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11

Fiscal Effects of Reforming the UK State Pension System

Richard Blundell and Carl Emmerson

11.1 Introduction

In this chapter we evaluate the fiscal and distributive impact of social security reform in the United Kingdom. To examine this, we consider three reforms to the state pension system, all designed to increase the retirement age by changing the incentive structure underlying the pension system. We analyze both the mechanical fiscal effects of implementing the reforms without allowing for behavioral responses as well as the full effects that additionally account for an individual's altering his or her retirement decisions in light of the reformed pension system. To address the behavioral effects we use a transition model of retirement that is based on microdata from the UK Retirement Survey. This model is developed in Blundell, Meghir, and Smith (2001), and we adapt that specification in this paper to provide simulations on individual data of pension reforms. Before describing the reforms and the simulation model, we introduce this study with

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some background concerning the current situation regarding pension reform in the United Kingdom.

In line with other OECD countries, the United Kingdom will experience population ageing over the next few decades and a growth in the proportion of people aged 65 and over relative to the working-age population. However, this process is not likely to be as dramatic in the United Kingdom as it is predicted to be in Germany, Italy, or Japan. The financial sustainability of the state pension system is not a substantive issue. Indeed, under current pension rules, the burden of state pensions is projected by the government to fall slightly as a percentage of national income, from 5.1 percent in 2001–2002 to around 4.8 percent by 2050–2051. Figure 11.1 also shows that expenditure on the basic state pension is forecast to fall as a share of national income. Expenditure on the State Earnings-Related Pension Scheme (SERPS) and the State Second Pension is forecast to rise, but by far less than would have been the case under the initial SERPS, introduced in 1978. This is a consequence of a series of reforms to the pension system in the 1980s that dramatically reduced its generosity.[1] There is also an increase in forecast expenditure on the Minimum Income Guarantee and Pension Credit entitlement, both of which are means tested.[2]

In contrast, the trend in the 1970s was toward a more generous state pension system. The main element of the state pension system, the basic state pension, was increased each year, in line with the greater of the increase in earnings or prices. In 1978 a new second-tier earnings-related pension (SERPS) was introduced, which was originally intended to pay a pension worth 25 percent of an individual's best 20 years of earnings. However, SERPS was never a universal scheme for all employees. Workers who belonged to a defined-benefit occupational pension could opt out of SERPS (and pay lower rates of National Insurance) so long as their occupational scheme guaranteed at least the same pension as SERPS. (In fact, until 1988, employers were allowed to make membership of their occupational pension scheme a condition of employment). At the time that SERPS was introduced more than half of all employees, and more than two-thirds of male employees, were opted out of the state scheme.[3]

It is worth bearing in mind that spending on pensions represents only part of total government spending on benefits for older nonworkers. In the 1980s, there was a very large increase in the number of older nonworkers on disability benefits[4] (see Tanner 1998), and spending on these benefits has more than doubled in real terms since 1990. As the level of the basic state pension is below the level of means-tested benefits for pensioners,

1. See Emmerson and Johnson (2002) for more details.
2. This is discussed further in Clark and Emmerson (2003).
3. For more details of the contracting out of arrangements and their impact see, for example, Disney, Emmerson, and Smith (2003).
4. The main benefit was invalidity benefit, which was replaced by incapacity benefit in 1995.

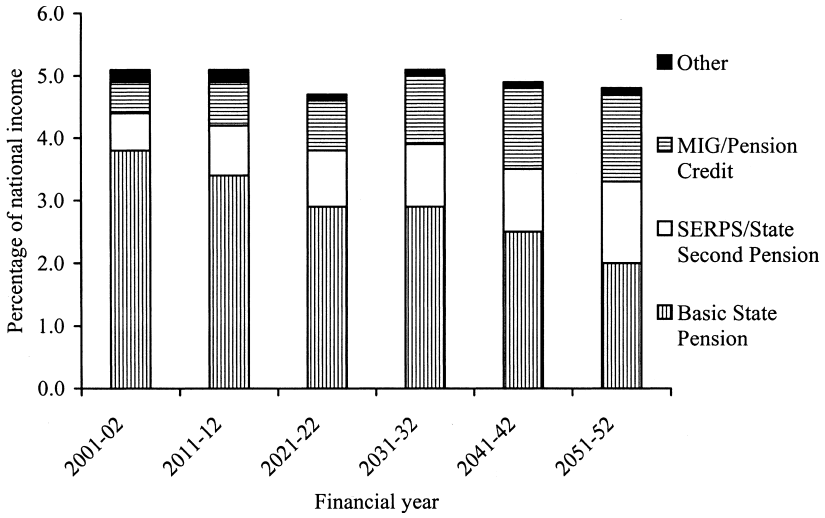

Fig. 11.1 Projected state spending on pensions in the UK

many pensioners are eligible for means-tested benefits on top of their state pension. By April 2003 more than half of families with an individual aged 60 or over were entitled to means-tested benefits.[5] Means testing is continuing to be an increasingly important element in state provision for pensioners, with the introduction of an earnings-indexed means-tested Pension Credit since October 2003.

Since the early 1980s, successive reforms have cut back the generosity of the state pension provision. The greater of growth in prices or earnings lasted only until November 1980, since when it has been formally indexed to prices and has fallen relative to average earnings. Reforms to SERPS introduced in 1986 and 1995 have reduced its generosity for anyone reaching the state pension age 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 provision for their pension. The most important change was to give individuals the choice to opt out of SERPS into a defined contribution scheme from 1988 (or alternatively, to leave their employer's defined-benefit scheme and join either a defined-contribution pension or return to SERPS). In practice, this meant a growth in individual retirement accounts (personal pensions) and the development of defined-contribution occupational pensions. 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 UK government is currently considering further pension reform.

5. See table 4.2 of Banks, Blundell, Disney, and Emmerson (2002).

While the United Kingdom does not have a public finance problem in terms of future expected state expenditures (at least under the current settlement), there is concern that some individuals might not be making sufficient private provision for their retirement. The latest proposals are to preserve the average per-pensioner generosity of state pensions at roughly their current level. In part, this would be financed through an increase in the state pension age to 68 by the middle of this century, although the proportion of national income spent on transfer payments to pensioners would still be projected to rise by 1.5 percent of national income over the next fifty years. The government has also proposed defaulting all employees into a private pension scheme—with (unless they choose to leave the scheme) a compulsory employer contribution worth 3 percent of salary. Reforms aimed at increasing retirement ages, and therefore improving the adequacy of retirement provision, are also being implemented.[6]

In fact, like many other OECD countries, the United Kingdom has been experiencing a trend toward earlier labor market exits among older, particularly male, workers. The percentage of employed men aged 60 to 64 halved from 1968, when over 80 percent were employed, to a little over 40 percent in 1996.[7] 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 of females across the same period.

Blundell, Meghir, and Smith (2001) looked at the extent to which these labor market trends might be explained by the financial incentives in the pension system that people faced when making their retirement decisions. In doing so, they focused not only on the pensions provided by the state, but also on employer-provided pensions and on other state benefits, such as invalidity benefit, both of which have played a crucial role in the United Kingdom. They found significant accrual and pension wealth effects, reflecting the substitution and wealth effects of pension systems on the incentive to retire.

Compared to many other European countries, the United Kingdom stands out as having a high level of coverage of private pensions and, at least in recent years, a trend toward less generous state pension provision. The models of retirement behavior estimated in the Blundell, Meghir, and Smith study fully account for the incentives underlying private occupational schemes, and those estimates are used in this chapter to analyze the fiscal impact of pension reform.

6. Proposals recently implemented are set out in *Department for Work and Pensions* (2002) and discussed in Emmerson and Wakefield (2003). The latest proposals are contained in *Department for Work and Pensions* (2006) and are discussed in Emmerson, Tellow, and Wakefield (2006).

7. See Banks, Blundell, Disney, and Emmerson (2002) or Disney and Hawkes (2003).

The plan of the chapter is as follows. The next section describes the UK pension system and the key elements that are likely to affect retirement behavior. Section 11.3 presents the basic empirical model we use to simulate the behavioral effects of pension reform. Section 11.4 describes the simulation methodology and the set of policy reforms. In section 11.5 the simulation results from three policy reforms designed to reduce the incentives for early retirement in the current pension system are presented. Section 11.6 concludes.

11.2 Institutional Features of the UK State Pension Scheme

The UK pension system is three-tiered. Figure 11.2 provides a summary diagram of these three tiers. A more detailed discussion can be found in Banks and Emmerson (2000). 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 those aged 60 and over 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[8] and a large and continually growing level of private provision. Finally, there is a third tier consisting of additional voluntary contributions and other private insurance.

11.2.1 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[9]) who have made sufficient contributions throughout their working lives.[10] In April 2003, the basic state pension was worth £77.45 a week for a single pensioner. 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. Since 1989 there has been no earnings test for receipt of the basic state pension.[11] Individuals who choose to defer their state pension currently receive an additional 1 percent for every seven

8. The State Second Pension replaced SERPS in April 2002. This is more generous to lower earners. For a discussion see, for example, Agulnik (1999) or Disney, Emmerson, and Tanner (1999).

9. The state pension age for women will be raised by six months each year from 2010 to 2020 so that equalization is achieved in 2020.

10. To qualify for the basic state pension, individuals need to have made or be credited with National Insurance contributions for 90 percent of their working lives. Credits are available for periods of illness, disability, or unemployment. Since the introduction of Home Responsibilities Protection in 1978, the number of years of contributions required can be reduced by time spent caring for children or another dependent.

11. See Disney and Smith (2002) for a discussion of the effects of the abolition of the earnings test on labor supply.

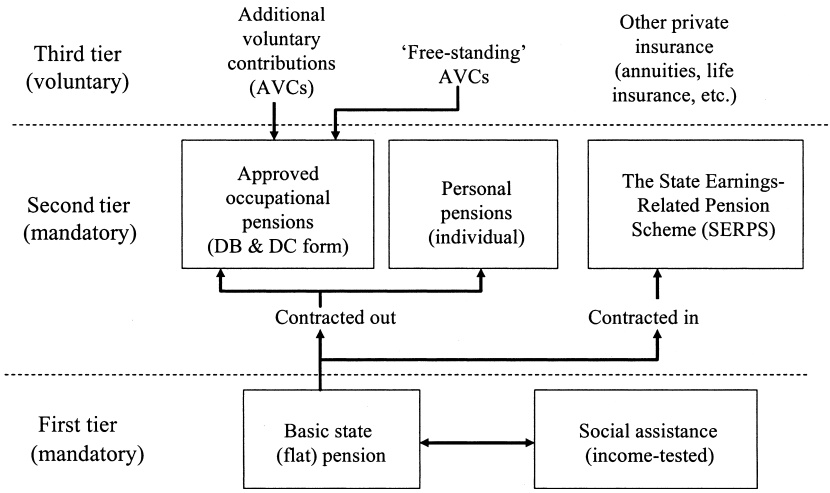

Fig. 11.2 The UK pension system, 1990

weeks of deferral, and from April 2006 this has been increased to 1 percent for every five weeks.

11.2.2 The State Earnings-Related Pension Scheme (SERPS)

The first part of the second tier of pension provision is the State Earnings-Related Pension Scheme. 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 will eventually only be worth 20 percent of average lifetime earnings. 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.[12] After retirement, the SERPS pension is uprated each year in line with price fluctuation.

11.2.3 Income Support and Invalidity Benefit

In addition to the basic state pension and SERPS, there are two other state benefits that are widely taken up by older nonworkers—income support and incapacity benefit (formerly invalidity benefit). Income support is

12. 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.

a flat rate, noncontributory means-tested benefit. It is payable to those who are on low incomes and are not in paid employment. Unlike people in younger age groups, those aged 60 and over 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-to-medium term. The generosity of means-tested benefits was extended further with the introduction of the pension credit in October 2003, which will be payable to lower-income individuals aged 65 or over.[13]

Incapacity benefit is a contributory benefit paid to the long-term sick and disabled. Incapacity benefit can only be received by individuals aged under the state pension age. In the case of invalidity benefit, an individual qualified on the basis of medical certificates from their doctor 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 the 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 of benefits during the 1980s. A key feature of incapacity 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). Since April 2001, it has been means tested against individual occupational pension income.

11.2.4 Occupational and Personal Pensions

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

In 2000, occupational pensions covered 10.1 million individuals, down from 11 million in the mid-1980s. They are typically defined-benefit schemes (see table 11.1), although since 1988 employees have also been allowed to opt out into defined-contribution occupational schemes, and

13. For an explanation of the pension credit, its impact on savings incentives, and the implications of earnings indexation to eligibility over time, see Clark and Emmerson (2003).

Table 11.1 Occupational schemes: Defined benefit versus defined contribution

	Private sector schemes	Public sector schemes	All schemes
Number of members (in millions):			
Defined benefit plans	4.6	4.5	9.1
Defined contribution planes	0.9	—	0.9
Hybrid schemes	0.1	—	0.1
Total	5.7	4.5	10.1
Percent of members in each type:			
Defined benefit plans	81	100	90
Defined contribution planes	16	—	9
Hybrid schemes	2	—	1
Total	100	100	100

Source: Table 3.2 of Government Actuary's Department (2003).

there has been a gradual shift from DB to DC schemes since then (see Disney and Stears 1996). The decline in coverage of occupational pension plans is due to a number of factors. It reflects changing employment patterns and a shift to employers who employ fewer workers. 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 percent 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 plan.

Table 11.2 summarizes labor market participation and income receipt by age, using data from the Family Expenditure Survey of 1994–1995 (corresponding to the second wave of the Retirement Survey). It shows relatively high rates of labor 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 preretirement 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.

Table 11.2 **Labor market participation and benefit receipt**

	Full time work	Part time work	Not working	Public pension	Private pension	Disability benefits	Disability benefits plus 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	0.1778	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.

11.3 The Basic Empirical Model

The simulated responses used in this chapter are based on the retirement model presented in Blundell, Meghir, and Smith (2002). This model was estimated using the UK Retirement Survey, and in this section we briefly review the model and specification of pension incentives. We also present the estimated model that is used in the simulations.[14]

11.3.1 The Data

The main data used for analyzing retirement behavior 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 is the first large-scale panel dataset in the United Kingdom to focus on individuals around the time of their retirement. Two waves of data were collected on a national random sample of individuals born between 1919 and 1933. The first wave of the survey was conducted between November 1988 and January 1989, and collected information on 3,543 key respondents (aged 55 to 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 reinterviewed in 1994. Eleven percent of respondents disappeared in this interval due to mortality; the residual attrition is a combination of nonresponse and (perhaps) unreported mortality.[15]

14. For other studies of retirement behavior in the United Kingdom see, for example, Blundell and Johnson (1998, 1999), Disney, Meghir, and Whitehouse (1994) and Tanner (1998).

15. 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. Attanasio and Emmerson (2003) use the retirement survey to look at the impact of wealth on morbidity and mortality, and incorporate the possibility that attrition may be correlated with mortality.

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. It also offers very rich demographic, economic, and health 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.[16] However, compared to the administrative datasets available in other countries, the sample in the Retirement Survey is relatively small (and is reduced by the high attrition rate between the two waves). Also, the survey does not collect earnings history information, which is needed to calculate exact pension entitlements for each individual. Instead, we impute earnings histories on the basis of employment history information.

11.3.2 The Pension Incentive Calculations

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 among 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 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.

Calculating State Earnings-Related Pension Scheme Benefits

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

$$SERPS = \sum_{t=1978}^{R} (\tilde{W}_t \frac{Y_R}{Y_t} - LEL_{R-1})\chi_{Rt}, \text{ where } \tilde{W}_t = \max(W_t, UEL_t).$$

Earnings up to the annual upper earnings limit (UEL) are revalued 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's reaching state pension age is deducted from each year's revalued earnings figure, and the net of LEL earnings are multiplied by an

16. For a good overview of information in the Retirement Survey see Disney, Grundy, and Johnson (1997).

accrual factor (χ_{Rt}).[17] For people retiring before 2000 the accrual rate was 1.25 percent a year. Details of earnings factors, upper and lower earnings limits, and accrual rates are given in Blundell, Meghir, and Smith (2001). 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 plans and for married women who have opted to pay reduced-rate National Insurance contributions.

Accrual rates have changed since 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. 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, men's marital status, and the age difference between them and their spouse, also affect their total pension wealth and accrual.

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 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 he or she will receive the benefit. These probabilities are derived in Blundell, Meghir, and Smith (2001) 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 to March 1994. We impute probabilities for individuals in the Retirement Survey on the basis of matched characteristics.

Occupational Pensions

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

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

17. From April 2000 this formula has changed. Instead of uprating 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, then the difference is uprated in line with earnings growth. Since the LEL is annually uprated in line with the Basic State Pension, that is, with prices, this has the effect of reducing the generosity of SERPS.

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 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. 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 the 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.

11.3.3 Total Pension Wealth and Pension Incentive Measures

In the analysis of the incentive effects of pensions on retirement presented in Blundell, Meghir, and Smith (2001), three different forward-looking measures of accrual were used. The first was simply the one-period accrual—that is, how much an individual can add to his or her total pension wealth by working this period. The second was 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 labor market exits by older workers are irreversible. In this case, when someone leaves the labor market he or she is giving up all possible future additions to his or her pension and will therefore consider how much he or she could increase the pension by staying in the labor 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 1990a, 1990b), 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, that is,

$$OV = V_t(r^*) - V_t(t) \text{ where } V_t(r) = \sum_{s=t}^{r-1} \beta^{s-t} Y_s^{\gamma} + \sum_{s=r}^{T} \beta^{s-t} [kB_s(r)]^{\gamma},$$

where Y_s is earnings and B_s is 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.

11.3.4 The Retirement Probability Model

A summary of the estimated retirement model results are presented in table 11.3. These are the estimated marginal effects from a probit model of transitions into retirement. A full set of results are presented in the Appendix. This model specification includes both an option value accrual term as well as separate terms for pension wealth. The wealth terms relate to the discounted present value of pension wealth for the individual whose retirement we are modeling and that of his or her spouse. Two specifications are considered in the simulations reported here. The first relates to a model in which there is a separate dummy variable for each age. The second simply includes a linear age trend. The specification of age dummies in a retirement transition model is clearly important. These two specifications provide a range of specifications over which to compare our simulation results.

In each specification, the coefficients on this wealth are always strongly significant and suggest that the restrictions underlying the standard option value model need to be relaxed to allow saving and borrowing against future pension wealth. If these wealth variables are excluded, the option

Table 11.3 **Estimated retirement transition models, with a full set of time dummies and with a linear time trend only**

	Full set of time dummies	Linear time trend only
Total wealth	0.0608	0.0631
	(0.0164)	(0.0163)
Option value	–0.5145	–0.4446
	(0.3476)	(0.3426)
Spouse pension wealth	0.0280	0.0269
	(0.0108)	(0.0107)
No. of observations	1,998	1,998
Pseudo R^2	0.197	0.153
Log likelihood	–661.525	–697.758

Notes: Marginal effects are reported. Standard errors in parentheses. 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. See table 11A.1.

value coefficient becomes much larger and significantly negative. For example, the coefficient becomes –0.903 (0.275) for the first model that contains a full set of time dummies.

In all cases, the pension wealth and option value variables are jointly significant. These results are consistent with the presence of both income and substitution effects in retirement decisions.[18] 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 forgone future opportunities from stopping working now; the negative coefficient on this term indicates that the greater those forgone opportunities, the less likely individuals are to retire. Since the incentive variables are measured in €100,000, the coefficient of –0.5145 on the option value, for example, implies that a €10,000 rise in the option value (leaving pension wealth unaffected) reduces the probability of retirement by a little over 5 percentage points.[19]

The behavioral adjustments in the counterfactual simulations presented in the next section reflect these estimated marginal effects.

11.4 The Pension Policy Reforms and Simulation Methodology

As we have seen, 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 Pension Scheme, occupational pensions, and disability benefit.[20] Here we outline the nature of the pension reforms and the methodology used for simulation.

11.4.1 Reform 1 (Increased State Pension Age)

The first reform concerns an increase in the state pension age for everyone by three years. Hence, under this reform (the Three-Year Reform) the state pension age is 68 for men and 63 for women. This means that the basic state pension and SERPS will not be received until individuals reach this higher state pension age. As disability benefits can currently be received until the state pension age, we also increase the age until which individuals can claim these benefits by three years.

We also augment the normal occupational pension retirement ages by three years. There is clearly a correspondence in practice between the state

18. The option value and total pension wealth measures are in €100,000s while net earnings are in €1,000s.

19. It is worth noting that the option value is significant and slightly larger in size for men, as is also shown in the Blundell, Meghir, and Smith (2001) study. However, it is much less precisely estimated for women. In our simulations, we chose to use the combined sample results as presented in table 11.3.

20. We ignore income support, since it is a universal benefit.

pension ages and the normal retirement ages in occupational pension plans, so increasing the state pension could be expected to have such a knock-on effect on occupational pension plans. Moreover, the increases in life expectancy that, in part, might cause the government to reduce the generosity of the state pension system could have a similar effect on occupational schemes.

11.4.2 Reform 2 (Common Reform)

The second reform assumes a pension system of the following five components: (a) an early entitlement age of 60, (b) a normal retirement age of 65, (c) a 60 percent replacement rate at age 65, (d) a 6 percent actuarial adjustment from 60 to 70, and (e) no other pathways to retirement.

Under this reform we replace the current state pension system with this revised state pension system and remove the possibility of individuals retiring onto any other sources of income—that is, we remove means-tested support, disability benefits, and existing, private occupational pension schemes.

This system is considerably more expensive to the treasury than the existing UK state pension system. This can be shown by the fact that entitlement to a full basic state pension is worth approximately 15 percent of average earnings with entitlement to the SERPS at most around 30 percent of average earnings (since it provides 20 percent of earnings between a lower and an upper threshold, with the former worth about 15 percent of average earnings and the latter set at around 150 percent of average earnings[21]). However, it should be noted that this reformed system is not more generous to all individuals. This is because it removes the possibility of retiring onto means-tested income support or disability benefit (invalidity benefit). In the base system, those who reach retirement with no or little other income will be eligible for means-tested income support, which essentially tops-up their income to that of the social security safety net. In addition, those able to meet the health criteria will be able to receive the flat-rate invalidity benefit (which, prior to April 2001, was not means tested) on top of any other occupational pension income that they might have.

In addition, higher-income individuals might also lose from this reformed system, since it is assumed that the more generous state system will replace occupational pensions (both public and private). Hence, those whose occupational pension plan provides a replacement rate more generous than this reformed state scheme will lose out. For example, those in a private-sector occupational pension plan are assumed to have an accrual rate of 1/60—therefore, someone with 40 years of service would receive a

21. These are known as the Lower Earnings Limit (LEL) and the Upper Earnings Limit (UEL), respectively.

replacement rate of 40/60 = 2/3 (integrated with the basic state pension), which is greater than the 60 percent offered at age 65 under reform 2. Those who retire before 65 will be entitled to even less under the reformed system. Those in public-sector occupational pension plans were assumed to have an accrual rate of 1/80, but not integrated with the basic state pension. This means that whether someone with 40 years of service is better off under the reformed system will depend on whether the 60 percent replacement rate is greater than 50 percent of his or her final salary (i.e., 40/80) plus the basic state pension.

11.4.3 Reform 3 (Modified Common Reform)

The other chapters in this volume present an Actuarial Reform in addition to the Common Reform and the increase in the state pension age. The purpose of this is to investigate the fiscal implications of making the actuarial adjustment approximately fair without changing either the normal retirement age or the average generosity of the system. This proposed system is, however, not relevant to the United Kingdom, as the existing UK state pension system pays benefits from the state pension age regardless of whether the individual has retired. It is not possible to claim state pension benefits prior to the state pension age. Currently, individuals can choose to defer receiving benefits if they wish, but this decision is purely an investment decision, as it can be made independently of whether to undertake paid employment. Hence, rather than increasing the generosity of the deferral payment, we instead estimate the fiscal impact of an alternative reform that is strongly based on the Common Reform (reform 2), but modified to bring it slightly more into line with the base UK pension system.

Under this modified common reform the state pension system still offers a replacement rate of 60 percent at age 65 (with the same accrual structure as under reform 2), but it also has a floor on benefits equal to the basic state pension and a ceiling set at the higher threshold, above which additional employee National Insurance contributions are not paid.[22] In addition, both means-tested income support and disability benefit are retained until age 60. As a result, only high-income individuals can be worse off under reform 3 compared to reform 2 (due to the fact that under reform 3, maximum pension income is capped). Furthermore, the retention of means-tested income support will mean that low-income individuals cannot be worse off under reform 3 than they are under the base system, since retired low-income individuals will be able to receive means-tested income support until age 60 and then a state pension worth at least the basic state pension from this age onward.

22. Known in UK parlance as the Upper Earnings Limit.

11.5 Effect of Policy Reforms

This section uses the estimated retirement transition models described in section 11.3 to model the impact of each of the reforms set out in sections 11.4.1, 11.4.2, and 11.4.3 on retirement ages and the government's finances. This impact is then separated into the mechanical impact of the reform, namely, that which would arise if retirement ages were fixed, and the behavioral impact of the reform; that is, the fiscal implications of any modeled change in retirement ages. We then turn to examine the distributional impact of each of the reforms. Additional tables of results—directly comparable to those in other chapters—can be found in the Appendix (tables 11A.2, 11A.3, and 11A.4).

11.5.1 Retirement Ages and Fiscal Implications of Reform 1, Using a Retirement Model with a Full Set of Age Dummies

The effect of raising the state pension age is to reduce the median level of total pension wealth and to increase option values, compared to the existing pension system. The income and substitution effects work in the same direction; the combined effect is to reduce the conditional probability of retirement at younger ages. The precise magnitude of the effect of reforming the state pension system depends on which specification is used. When a full set of age dummies is included these tend to dominate any of the pension wealth and accrual incentives, and the effect of reforming the pension system appears to be very small. To the extent that the age dummies pick up the incentive effects, these would need to be adjusted to reflect the pivotal ages in the new system. Under the base system, with a full set of age dummies included, the mean retirement age is estimated at 63.1.

The first reform, which increases the state pension age for both men and women by three years, is estimated to increase this to 63.5 if the estimated age effects are assumed to be unchanged by the reform. Under the alternative assumption, that the reformed system would lead directly to a shift in the estimated age effects, this rises to 64.9. Figure 11.3, panel A, shows the estimated distribution of retirement ages under both of these assumptions compared to the estimated distribution in the base pension system. This shows that the distribution of retirement ages under the base system and under reform 1, when the estimated age effects are held constant, are very similar, although the reform does lead to slightly fewer retirements between 56 and 60 (inclusive) and more retirements occurring between 62 and 70 (inclusive). As expected, when the reform is also assumed to shift the estimated age effects, this leads to larger differences in the distribution of retirement ages. The spikes in the base system that occurred at 60 and 65 (which are the state pension ages for women and men, respectively) now occur at 63 and 68.

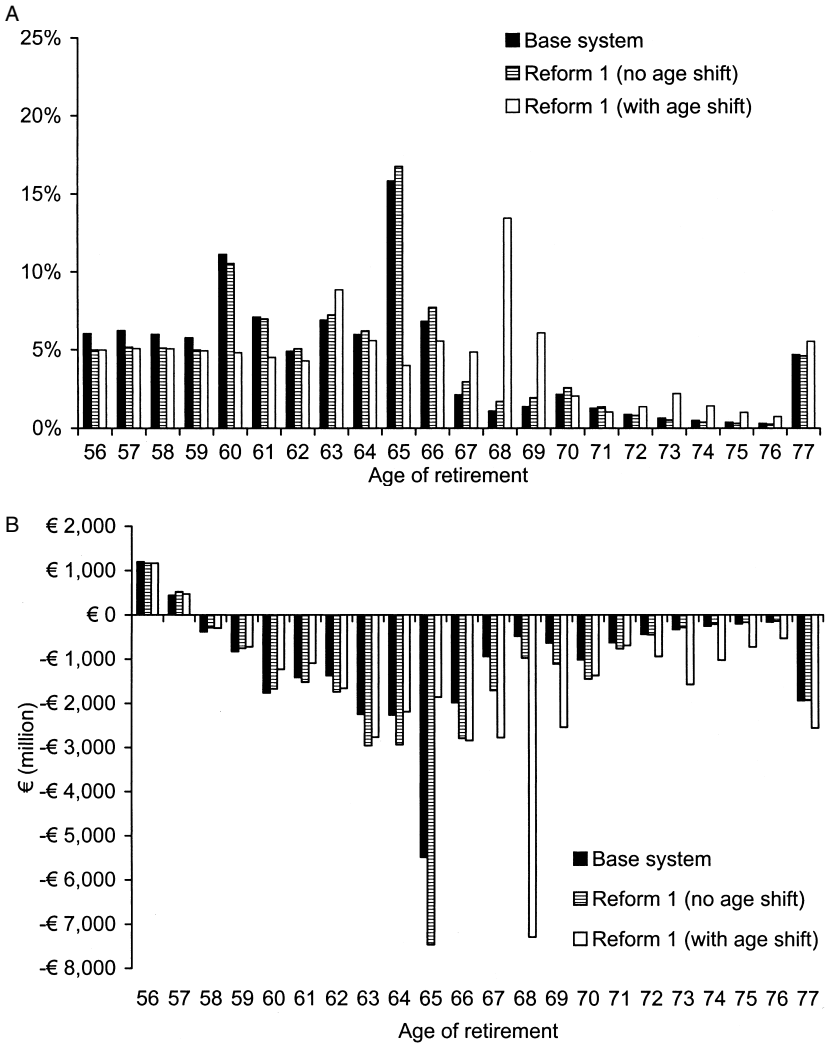

Fig. 11.3 ***A,*** **The distribution of retirement ages under the base system and reform 1, using an option value model and a full set of age dummies;** ***B,*** **Net expenditure under the base system and reform 1, by age of retirement, using an option value model and a full set of age dummies;** ***C,*** **Gross expenditure under the base system and reform 1, by age of retirement, using an option value model and a full set of age dummies;** ***D,*** **Income tax, National Insurance Contribution, and VAT receipts under the base system and reform 1, by age of retirement, using an option value model and a full set of age dummies.**

Note: For details of the specification of the retirement model, see section 11.3

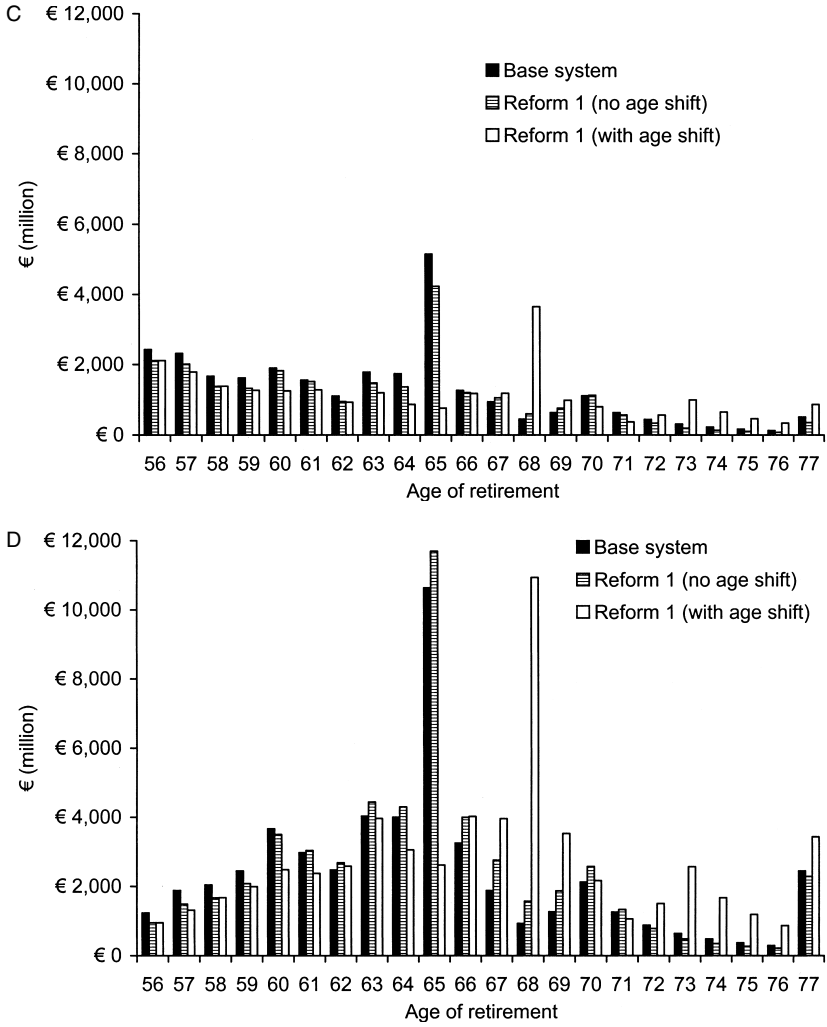

Fig. 11.3 (continued)

Increasing the state pension age would lead to a lower level of expenditure on the state pension. The increase in retirement ages would also lead to an increase in government revenues, arising from increased income tax and national insurance contributions. Both of these would lead to lower levels of government borrowing (or larger government surpluses) than under the base system. This impact, at least in part, will be offset by increased state spending on both means-tested income support and disability benefit. This is because these can both be received until the state pension age,

and therefore under the reformed system can be received for up to three extra years.

Estimates of the government expenditure and government revenues from these sources under both the base system and under reform 1 are presented in table 11.4. Under the base system, expenditure on the state pension to this cohort of individuals is estimated to be €24.7 billion. Under the reformed system (assuming no change in the estimated age effects) this is reduced by 24.2 percent to €18.7 billion. As we will show later (in section 11.5.4) this comprises a slightly larger mechanical effect, arising from the increase in the state pension age, offset slightly by an increase in some individuals' entitlements to the SERPS, arising from the increased average retirement ages.

The net reduction in spending on the state pension is partially offset by a large increase in expenditure on disability benefit (invalidity benefit) of 40.7 percent and a tripling in expenditure on means-tested income support (an increase of 200.3 percent). Overall, state expenditures are still reduced by 12.1 percent. Under the alternative assumption, that the increase in the state pension age also shifts the estimated age effects, the savings from reduced expenditure on the state pension are reduced. This is because the larger upward shift in retirement ages leads to higher expenditure on the SERPS than when the age effects are held fixed. As a result, the reduction in net state pension spending is smaller than in the model when the age effects are not shifted by the full three years. The smaller reduction in state

Table 11.4 **Total fiscal impact of reform 1—option value model with a full set of age dummies**

	€ (in millions)			Percent change on base system	
	Base	Reform 1 (no age shift)	Reform 1 (age shift)	Reform 1 (no age shift)	Reform 1 (age shift)
State pension	24,733	18,741	19,739	–24.2	–20.2
Invalidity benefit	2,619	3,685	3,671	40.7	40.2
Income support	765	2,297	1,470	200.3	92.2
Total spending	28,117	24,723	24,881	–12.1	–11.5
Employee National Insurance	5,354	6,427	6,758	20.0	26.2
Employer National Insurance	7,045	7,457	8,261	5.8	17.3
Income tax	28,156	29,755	33,130	5.7	17.7
Value added tax	10,637	10,660	11,716	0.2	10.1
Total tax	51,192	54,299	59,866	6.1	16.9
Net expenditure	–23,075	–29,576	–34,985	28.2	51.6
Net change as % of gross base benefits	n.a.	n.a.	n.a.	–23.1	–42.4

Note: For details of the specification of the retirement model see section 11.3; n.a. = not applicable.

pension spending is almost entirely offset by a larger reduction in expenditure on means-tested income support. In particular, shifting the age effects by three years reduces the amount of additional spending on income support. Overall expenditure under the model with the shift in age effects is 11.5 percent lower than under the base case, compared to the 12.1 percent lower found when the age effects are held constant.

Turning to the impact of increasing the state pension age on government receipts: this reform will also have both a direct and an indirect impact. The direct impact will be through increased employee National Insurance contributions on earnings, as these will now be paid up to the higher state pension age (there is no corresponding direct impact on employers' National Insurance contributions, as these are levied on the earnings of individuals aged both below and above the state pension age). There will also be a direct effect that will lead to reduced income tax receipts levied on both state and private pension income due to the increase in the pension age. Similarly, there will be a direct impact from reduced VAT receipts, arising from the lower social security spending.[23] The indirect impact of reform 1 arises as a result of the increased average retirement age. This will increase income tax and employees' and employers' National Insurance contributions. Table 11.4 shows that in the base system, total government receipts from these taxes are estimated at €51.2 billion. This estimate comprises employees' National Insurance contributions of €5.4 billion, employers' National Insurance contributions of €7.0 billion, income tax receipts of €28.2 billion, and VAT receipts of £10.7 billion. The table shows that total revenues from these four taxes exceed total spending on means-tested income support, disability benefit, and state pension. This means that the excess revenues are essentially being used to pay for other items of public expenditure or to reduce public debt.

We find that under reform 1, assuming no change in the estimated age effects, employee national insurance is increased by 20.0 percent. The increase in employer national insurance is smaller, at 5.8 percent, which is not surprising, since this is only from the indirect impact of an increased average retirement age, discussed previously. The increase in income tax receipts is smaller still, at 5.7 percent. Increased income tax receipts under reform 1 show that the direct impact of lower receipts on pension income is more than offset by the impact of an increased average retirement age. Overall income tax, national insurance, and VAT revenues are estimated to be 6.1 percent higher.

Under the alternative assumption, that the increase in the state pension age would also shift the estimated age effects by a full three years, we find

23. The standard rate of VAT in the United Kingdom is currently 17.5 percent. But because some items, such as food, books, and newspapers are zero rated and domestic fuel is rated at 5 percent we set VAT equal to 10 percent of net incomes.

that government revenues from each of these three sources would be further increased. This is due to the larger increase in average retirement ages that occurs under this assumption. Overall, income tax, VAT, and national insurance revenues would be 16.9 percent higher than under the base system, compared to the 6.1 percent found earlier.

The overall impact on the government's finances from the items modeled is also presented in table 11.4. Under the base system, there is a net surplus of €23.1 billion. This is increased by 28.2 percent, to €29.6 billion under the model where the age effects are held fixed. It is increased by 51.6 percent, to €35.0 billion under the model where age effects are, by assumption, fully shifted by three years. In part, these percentages are inflated by the fact that they are being compared to the net surplus. However, the fiscal gains to the treasury are also large when compared to gross expenditures. Under the model with no shift in the estimated age effects, the increase in the net surplus of €6.5 billion represents 23.1 percent of gross expenditure. Under the model with a full three-year shift in the estimated age effects, the increase in the net surplus of €11.8 billion represents 42.4 percent of gross expenditure.

The reduction in net expenditure (increase in net surplus), disaggregated by age of retirement, is shown in figure 11.3, panel B. Under the base system, there is an overall net expenditure from the state on those who retire before age 58. This is because the expenditure and revenues are calculated over ages 56 to 77, and therefore taxes on earnings from those who retire this early will often be low (or for those who retire at 56, zero). Net expenditure peaks at age 65—this is not due to those retiring at this age being particularly expensive to the state, but due to the fact that 65 is the most common retirement age (as shown in figure 11.3, panel A). Under reform 1, the pattern of net expenditures varies by the assumption that is made to the interpretation of the age effects. Under the assumption that there is no shift in the estimated age effects, the pattern of net expenditure is quite similar to that observed in the base system, although there is, unsurprisingly, a particularly large reduction in net expenditure (i.e., an increase in the net surplus) among those who retire at age 65. Under the assumption that the estimated age effects are shifted by the full three years, the spike at 65 is shifted to age 68.

The estimated impact on the budget of an increase in the state pension age can also be disaggregated into the impact on gross expenditures and the impact on gross government revenues. This is shown in figures 11.3, panels C and D. The spike in gross expenditures occurring at age 65 is reduced under the assumption that the age effects are fixed, and is reduced and moved to age 68 under the assumption that reform leads to a shift in the age effects by three years. Turning to government revenues—under the first assumption, the revenue received from those retiring at age 65 is increased, and under the second assumption, it is both increased and shifted to age 68.

11.5.2 Retirement Ages and Fiscal Implications of Reforms 2 and 3, Using a Retirement Model with a Full Set of Age Dummies

Under both reform 2 and reform 3, the median level of total pension wealth is increased. The income effect from these reforms will therefore tend to reduce retirement ages. The substitution effect will tend to work in the opposite direction, with state pension rights being increased by 6 percent for each year of additional work between 60 and 70. This is in contrast to being employed under the base system, where the basic state pension and the State Earnings-Related Pension Scheme become payable at the state pension age regardless of whether an individual has actually retired. The option value effect is reinforced in reform 2 by the absence of any nonpension benefits (such as disability benefits) before retirement age under the simulated reform, which increases the incentive to stay in work. In both reform 2 and reform 3, the overall effect on retirement behavior is to lead to an increase in the average retirement age. Under the base system, this is estimated to be 63.1, under reform 2 it is estimated to be 64.6, and under reform 3 it is estimated to be 63.9. The fact that average retirement ages are closer in reform 3 to the base system than in reform 2 is perhaps not surprising, as the reform 3 system is, by design, closer to the base system.

The estimated distribution of retirement ages under both reform 2 and reform 3 are shown in figure 11.4, panel A, alongside those arising from the base system. Under all three systems, the most common retirement ages are 60 and 65. This corresponds to the state pension ages for women and men, respectively, in the base pension system. These spikes are the result of the estimated age effects from the base pension system and therefore could be expected to change under the reformed system. Reform 2 leads to lower retirement rates at all ages up to 63 (inclusive) and correspondingly higher retirement rates up to age 76. The large fall in retirements prior to age 60 is unsurprising, as under reform 2 they would receive no pension income until they reached 60. Turning to reform 3: for all ages between 56 and 73, the retirement rates under reform 3 are estimated to be between those under the base system and those under reform 2. Again, this is to be expected, given the design of the system.

Both reform 2 and reform 3 represent more generous and therefore more expensive state pension systems than the existing UK pension system. This is shown in table 11.5. Total state expenditure is estimated to be €73.5 billion under reform 2 and €81.8 billion under reform 3, compared to €28.1 billion under the base system. Under reform 2, this increase in spending is due to a large increase in spending on the state pension, which is partially offset by the fact that there is no spending on means-tested income support or disability benefit. Under reform 3, spending on state pensions is even higher than under reform 2. This shows that the cap on state pension

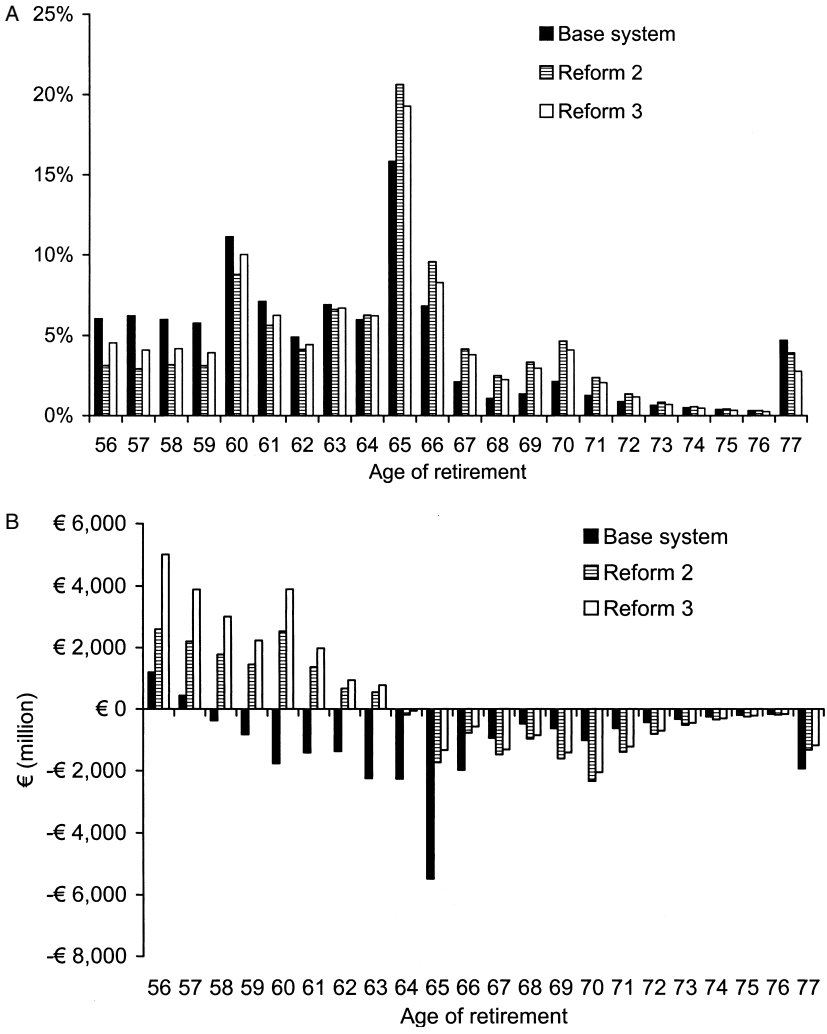

Fig. 11.4 ***A,*** **The distribution of retirement ages under the base system, reform 2 and reform 3, using an option value model and a full set of age dummies;** ***B,*** **Net expenditure under the base system, reform 2 and reform 3, by age of retirement, using an option value model and a full set of age dummies.**

income under reform 3 does not reduce spending sufficiently to finance the (re-) introduction of a floor on pension benefits equal to the basic state pension. In addition, under reform 3, disability benefit (invalidity benefit) and means-tested income support are retained for those who retire before age 60. This leads to lower disability benefit expenditure than in the base system (as under reform 3, men aged 60 to 64 will no longer be able to claim

Table 11.5 **Total fiscal impact of reforms 2 and 3—option value model with a full set of age dummies**

	€ (in millions)			Percent change on base system	
	Base	Reform 2	Reform 3	Reform 2	Reform 3
State pension	24,733	73,498	80,087	197.2	223.8
Invalidity benefit	2,619	0	731	–100.0	–72.1
Income support	765	0	954	–100.0	24.7
Total spending	28,117	73,498	81,772	161.4	190.8
Employee National Insurance	5,354	6,828	6,561	27.5	22.6
Employer National Insurance	7,045	8,546	8,128	21.3	15.4
Income tax	28,156	41,769	40,590	48.3	44.2
Value added tax	10,637	17,102	16,593	60.8	56.0
Total tax	51,192	74,245	71,872	45.0	40.4
Net expenditure	23,075	747	9,901	96.8	n.a.
Change as % of base benefits	n.a.	n.a.	n.a.	79.4	117.3

Notes: For details of the specification of the retirement model see section 3. Given the move from net surplus to a net deficit under reforms 2 and reform 3 it is not possible to express the change in net expenditure as a percentage. n.a. = not applicable.

it), but higher levels of means-tested income-support spending (which is due to those retiring before 60 having no other pension income and therefore falling onto income support, being enough to more than offset the fact that people will not be eligible from 60 onward.

Turning to government revenues, both reform 2 and reform 3 lead to higher levels of government receipts. Revenues from employers' national insurance are increased by 15.4 percent as a result of the increase in average retirement ages. Employees' National Insurance receipts are increased by 22.6 percent. This is higher than the estimated increase in employers' National Insurance receipts because of women in paid employment having to pay employees' National Insurance contributions up to age 65 under the reformed systems (compared to the state pension age for women of 60 under the base system). Income tax receipts are increased even more substantially—this larger increase being due to more income tax being paid on the more generous state pension system. The increase in revenues under reform 2 is larger than the increase under reform 3. This is due to the earlier average retirement age under reform 3 and the fact that the ceiling on taxable state pension benefits reduces receipts. The reintroduction of disability benefit and means-tested income support does not increase income tax receipts, as these sources of income are not taxable, while those who only receive a pension income equal to the floor of the basic state pension will also not have to pay any income tax (this is because their income will not be sufficient to take them above the income tax personal allowance). The

increase in spending on the state pension, and the increase in retirement ages, also leads to a substantial increase in estimated VAT receipts.

The overall impact on the government's finances from the items modeled is also presented in table 11.5. Under the base system, there is a net surplus of €23.1 billion. Under reform 2, this leads to the system being just in balance (surplus of £0.7 billion), and under reform 3, a large deficit of €9.9 billion. The cost to the treasury of reform 2 would be €22.3 billion, or 79.4 percent of gross expenditure. The cost of reform 3 would be €33.0 billion, or 117.3 percent of gross expenditure.

A breakdown of net expenditure by the age at which individuals retire is provided in figure 11.4, panel B. Comparing reform 2 to the base system, we see that the reformed system is more expensive to the treasury at all retirement ages prior to age 67, with net expenditure being similar thereafter. Reform 2 is particularly more expensive at ages 60 and 65, as shown by the difference between the reform 2 and base system bars at these points. These are the modal retirement ages for women and men, respectively. Figure 11.4, panel B also shows that reform 3 has a greater budgetary cost than reform 2, at all retirement ages.

11.5.3 Retirement Ages and Fiscal Implications of Reforms 1, 2, and 3, Using a Retirement Model with a Linear Age Model

All of the analysis so far has looked at retirement ages and the fiscal impact of different reforms using a retirement model containing a full set of age dummies. This section performs the same analysis but with the more parsimonious retirement model that only allows for a linear age trend. The estimated retirement ages under the base system, and each of the three reforms, is shown in figure 11.5, panel A. Under the base system, the model retirement age is estimated to be 63 and the pattern of retirement ages differs substantially from the more flexible model that used a full set of age dummies (and was shown in figure 11.3, panel A). The changes in retirement ages caused by each of the reforms are all in the same direction as estimated in the model using a full set of age dummies. Under the base system, the average retirement age is estimated to be 63.2 (compared to 63.1 found under the model with a full set of age dummies). Reform 1 leads to an increase in average retirement age to 63.5, which is exactly the same as found using the previous model with no shift in the estimated age effects (using a model with an age shift led to an increase to 64.9). Reform 2 is estimated to increase the average retirement age to 64.2, while reform 3 is estimated to lead to a slightly smaller increase, to 63.7. These compare to the 64.6 and 63.9 ages found using the first retirement model.

The fiscal impact of these reforms, using the linear age retirement model, is summarized in table 11.6. Despite the very different distribution of retirement ages shown in figure 11.5, panel A, compared to 11.3, panel A, and 11.4, panel A, the estimated fiscal impacts are very similar to those ob-

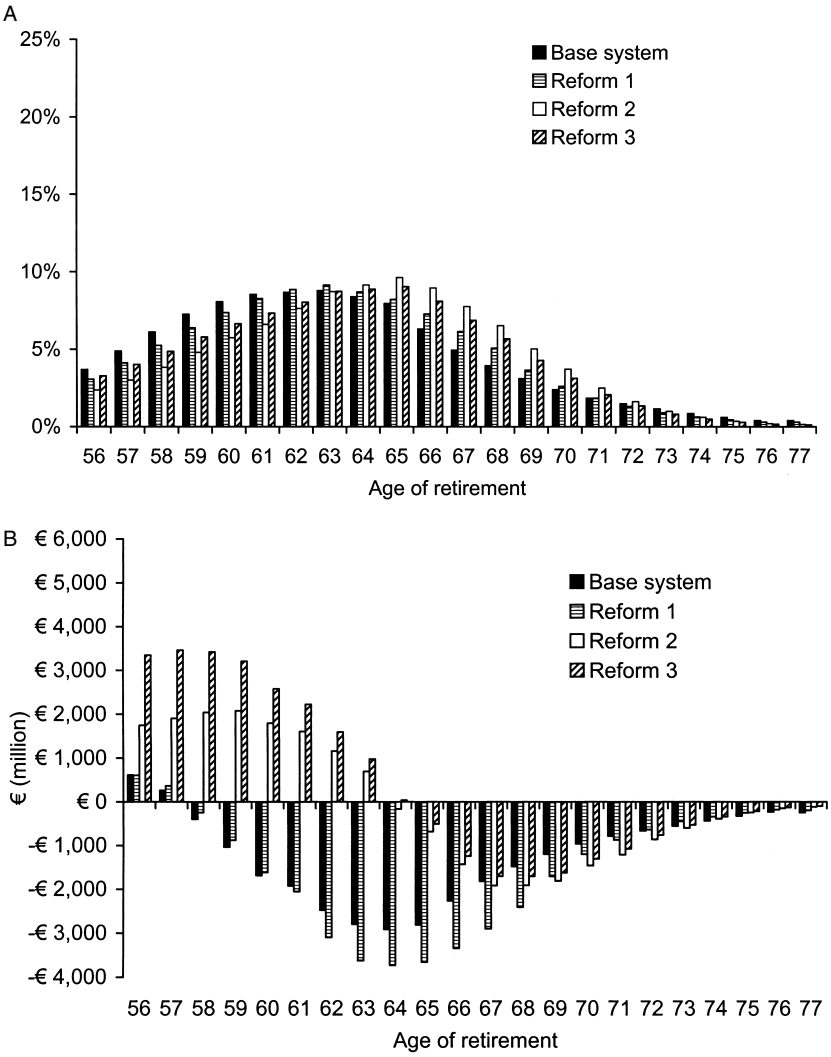

Fig. 11.5 *A,* **The distribution of retirement ages under the base system, reform 1, reform 2, and reform 3, using an option value model and a linear age term;** *B,* **Net expenditure under the base system and reform 1, by age of retirement, using an option value model and a linear age term.**

tained when using the retirement model with a full set of age dummies. Reform 1 is estimated to reduce total state spending by 13.4 percent and to increase government revenues by 4.7 percent. This compares to a saving of 12.1 percent and an increase of 6.1 percent found using a full set of age dummies and not shifting the age effects (presented in table 11.3). Under reform 2, expenditures are estimated to increase by 167.1 percent and tax

Table 11.6 **Total fiscal impact of reforms 1, 2, and 3—option value model with a linear age trend only**

	Percent change on base system		
	Reform 1	Reform 2	Reform 3
State pension	–24.0	194.7	220.1
Invalidity benefit	48.6	–100.0	–75.0
Income support	171.7	–100.0	32.2
Total spending	–14.4	167.1	195.7
Employee National Insurance	18.9	20.8	17.4
Employer National Insurance	4.4	14.6	10.3
Income tax	4.2	40.0	37.4
Value added tax	–1.1	54.3	51.2
Total tax	4.7	37.4	34.4
Net expenditure	24.0	n.a.	n.a.
Change as % of base benefits	–23.4	137.7	169.6

Note: Given the move from net surplus to a net deficit under reforms 2 and reform 3, it is not possible to express the percentage change in net expenditure. n.a. = not applicable.

revenues by 37.4 percent (compared to 161.4 percent and 45.0 percent shown in table 11.5), while under reform 3 expenditures are estimated to increase by 195.7 percent and tax revenues by 34.4 percent (compared to 190.8 percent and 40.4 percent, as shown in table 11.5).

Figure 11.5, panel B breaks down this net expenditure by the age of retirement. This does give a very different picture to that shown for reform 1 in figure 11.3, panel B and reforms 2 and 3 in figure 11.4, panel B. This is caused by the very different pattern of retirement ages estimated using a linear age trend (and shown in figure 11.5, panel A) compared to those found when using a full set of age dummies (and shown in figures 11.3, panel A and 11.4, panel B). The large cost of reforms 2 and 3 still arises from those retiring before age 67.

11.5.4 Decomposing the Fiscal Implications of Reforms 1, 2, and 3

The fiscal impact of each of the reforms that has been described in sections 11.5.1 to 11.5.3 can be broken down into two components. First, the fiscal impact that would arise if the reformed system were introduced but individuals did not change their retirement behavior (the mechanical effect). Second, the fiscal impact that arises due to individuals changing their retirement behavior (the behavioral effect). This section presents these two breakdowns for each of the three reforms and each of the two retirement models discussed so far.

The fiscal impact of the first reform is decomposed into these two effects in table 11.7. The first set of rows take the retirement model with a full set

of age dummies and where the estimated age effects are held fixed. Under this model, reform 1 was estimated to reduce state expenditure by €3.4 billion. The mechanical effect is found to reduce spending by €3.9 billion, with the increase in retirement ages leading to a relatively small offset in expenditure of €0.5 billion. This small increase is mainly due to an increase in state pension spending, as individuals retire later and therefore accrue a larger entitlement to the SERPS. On tax receipts, it is the mechanical effect of the reform that is relatively small, at €0.1 billion. This is due to increased employee National Insurance receipts arising from the increase in the state pension age, which is slightly offset by lower income tax receipts on the reduced state pension benefits. The behavioral part of the fiscal impact works in the same direction as the mechanical effect, due to increased tax receipts from the increase in average retirement ages. This is estimated to increase revenues by €3.0 billion.

The second set of rows show the mechanical and behavioral effects using the retirement model with the full set of age dummies and shifting the estimated age effects by the full three years. By definition, the mechanical

Table 11.7 Decomposition of the total effect of reform 1

	Mechanical	Behavioral	Total
Full age dummies, no age shift			
Total expenditure (€)	−3,894	500	−3,394
Total taxes (€)	95	3,012	3,107
Net change (€)	−3,989	−2,512	−6,501
Net change as % of net base benefits	17.3	10.9	28.2
Net change as % of gross base benefits	–14.2	–8.9	–23.1
Full age dummies, with age shift			
Total expenditure (€)	−3,894	658	−3,236
Total taxes (€)	95	8,579	8,674
Net change (€)	−3,989	−7,921	−11,910
Net change as % of net base benefits	17.3	34.3	51.6
Net change as % of gross base benefits	–14.2	–28.2	–42.4
With linear age trend			
Total expenditure (€)	−3,976	247	−3,729
Total taxes (€)	132	2,522	2,654
Net change (€)	−4,108	−2,275	−6,383
Net change as % of net base benefits	15.7	8.7	24.4
Net change as % of gross base benefits	–14.8	–8.2	–23.0

Note: For details of the specification of the retirement model see section 11.3.

effect of this reform is exactly the same as under the previous model. The larger increase in retirement ages leads to larger behavioral effects. The increase in state expenditures from the behavioral response to the reform is still relatively small at just €0.7 billion. This is due to the fact that for many individuals, extra years of employment will not increase their entitlement to state pensions—for example, because they are opted out of the SERPS, or if the extra years of work do not add to their best twenty years. The behavioral component of the fiscal impact is estimated to be larger on tax receipts. This is because the larger increase in retirement ages increases receipts from National Insurance contributions, income tax, and VAT revenues. The third set of rows of table 11.7 show the decomposition using the retirement model with a linear age trend. These are quite similar to the model with no shift in the estimated age effects.

The decomposition of the fiscal impact of reforms 2 and 3 under each of the retirement models is presented in table 11.8. As with reform 1, the behavioral impact of the reforms is found to be relatively larger in the retirement model with the full set of age dummies than in the model that only uses a linear age trend. This is due to the estimated increase in retirement ages accruing under reforms 2 and 3, being larger in the former model.

Looking at state expenditure under reform 2, it is clear that the mechanical impact of the reform is only very slightly offset by its behavioral impact. The fact that the very large increase in the generosity of the state system implied by this reform is only slightly offset by individuals retiring slightly later is unsurprising. With tax receipts, the behavioral impact of the reforms is found to be relatively more important, and as with reform 1 they are found to both operate in the same direction—namely, to increase revenues.

Under reform 3, the mechanical component of the fiscal effect of the reform on both state spending and tax receipts is estimated to be larger than under reform 2. This reflects the fact that reform 3 is, on average, more generous than reform 2. The behavioral component of the fiscal effect on both state spending and tax receipts is estimated to be smaller. This reflects the smaller increase in average retirement ages occurring as a result of reform 3. Hence with regards to state expenditures, the behavioral components of the fiscal effect of reform 3 are very small relative to the mechanical component. On tax receipts, both effects are still very important, and continue to operate in the same direction.

11.5.5 Distributional Impact of Reforms 1, 2, and 3

The microdata used in this analysis can also be used to examine the distributional impact of each of these potential reforms. This data calculates each individual's total expected pension wealth under the base system and under each of the three reforms. An alternative calculation would be to take the individual's incomes in each of the three reforms. However, this seems inappropriate, since a reform such as an increase in the state pension

Table 11.8 Decomposition of the total effect of reforms 2 and 3

	Mechanical	Behavioral	Total
Reform 2, full age dummies			
Total expenditure (€)	47,807	–2,426	45,381
Total taxes (€)	10,642	12,411	23,053
Net change (€)	37,165	–14,837	22,328
Net change as % of net base benefits	–161.1	64.3	–96.8
Net change as % of gross base benefits	132.2	–52.8	79.4
Reform 2, with linear age trend			
Total expenditure (€)	47,994	–1,651	46,343
Total taxes (€)	11,173	6,847	18,020
Net change (€)	36,821	–8,499	28,322
Net change as % of net base benefits	–141.0	32.5	–108.5
Net change as % of gross base benefits	132.7	–30.6	102.1
Reform 3, full age dummies			
Total expenditure (€)	54,374	–719	53,655
Total taxes (€)	11,947	8,733	20,680
Net change (€)	42,427	–9,451	32,976
Net change as % of net base benefits	–183.9	41.0	–142.9
Net change as % of gross base benefits	150.9	–33.6	117.3
Reform 3, with linear age trend			
Total expenditure (€)	54,381	–111	54,270
Total taxes (€)	12,500	4,627	17,127
Net change (€)	41,881	–4,738	37,143
Net change as % of net base benefits	–160.4	18.1	–142.2
Net change as % of gross base benefits	151.0	–17.1	133.9

Note: For details of the specification of the retirement model see section 11.3.

age might lead to individuals remaining in work longer, and therefore receiving a higher income, but they would prefer the unreformed system, in which they could retire earlier.

Individuals are then placed in wealth quintiles on the basis of the wealth in the base system according to two different equivalence scales. The first assumes that to have the same standard of living, couples need two-thirds more wealth than a single individual. The second simply places one fifth of single individuals and one fifth of couples in each quintile. Essentially, this latter equivalence scale assumes that a couple at the 80th percentile of the wealth distribution of couples is as well off as a single person at the 80th percentile of the wealth distribution of single individuals.

The concern with this latter equivalence scale is that it might overstate the well-being of single individuals, since we know that, on average, older single people are poorer than older couples. However, as this section will show, the distributional results do not seem to be sensitive to the choice of either of these equivalence scales. Once individuals are placed in wealth quintiles according to their wealth and family size under the base system, the total amount of wealth in each quintile is estimated. This is then compared to the total amount of wealth in each base quintile under each of the reformed systems. Working out the distributional impact in this way, rather than taking the average change in wealth observed across individuals, is designed to make our results less sensitive to any outliers, which is a particular concern given our relatively small sample sizes.

The distributional impact of each of the reforms using the simple equivalence scale is presented in table 11.9. Table 11.10 shows the distributional results, assuming that one fifth of single individuals and one fifth of couples are in each quintile.

Reform 1, which increases the state pension age, unsurprisingly leads to lower levels of average pension wealth. Under the retirement model with a full set of age dummies without any shift in the estimated age effects, the reform leads to average losses across the top three wealth quintiles. This compares to no average loss in the poorest two wealth quintiles. This is caused by the availability of means-tested income support and disability benefit, compensating many of those who are out of work, who do not have a private pension.

Shifting the age effects leads to quite different distributional effects, with those in the poorest two quintiles suffering average losses. This is be-

Table 11.9 **Distributional impact of the reforms, measured by the percent change in pension wealth, using a simple equivalence scale**

	Quintile (%)					
System and retirement model	1 (poorest)	2	3	4	5 (richest)	All (%)
Reform 1						
Full age dummies, no age shift	–0.2	0.4	–5.3	–10.4	–6.7	–5.9
Full age dummies, with age shift	–13.5	–14.1	–13.6	–13.6	–9.9	–12.2
Linear age trend only	12.6	7.8	0.2	–8.0	–5.5	–2.2
Reform 2						
Full age dummies	202.8	35.3	19.2	–19.6	–5.9	13.7
Linear age trend only	209.7	48.3	18.9	–18.5	–8.0	15.0
Reform 3						
Full age dummies	261.0	65.1	38.4	5.2	–1.5	32.1
Linear age trend only	268.0	76.5	41.0	5.4	–3.3	33.6

Note: For details of the specification of the retirement model see section 11.3.

Table 11.10 **Distributional impact of the reforms, measured by the percent change in pension wealth, keeping one-fifth of singles and couples in each quintile**

	Quintile (%)					
System and retirement model	1 (poorest)	2	3	4	5 (richest)	All (%)
Reform 1						
Full age dummies, no age shift	0.9	–1.0	–4.6	–9.8	–7.0	–5.9
Full age dummies, with age shift	–14.4	–14.4	–12.9	–12.7	–10.5	–12.2
Linear age trend only	12.6	6.9	0.6	–7.8	–5.7	–2.2
Reform 2						
Full age dummies	188.6	37.3	16.9	–18.5	–6.9	13.7
Linear age trend only	199.3	44.6	18.6	–19.0	–7.8	15.0
Reform 3						
Full age dummies	239.2	68.2	36.3	6.0	–2.1	32.1
Linear age trend only	248.5	76.7	40.0	4.5	–2.7	33.6

Note: For details of the specification of the retirement model see section 11.3.

cause many individuals are now assumed to retire later as a result of the reform. This means that entitlements to means-tested income support and disability benefit will be reduced (which are included in the estimates of pension wealth, whereas earnings are not). The results from the retirement model that includes only a linear age trend are quite different. These suggest that in fact, on average those in the poorest two wealth quintiles will gain from the reform. However, this feature arises simply from the fact that under this model, many of these individuals estimated to be employed and under the reformed system will be able to continue to accrue an additional entitlement to the SERPS when the state pension is increased. In practice, this appears to be an unreasonable estimate, as demonstrated by the difference in estimated retirement rates shown in figures 11.3, panel A, and 11.5, panel A.

Table 11.9 and table 11.10 also show that under reform 2, individuals are, on average, better off than under the base system. This is due to large increases in the pension wealth of those in the poorest three wealth quintiles, and in particular, very large gains among those in the poorest quintile. Those in the top two wealth quintiles actually lose, on average. These differences are caused by the fact that individuals with higher pension wealth under the base system will be more likely to have a private pension, which they will lose under the reformed system. These distributional results are invariant to the choice of retirement model.

Under reform 3, the average gains across the whole population are larger than under reform 2. On average, all of the quintiles gain from this reform, compared to reform 2. This is because the retention of the basic state pension, means-tested income support, and disability benefit are worth more to each quintile than the fact that the earnings-related component of the

state pension is now capped. On average, compared to the base system, the richest quintile still loses. Again, these distributional results are invariant to the choice of retirement model.

11.6 Summary and Conclusions

The focus of this chapter has been the evaluation of the fiscal and distributive impact of social security pension reform in the United Kingdom. We have considered three reforms to the state pension system that are all designed to increase the retirement age by changing the incentive structure underlying the pension system. The first increased the pension age by three years, the second introduced an actuarial adjustment to retirement before 65 and after 65, allowing deferral to age 70. It also eliminated all other pathways to retirement. The final reform adapted the second reform to include a cap and a floor so as to more closely mirror the existing state pension scheme in the United Kingdom.

The simulations show that increasing the state pension age would lead to a lower level of expenditure on the state pension. The increase in retirement ages would also lead to an increase in government revenues, arising from increased income tax and national insurance contributions. In particular, employee National Insurance receipts would increase, since they would be payable to new increased state pension age. The increase in receipts and reduction in state spending would lead to lower levels of government borrowing (or larger government surpluses) than under the base system. At least in part, this impact will be offset by increased state spending on both means-tested income support and disability benefit.

As age effects are so central to any microeconometric model of retirement transitions, the detailed simulation results were presented for different specifications. For reform 1, in which the state pension age is increased, the important contrast in these different specifications was whether the age dummies were held fixed or allowed to shift in line with the reform. For the first reform, the overall expenditure under the model with the shift in age effects is 11.5 percent lower than under the base case, compared to the 12.1 percent lower found when the age effects are held constant. We also find that, assuming no change in the estimated age effects, employee National Insurance is increased by 20.0 percent. Overall, income tax, national insurance, and VAT revenues are estimated to be 6.1 percent higher. Under the alternative assumption that the increase in the state pension age would also shift the estimated age effects by a full three years, we find that government revenues from each of these sources would be further increased. This is due to the larger increase in average retirement ages that occurs under this assumption. Overall, tax and National Insurance revenues would be 16.9 percent higher than under the base system, compared to the current 6.1 percent.

Both reform 2 and reform 3 represent considerably more generous and

therefore more expensive state pension systems than the existing UK pension system. Under reform 2, this increase in spending is due to a large increase in spending on the state pension, which is partially offset by the fact that there is no spending on means-tested income support or disability benefit. Under reform 3, spending on state pensions is even higher than under reform 2. This shows that the cap on state pension income under reform 3 does not reduce spending sufficiently to finance the (re-) introduction of a floor on pension benefits equal to the basic state pension. In terms of government revenues, both reform 2 and reform 3 lead to higher levels of government receipts.

Appendix

Table 11A.1 **Retirement transition models, with a full set of time dummies and with a linear time trend only**

	Full set of time dummies		Linear time trend only	
Variable	Men	Women	Men	Women
Total wealth	0.0608		0.0631	
	(0.0164)		(0.0163)	
Option value	–0.5145		–0.4446	
	(0.3476)		(0.0326)	
Spouse pension wealth	0.0280		0.0269	
	(0.0108)		(0.0107)	
Net earnings	–0.0039		–0.0021	
	(0.0047)		(0.0046)	
Net earnings^2	0.0001		0.0001	
	(0.0001)		(0.0001)	
Partners net earnings	–0.0066		–0.0068	
	(0.0029)		(0.0029)	
Partner's net earnings^2	0.0002		0.0002	
	(0.0001)		(0.0001)	
Female dummy		0.1252		0.9176
		(0.1611)		(0.2186)
Age difference	–0.0042	–0.0065	–0.0038	–0.0064
	(0.0023)	(0.0039)	(0.0022)	(0.0039)
Job tenure	0.0000	0.0028	0.0005	0.0028
	(0.0014)	(0.0015)	(0.0014)	(0.0015)
Percent full-time employment	0.0535	0.0214	0.0461	0.0284
	(0.0380)	(0.0403)	(0.0377)	(0.0405)
Education dummy	–0.0210	–0.0088	–0.0188	–0.0191
	(0.0196)	(0.0248)	(0.0199)	(0.0235)
Health score	0.0228	0.0230	0.0196	0.0206
	(0.0094)	(0.0106)	(0.0095)	(0.0107)
Partner's health score	–0.0090	–0.0201	–0.0110	–0.0176
	(0.0067)	(0.0123)	(0.0068)	(0.0122)

(*continued*)

Table 11A.1 (continued)

	Full set of time dummies		Linear time trend only	
Variable	Men	Women	Men	Women
Renter	–0.0177	–0.0053	–0.0165	–0.0057
	(0.0223)	(0.0306)	(0.0225)	(0.0306)
Mortgage	–0.0357	–0.0293	–0.0366	–0.0289
	(0.0202)	(0.0226)	(0.0203)	(0.0229)
Industry				
Engineering	0.0525	–0.0382	0.0482	–0.0439
	(0.0433)	(0.0438)	(0.0423)	(0.0415)
Manufacturing	–0.0006	n.a.	0.0039	n.a.
	(0.0373)	n.a.	(0.0379)	n.a.
Distribution	–0.0053	0.0398	0.0059	0.0328
	(0.0343)	(0.0704)	(0.0365)	(0.0675)
Services	–0.0540	–0.0310	–0.0500	–0.0400
	(0.0246)	(0.0446)	(0.0259)	(0.0429)
Government	–0.0122	–0.0070	0.0090	–0.0176
	(0.0407)	(0.0597)	(0.0467)	(0.0551)
Spouse retired	0.0688	0.1170	0.0756	0.1069
	(0.0395)	(0.0550)	(0.0396)	(0.0534)
Occupational pension	0.6049	0.0290	0.060	0.0148
	(0.0252)	(0.0372)	(0.0245)	(0.0350)
£1–£3,000 wealth	0.0235	–0.0119	0.0246	–0.0016
	(0.0302)	(0.0307)	(0.0302)	(0.0328)
£3,000–£10,000 wealth	0.0358	0.0339	0.0361	0.0435
	(0.0371)	(0.0457)	(0.0369)	(0.0480)
>£10,000 wealth	0.0233	–0.0326	0.0325	–0.0226
	(0.0390)	(0.0330)	(0.0403)	(0.0366)
Missing wealth	0.0414	–0.0480	0.0672	–0.0445
	(0.0613)	(0.0373)	(0.0659)	(0.0401)
Linear age term	n.a.	n.a.	0.0305	0.0211
	n.a.	n.a.	(0.0042)	(0.0054)
Age				
57	0.0298	–0.0218	n.a.	n.a.
	(0.1187)	(0.0590)	n.a.	n.a.
58	0.0003	0.0010	n.a.	n.a.
	(0.0956)	(0.0642)	n.a.	n.a.
59	0.0134	–0.0096	n.a.	n.a.
	(0.1013)	(0.0592)	n.a.	n.a.
60	–0.0031	0.1961	n.a.	n.a.
	(0.0916)	(0.1102)	n.a.	n.a.
61	0.1024	0.1247	n.a.	n.a.
	(0.1001)	(0.1010)	n.a.	n.a.
62	0.0142	0.0713	n.a.	n.a.
	(0.1016)	(0.0937)	n.a.	n.a.
63	0.0980	0.1270	n.a.	n.a.
	(0.1420)	(0.1182)	n.a.	n.a.
64	0.1365	0.0997	n.a.	n.a.
	(0.1595)	(0.1256)	n.a.	n.a.

Table 11A.1 (continued)

	Full set of time dummies		Linear time trend only	
Variable	Men	Women	Men	Women
65	0.5369	0.4000	n.a.	n.a.
	(0.2002)	(0.1816)	n.a.	n.a.
66	0.2555	0.5152	n.a.	n.a.
	(0.2157)	(0.3772)	n.a.	n.a.
67	0.3585	n.a.	n.a.	n.a.
	(0.2382)	n.a.	n.a.	n.a.
68	0.2615	n.a.	n.a.	n.a.
	(0.2455)	n.a.	n.a.	n.a.
69	0.4353	n.a.	n.a.	n.a.
	(0.2655)	n.a.	n.a.	n.a.
70	0.7241	n.a.	n.a.	n.a.
	(0.2226)	n.a.	n.a.	n.a.
No. of observations	1,998		1,998	
Pseudo R^2	0.197		0.153	
Log likelihood	–661.525		–697.758	

Notes: Marginal effects are reported. Standard errors in parentheses. n.a. = not applicable.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Table 11A.2 **Total fiscal impact of reform**

	Present discounted value				Total change relative to base (%)		
	Base	Three-Year	Common	Modified	Three-Year Reform	Common Reform	Modified Reform
			Option value linear age (S1)				
Benefits							
State pension	25,134	19,094	74,080	80,446	–24.0	194.7	220.1
Invalidity benefit	1,754	2,606	0	439	48.6	–100.0	–75.0
Income support	5,679	2,309	0	1,123	–59.3	–100.0	–80.2
Total	32,567	24,009	74,080	82,008	–26.3	127.5	151.8
Taxes							
Employee National Insurance	5,679	6,752	6,858	6,666	18.9	20.8	17.4
Employer National Insurance	7,441	7,769	8,529	8,207	4.4	14.6	10.3
Income tax	29,706	30,959	41,579	40,819	4.2	40.0	37.4
VAT	11,023	10,905	17,003	16,667	–1.1	54.3	51.2
Total	53,849	56,385	73,970	72,359	4.7	37.4	34.4
			Option value—Age dummies (no shift) (S2)				
Benefits							
State pension	24,733	18,741	73,498	80,087	–24.2	197.2	223.8
Invalidity benefit	2,619	3,685	0	731	40.7	–100.0	–72.1
Income support	765	2,297	0	954	200.3	–100.0	24.7
Total	28,117	24,723	73,498	81,772	–12.1	161.4	190.8

Taxes							
Employee National Insurance	5,354	6,427	6,828	6,561	20.0	27.5	22.6
Employer National Insurance	7,045	7,457	8,546	8,128	5.8	21.3	15.4
Income tax	28,156	29,755	41,769	40,590	5.7	48.8	44.2
VAT	10,637	10,660	17,102	16,593	0.2	60.8	56.0
Total	51,192	54,299	74,245	71,872	6.1	45.0	40.4
			Option value—Age dummies (with shift) (S3)				
Benefits							
State pension	24,733	19,739	73,498	80,087	–20.2	197.2	223.8
Invalidity benefit	2,619	3,671	0	731	40.2	–100.0	–72.1
Income support	765	1,470	0	954	92.2	–100.0	24.7
Total	28,117	24,881	73,498	81,772	–11.5	161.4	190.8
Taxes							
Employee National Insurance	5,354	6,758	6,828	6,561	26.2	27.5	22.6
Employer National Insurance	7,045	8,261	8,546	8,128	17.3	21.3	15.4
Income tax	28,156	33,130	41,769	40,590	17.7	48.3	44.2
VAT	10,637	11,716	17,102	16,593	10.1	60.8	56.0
Total	51,192	59,866	74,245	71,872	16.9	45.0	40.4

Table 11A.3 **Decomposition of the total effect of reform**

	Change in present discounted value								
	Three-Year Reform			Common Reform			Modified Common Reform		
	Mechanical	Behavioral	Total	Mechanical	Behavioral	Total	Mechanical	Behavioral	Total
				Option value linear age (S1)					
Benefits: Total	–8,806	247	–8,558	43,165	–1,651	41,513	49,552	–111	49,441
Taxes: Total	132	2,404	2,536	10,469	9,652	20,121	12,500	6,010	18,510
Net change	–8,938	–2,157	–11,094	32,696	–11,303	21,392	37,052	–6,121	30,931
Change as % of base benefits	–27.4	–6.6	–34.1	100.4	–34.7	65.7	113.8	–18.8	95.0
				Option value—Age dummies (no shift) (S2)					
Benefits: Total	–3,894	500	–3,394	47,807	–2,426	45,381	54,374	–719	53,655
Taxes: Total	599	2,485	3,084	7,080	9,508	16,588	8,009	6,714	14,724
Net change	–4,494	–1,985	–6,478	40,727	–11,934	28,793	46,364	–7,433	38,932
Change as % of base benefits	–16.0	–7.1	–23.0	144.8	–42.4	102.4	164.9	–26.4	138.5
				Option value—Age dummies (with shift) (S3)					
Benefits: Total	–3,894	658	–3,236	47,807	–2,426	45,381	54,374	–719	53,655
Taxes: Total	599	6,996	7,595	7,080	9,508	16,588	8,009	6,714	14,724
Net change	–4,494	–6,338	–10,831	40,727	–11,934	28,793	46,364	–7,433	38,932
Change as % of base benefits	–16.0	–22.5	–38.5	144.8	–42.4	102.4	164.9	–26.4	138.5

Table 11A.4 Distributional analysis: Option value—Linear age (S1)

	Present discounted value				Change relative to base		
	Base	Three-Year	Common	Modified	Three-Year Reform	Common Reform	Modified Reform
			Quintile 1 (highest)				
After-tax income	13,512	12,748	12,463	13,141	–764	–1,049	–371
Change as % of base benefits					–5.7	–7.8	–2.9
			Quintile 2				
After-tax income	7,848	7,232	6,360	8,199	–615	–1,487	352
Change as % of base benefits					–7.8	–19.0	4.9
			Quintile 3				
After-tax income	6,217	6,254	7,371	8,705	37	1,155	2,488
Change as % of base benefits					0.6	18.6	39.8
			Quintile 4				
After-tax income	4,340	4,640	6,275	7,667	300	1,934	3,327
Change as % of base benefits					6.9	44.6	71.7
			Quintile 5 (lowest)				
After-tax income	2,290	2,579	6,853	7,981	289	4,563	5,691
Change as % of base benefits					12.6	199.3	220.7

Table 11A.5 Distributional analysis: Option value—Age dummies (with shift) (S3)

	Present Discounted Value				Change relative to base		
	Base	Three-Year	Common	Modified	Three-Year Reform	Common Reform	Modified Reform
			Quintile 1 (highest)				
After-tax income	13,440	12,029	12,510	13,161	–1,411	–930	–279
Change as % of base benefits					–10.5	–6.9	–2.3
			Quintile 2				
After-tax income	7,801	6,809	6,359	8,268	–993	–1,442	467
Change as % of base benefits					–12.7	–18.5	6.9
			Quintile 3				
After-tax income	6,270	5,461	7,329	8,545	–809	1,059	2,275
Change as % of base benefits					–12.9	16.9	41.7
			Quintile 4				
After-tax income	4,459	3,816	6,122	7,499	–643	1,663	3,039
Change as % of base benefits					–14.4	37.3	79.6
			Quintile 5 (lowest)				
After-tax income	2,295	1,965	6,624	7,785	–330	4,329	5,490
Change as % of base benefits					–14.4	188.6	279.4

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