational pension income received in retirement. When we compare our estimates of individuals' occupational pension with the actual occupational pension they received (where this information is available, i.e. for individuals who had retired by the second wave of the Retirement Survey and reported pension receipt) as with

[18] We assume an accrual rate of 1/60th for private sector and 1/80th for public sector. For pensionable earnings we take the best three out of last ten years' earnings for individuals working in the private sector and the best year's earnings out of the last ten years for individuals working in the public sector. We assume an integration factor of 1 for private sector schemes and 0 for public sector schemes.

[19] The survey asks "At what age will you start to receive the pension" and then asks "is that the usual age for drawing a pension", which it is for 90% of respondents. Where information on usual pension age is missing, we assume that it is 65 (the modal age).

SERPS, we under-predict individuals' total level of occupational pension income, but the correlation coefficient is positive and significant and high.

3.4 Total pension wealth and accrual measures

To identify the effects of incentive measures on retirement behaviour requires these measures to vary across individuals and/or over time conditional on the other socio-demographic covariates that would be included in a model of retirement. As the previous discussion of the construction of the pension incentive measures has shown, there are a number of potential sources of variation in total wealth and in the forward-looking accrual measures for each of the four separate elements of the pension system. Almost all of the sources of variation affect both total pension wealth and accrual. However, future earnings will affect forward-looking accrual measures but not current total pension wealth, while total wealth (but not accrual) varies with past earnings and with the individual's date-of-birth (in the case of individuals with SERPS).

In our analysis of the incentive effects of pensions on retirement, three different forward-looking measures of accrual are used. The first is simply the one-period accrual, i.e. how much an individual can add to their total pension wealth by working this period. The second is peak value. This represents the difference between total pension wealth accumulated by the start of the period and the maximum total pension wealth an individual could accumulate looking forward across all future years. This is a more appropriate measure if it is assumed that labour market exits by older workers are irreversible. In this case, when someone leaves the labour market they are giving up all possible future additions to their pension and will therefore consider how much they could increase their pension by staying in the labour market not just this period, but in all future periods. By not retiring now, individuals retain an option to retire in the future and, thereby, to increase their pension. This is very similar in spirit to the option value (Stock and Wise (1990)), which is the third measure used.

In the option value model individuals are assumed to compare the value of retiring now to the maximum of the expected values of retiring at all future ages, where the value of retiring at future ages includes both possible pension additions and future earnings, i.e.

where Y_s is earnings and B_s retirement benefits. The option value differs from the peak value by incorporating the future value of earnings until retirement and by incorporating utility parameters k, the differential value of income in leisure compared

to earned income and γ, the coefficient of relative risk aversion. In our calculation of option values we assume $k = 1.5$ and $\gamma = 0.75$. We assume a discount factor, β, of 0.97 throughout.

Table 3 summarise the distribution of pension incentive measures by age. These are calculated across a balanced sample of the same age our sample. All the figures are expressed in 1998 prices. The option values yield pronounced incentives for people to stay in work at younger ages than the single period accruals. The median option values remain positive up to age 70, reflecting relatively low replacement rates in the UK. With the assumption that real earnings remain constant indefinitely, this appears to create an incentive for some individuals to carry on working even at older ages. This will be reinforced by increasing selection of high-wage individuals into the sample with age. Table 3 also compares the incentive measures for men with and without occupational pensions. Fig. 1 showed a clear difference in the labour market exit behaviour of these two groups, with men with an occupational pension being more likely to stay in work at younger ages. It shows that men with occupational pensions tend to have higher median option values up to the state pension age - and higher wealth. These incentives could work in either direction towards earlier or later retirement. The observed pattern of exits suggests that the effect of the higher option values is likely to dominate at least at younger ages, encouraging men with occupational pensions to stay in employment. It is worth pointing out that although the typical annual occupational pension is considerably higher than the typical SERPS pension, the difference between total pension wealth for people with occupational pensions and those without is reduced by the more generous survivors' benefit provisions of SERPS. In the case of SERPS, the surviving spouse inherits the pension in full; in the case of occupational pensions, they inherit only half.[20]

4. Estimated Pension Incentives and the Probability of Retirement

In this section we present estimates the impact of the incentive and wealth variables on retirement decisions by modelling the conditional probability of exit from employment for individuals in the Retirement Survey.

For each individual i, we write $D_{it}=1$ if the individual has left the labour market in period t (conditional on being in the labour market in period t-1). The probability of this event is then modelled as a function of observable household and individual characteristics as well as the pension incentive variables. The pension

[20] The survivor's benefit was due to be cut to half in SERPS from April 2001. However, in the run up to the pre-announced reform many people were issued the wrong information in the form of leaflets that did not refer to the reform. The change has been delayed to October 2002 and those who can show that they were mis-informed will keep their original entitlement.

incentive variables, defined in the previous section, are discounted wealth, option value (or single period accrual), spouse's pension wealth and the pension age. The latter measures the earliest age at which someone the pension can be drawn. This varies across gender but also across type of pension plan. Denoting the observable characteristics as Z_{it}, and the pension incentive variables as I_{it}, our conditional probability model may be expressed as

$$\Pr[D_{it}=1] = G(a'Z_{it} + b'I_{it})$$

where G is the cumulative distribution function of unobservables in the conditional exit model and a and b are unknown response coefficients.

In estimation we assume G is a cumulative standard normal and consequently estimate a and b using a Probit model for the conditional exit probability, pooled over all five years of retirement information in the Retirement Survey. In constructing the standard errors we need to allow for dependence over time in the unobservables for the same individual who survives in the panel more than one period before retiring. This is implemented using the block bootstrap method.

4.1 The Impact on Retirement

The discussion in section 3 has highlighted the sources of variation in the pension incentive variables. We argue that there is sufficient variability in the pension variables, conditional on the full set of other variables included in the regressions. Generally it is difficult to gauge how much variation one needs for a credible estimate – after all this crucially depends on the amount of variance in the errors. However we note that, for our most general specification, 40% of total pension wealth remains unexplained by all the other included regressors, including option values (see Blundell, Meghir and Smith (2000) for more detail). For the option value, 24% of that for men remains unexplained by the other regressors, including total pension wealth. Overall, the pension variables, conditional on our functional form assumptions and exclusion restrictions, seem to display sufficient variability.

Turning to the conditional exit probability estimates, Table 4 presents the marginal effects and standard errors from a Probit regression for the two specifications estimated using data on our sample of men in the Retirement Survey. The results are separated into two panels according to the specification of the incentive variable. Panel (i) includes single accrual and panel (ii) the option value. These are precisely as defined in the previous section and in particular allow for the basic pension, SERPS and Occupational Schemes where the individual is eligible. They also allow for eligibility to invalidity benefit according to the assigned probability model described in section 3.

The estimates include a full set of cohort and age effects. They also include a dummy for age at which individuals become eligible to receive a pension is included – the "pension age". For recipients of the basic state pension and SERPS this is the normal state pension age, 65 for men and 60 for women. For individuals with an occupational pension we use the age at which they are entitled to start drawing their occupational pension. This varies across individuals in occupational pension schemes so that it has potential explanatory power even when added to the specification with the full set of age dummies in the final column.

The results are quite encouraging for the retirement model. The pension wealth and incentive variables are jointly significant. The signs are as we would expect - a positive wealth effect and a negative accrual effect. These results are consistent with the presence of both income and substitution effects in retirement decisions.[21] The positive coefficient on the total pension wealth variable points to an income effect, whereby individuals who accumulate a lot in earlier years retire earlier. The impact of the option value reflects foregone future opportunities from stopping working now; the negative coefficient on this term indicates that the greater those foregone opportunities, the less likely individuals are to retire. Since the incentive variables are measured in £100,000, the coefficient of -.0825 on the option value in the final column of panel (ii) for example, implies that a £10,000 rise in the option values (leaving pension wealth unaffected) reduces the probability of retirement by a little under eight and one quarter percentage points. The counterfactual simulations in the next section are intended to shed more light on what these magnitudes are likely to mean in reality.[22] A more detailed examination of the Table 4 reveals some further interesting features. On pure likelihood grounds, the specification that includes the option value dominates the specification with the more ad-hoc incentive variable.

4.2 Model Properties and Policy Simulations

To understand the properties of the model Fig. 3 shows the predictive impact of the incentive measures underlying occupational pensions. In these predictions the impact of the occupational pension dummy variable is removed and the figure just captures the impact of the differing wealth and option values. This figure shows the "crossing effect" in which those with occupational pensions stay longer for the first few years and then, from age 59 in our case, start to retire at a quicker rate. The two survival curves then cross at age 64.

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[21] The option value and total pension wealth measures are in £ 100,000s while net earnings are in £ 1,000s.

[22] The significance of these coefficients requires some discussion. The panel nature of the survey means that the standard errors calculated from the standard formula for the Probit model will not account for the dependence across time periods. In Blundell, Meghir and Smith (2000), we present bootstrap confidence intervals that do allow for this dependence. Interestingly these intervals maintain the significance in the wealth and incentive variables found in Table 8.

5. Summary and Conclusions

The UK experienced a serious decline in labour market attachment among older workers in the 1980s and 1990s. This was especially acute among men aged 55 or older. The analysis we present shows that during the two recessions – the first in the early 1980s and the second in the early 1990s, the fraction of such men in employment declined by more than 30 percentage points to record low levels of little over 50% and has shown no sign of recovery. To what extent can these low levels of labour market attachment be attributed to the workings of the UK pension system; and to what extent can these trends be reversed by reforms to this system? These questions formed the motivation for this study.

The paper provides a comprehensive evaluation of the economic incentives for retirement underlying the UK pension system. This accounted for the changing impact of the State Earnings Related Pension system, introduced in 1978 and of growing importance for those retiring in the 1990s. It also accounted for the complex set of private defined benefit occupation pension schemes, which provided coverage for nearly 70% of those approaching retirement in the 1990s. We highlighted the importance of invalidity benefit as a mechanism for income support in early retirement whose take-up approached nearly 1.5 million among individuals below state retirement age in the 1990s.

To examine the impact of these factors on retirement we used a sample of men aged 55 or older from the UK Retirement Survey. Their retirement probability was modelled in terms of the incentives underlying their own pension plans and other socio-economic factors. Our analysis followed an option value approach and allows a separate role for pension wealth. We also allowed for the spouse's economic and demographic characteristics. The estimation results pointed to significant incentive and wealth effects through the pension system. The occupational pension incentives are found to encourage early retirement, however, disability benefit alone appears to have little impact. Overall the option value model performed better than models that used a simpler and more ad-hoc incentive measure.

As a more cautious final note it should be pointed out that the data source we used had a number of drawbacks. Most notably the high attrition between waves and the resulting small sample size used in our analysis. In addition many of the features of the occupational plans that we would like to include are missing from the data. More optimistically, the new English Longitudinal Survey of Ageing which is in the process of getting ready to go into the filed will remedy both of these defects and will also provide a comprehensive and detailed data source on health and retirement.

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Appendix: Probit results, Invalidity benefit

	Men		Women	
	Coeff	*SE*	Coeff	*SE*
Yorks&Humberside	-.0958	*.0748*	-.1601	*.1129*
North West	.0217	*.0713*	.2176	*.0989*
East Midlands	-.4242	*.0857*	-.2936	*.1256*
West Midlands	-.3005	*.0773*	-.3128	*.1155*
East Anglia	-.6051	*.1189*	-.4210	*.1700*
South East	-.5109	*.0835*	-.2288	*.1165*
Greater London	-.5336	*.0731*	-.4302	*.1101*
South West	-.4568	*.0852*	-.3078	*.1253*
Wales	.2494	*.0809*	.3606	*.1088*
Scotland	.0179	*.0743*	.2237	*.0998*
Age	.5859	*.0246*	.4968	*.0354*
Age squared	-.0054	*.0002*	-.0048	*.0003*
College education	-.6891	*.0962*	-.0452	*.1019*
Spouse employed	.1476	*.0416*	-.1923	*.0467*
Homeowner with mortgage	.0109	*.0484*	-.0529	*.0614*
Outright owner	-.0850	*.0399*	-.2829	*.0595*
Constant	-15.7892	*.6933*	-13.5498	*.9405*

Number obs	9636		14192	
Pseudo R^2	0.2047		0.2013	

Source: Data from Family Expenditure Survey April 1988 – March 1994

Table 1: Labour market participation and benefit receipt

	FT work	PT Work	Not working	Public pension	Private pension	Disab Benefits	DisBen+ Private	Other Benefits
Men								
50-54	0.6447	0.2053	0.1500	0.0000	0.0947	0.0737	0.0237	0.0658
55-59	0.4620	0.1881	0.3598	0.0000	0.3432	0.1386	0.0825	0.0728
60-64	0.2680	0.1787	0.5533	0.0000	0.5395	0.2096	0.1478	0.1237
65-69	0.0213	0.0816	0.8972	0.8121	0.7411	0.1667	0.1312	0.0532
Women								
50-54	0.4667	0.2427	0.2907	0.0507	0.1040	0.0400	0.0133	0.0480
55-59	0.2936	0.2385	0.4679	0.0975	0.1988	0.0398	0.0061	0.0520
60-64	0.0909	0.1394	0.7697	0.7970	0.3606	0.0242	0.0152	0.0485
65-69	0.0156	0.0688	0.9156	0.9594	0.4125	0.0000	0.0000	0.0469

Source: Family Expenditure Survey 1994-95

Table 2: Sample characteristics

	Men	Women
Number of person observations	1276	722
Mean age	61.50	59.87
Proportion currently married	0.8659	0.7659
Age difference between individual and spouse (years)	2.80	-1.17
Net earnings ($)	18,157	9,064
Proportion with an occupational pension	0.6857	0.3850
Proportion of women paying reduced rate NI	0.0000	0.7410
Length of time in current job (years)	12.16	9.85
Proportion of time since leaving educ in FT employment	0.6143	0.2341
Industry = energy	0.0940	0.0000
Industry = engineering	0.0030	0.0457
Industry = manufacturing	0.2014	0.1191
Industry = distribution	0.1951	0.1551
Industry = services	0.2429	0.6053
Industry = government	0.0635	0.0748
Zero financial wealth	0.1897	0.1856
£ 1 - £ 3,000 financial wealth	0.4036	0.4460
£ 3,000 - £ 10,000 financial wealth	0.2045	0.1717
>£ 10,000 financial wealth	0.1575	0.1399
Missing financial wealth	0.0447	0.0568
School dropout	0.4397	0.6108
High school education	0.4287	0.3047
College	0.1317	0.0845
Health in 1988 (severity score)	0.3017	0.3670

Variable definitions

High school dropout	No qualification
High school graduate	O levels, A levels, School certificate, Certificate of sixth form studies, clerical and commercial qualifications (eg typing/ shorthand/book-keeping/commerce), City and Guilds, Nursing qualifications, other qualification, recognised trade

	apprenticeship
College	University degree or diploma, teaching qualification, membership of professional institution
Severity score	Measure of self-assessed health status based on the international classification of impairments, disabilities and handicaps based on the international classification of impairments, disabilities and handicaps (ICDIH). Separate scales are constructed for areas of locomotion, reaching and stretching, dexterity, seeing, hearing, continence, communication, personal care, behaviour, intellectual functioning, consciousness, digestion and disfigurement. The severity score is constructed as a weighted average of the three highest severity scores from the 13 areas: Highest + 0.4(second highest) + 0.3(third highest).

Table 3: Total pension wealth measures, balanced panel

	Whole sample		*With occupational pension*		*No occupational pension*	
Age	*Mean*	*Median*	*Mean*	*Median*	*Mean*	*Median*
58	76850	62081	80516	65324	57994	57908
59	80243	64146	84505	69456	58323	59043
60	84310	66820	89290	72162	58696	60210
61	86293	69019	91595	74405	59021	61302
62	87252	71089	92683	76634	59320	62343
63	87238	72751	92612	78526	59602	63345
64	87255	74086	92575	80412	59898	64346
65	87369	74798	92652	81324	60198	65335
66	81966	69235	87263	76691	54723	59338
67	76582	63840	81865	72046	49413	53521
68	70692	58852	75831	67247	44261	47878
69	64662	54079	69506	62212	39753	42486
70	58320	49013	62780	56282	35380	37256
71	55687	51177	60460	57693	31138	32182

Table 4: The probability of male retirement (N=1276)

	Single Period Accrual		***Option Value***	
	Marg effect	*SE*	Marg effect	*SE*
Accrual (÷£ 100,000)	.0699	*.0188*	.0825	*.0201*
Total wealth (÷£ 100,000)	-.1954	*.1623*	-.1144	*.1769*
Spouse wealth (÷£ 100,000)	.0224	*.0155*	.0278	*.0158*
Log likelihood	-383.88		-381.92	
X^2 test (PW, Acc)	23.94		27.22	

Notes: The full set of results can be found in Blundell, Meghir and Smith (2000). The full set of demographic controls include earnings (and earnings squared), education, health, job tenure, industry, proportion of time spent in full-time employment, whether individual has an occupational pension, housing tenure, financial wealth, age difference within couples, spouse' s earnings, spouse' s health and whether spouse is retired.