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A Lifetime of Changes
State Pensions and Work Incentives at Older Ages in the UK, 1948–2018

James Banks and Carl Emmerson

11.1 Introduction

Over recent decades, older individuals in advanced economies have enjoyed substantial increases in longevity. This is undoubtedly good news, but without adjustments to retirement ages, it does have the consequence of placing a greater strain on all types of pension arrangements. Pay-as-you-go schemes require higher tax rates on the (relatively smaller) working population to finance a given level of retirement benefits, while funded schemes require greater contributions from either government, individuals, or employers or the resulting annual retirement income they are able to deliver will be lower. Given this, it is unsurprising that increased retirement ages are considered, alongside greater pension contributions and reduced pension incomes, as a potential part of the appropriate adjustment to rising longevity at older ages.

This chapter sets out how pension reforms have evolved in the United

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Kingdom and puts this information alongside trends in labor-market participation at older ages. We build on and update analyses that have previously been carried out prior to the most recent policy developments in the last 15 years, such as that contained in the studies of Blundell and Johnson (1999) or Disney and Emmerson (2005). As set out in Wise (2017), male employment rates at older ages have risen markedly across many advanced economies since the mid-1990s, and the UK is no exception, so it is tempting to ask whether such recent trends could be at least partially caused by recent trends in the pension system, and hence we consider our study, along with the other chapters in this volume, to be timely.

In one sense, the UK is a good country for such a study, since, as we show, there has been a sequence of rather major pension reforms—much more so than in most other Organisation for Economic Co-operation and Development (OECD) countries. Some, like the rise in the female state pension age, have reduced the generosity of the system, while others, such as the introduction of the State Earnings-Related Pension Scheme (SERPS) in the mid-1970s or triple-lock indexation in the early 2010s, have made the system more generous. Some have changed the way in which the pension system implicitly taxes or subsidizes an extra year of work at older ages; some have not. But overall, as we will also show, while there have been some quite large changes to the pension wealth of cohorts, in recent years (since the mid-1990s) the public pension system has been largely neutral when it comes to work incentives or disincentives, so in this sense, the UK may be a less satisfactory laboratory for such analysis than some of the other European countries in this volume.

Rather than immediately setting about building a full individual-based option value type of analysis of the effects of pensions on work incentives and employment (as in, e.g., Meghir and Whitehouse 1997; Blundell, Meghir, and Smith 2004) or developing a fully structural dynamic model of public and private pension choices, savings, labor supply, and retirement (as in O'Dea 2018), our goals in this chapter are considerably more modest. We simply set out to characterize the effects of the long history of UK pension reform on a number of different (crude) types of individuals and then relate these reform effects to employment outcomes for the same types. Despite this rather aggregate methodology, we show that the sequence of reforms generates variations over time by sex, education, and single year of age/cohort that allow us to estimate the effects of pension wealth and accrual on employment while controlling flexibly for potentially confounding effects using a full set of dummies for age, education, and time. As well as documenting the effects of the pension reforms on pension wealth and work incentives of each type, we also show that changes in pension wealth and the implicit tax rates on work implied by the pension system have both been statistically significantly associated with changes in employment.

Of course, a range of other factors will be changing over time and also

will potentially impact the labor supply decisions of older individuals. For a recent discussion, see Banks, Emmerson, and Tetlow (2019). These include successive cohorts of individuals approaching retirement ages with higher levels of education, differences in health over time, the changing state of the economy (in particular, the labor demand in industries that different cohorts of older individuals work in), the generosity of other parts of the tax and benefit system, and changes to compulsory retirement ages. Some of these will be controlled for by our empirical methodology, but to the extent that these are correlated with the cohort- and type-specific experiences of pension reform, then their presence would be a limitation on the degree to which any part of our analysis could be interpreted as indicating causal evidence in favor of the hypothesis that the employment outcomes of older adults respond to the financial incentives in state pensions as would be predicted by a standard economic model.

One final aspect, however, that directly relates to financial incentives to retire will be the incentives coming from private pension arrangements, which may well be changing over time and across types in a way that is correlated with state pension changes. We attempt to provide some very simple approximations for such arrangements in our final simulations and empirical estimations and show that, if anything, this strengthens our conclusions.

The remainder of this chapter is structured as follows. Section 11.2 begins by describing historical trends in employment rates by age and sex and then goes on to outline the reforms to the UK state pension system in some detail. Section 11.3 explains how we approach the simulation of state pension entitlements and the implied work disincentives for men and women born in different years and with different earnings profiles and documents the resulting variation seen over time as successive reforms take effect. The results from assessing the effect of changing financial incentives from the state pension system on employment rates are presented in section 11.4. Section 11.5 concludes.

11.2 Historical Background and Context

11.2.1 Labor Market Trends

The UK is no exception to the broad international picture, shown in Wise (2017), of rising male labor market participation at older ages since 1995. Having fallen sharply during the late 1970s and the first half of the 1980s, employment rates of men aged 55 to 69 have risen since the mid-1990s. Figure 11.1, which uses data from the UK *Labour Force Survey* (LFS), shows that the increase has been common across each five-year age group within the male 55 to 69 population (the employment rate for each group in 2017 was 12 to 14 percentage points higher than its low in the mid-1990s). Since the earlier decline in employment among men aged 65 to 69 was smaller, this

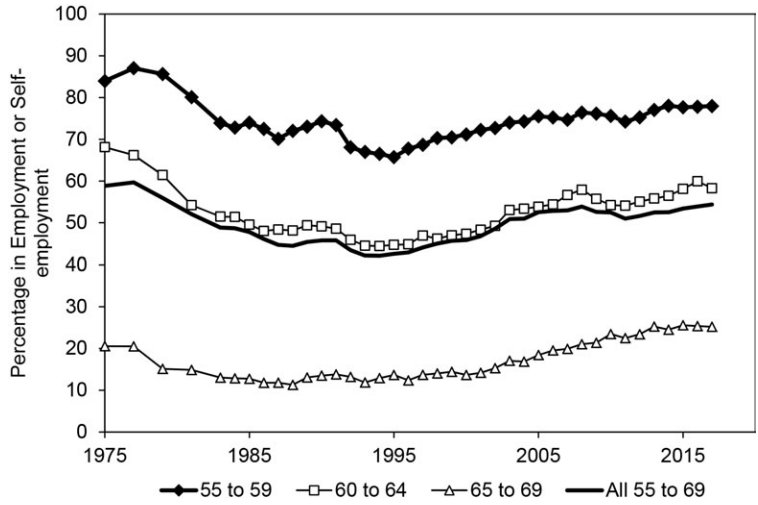

Fig. 11.1 Employment rates of men, by age band, 1975–2017
Source: Labour Force Survey.

means that the employment rate of this group of older men—which now stands at 25 percent—is at its highest level for at least 40 years. In contrast, the employment rates of men aged 55 to 59 and men aged 60 to 64, while at levels not seen since the start of the 1980s, remain quite some way below their level in the mid-1970s.

As is also seen in other advanced economies, the trends in employment rates among older women have been markedly different from those seen among older men. These were relatively flat during the late 1970s and most of the 1980s, rose gradually through the second half of the 1990s, and have risen particularly sharply since then. As a result, the employment rate of women aged 55 to 69, which in 2017 had reached 44 percent, is well above its rate in the mid-1970s and is probably at its highest level ever.

Looking more closely at the employment rates of each five-year age group shown in figure 11.2, a particularly sharp increase can be seen among women aged 60 to 64 since 2010. This coincides with the rise in the female state pension age, described in more detail in the next subsection, with this being the earliest age at which a state pension can be received in the UK (and is the only focal age in the UK state pension system). The female state pension age was 60 in 2010 and has risen gradually since such that by the end of 2018, it aligns with the state pension age for men age 65 (before both the male and female state pension ages rise further so that they reach age 66 in October 2020). Separating out the effect of this reform from other labor market trends, Cribb, Emmerson, and Tetlow (2016) show that the rise in the female state pension age for women aged 60 to 62, which occurred between

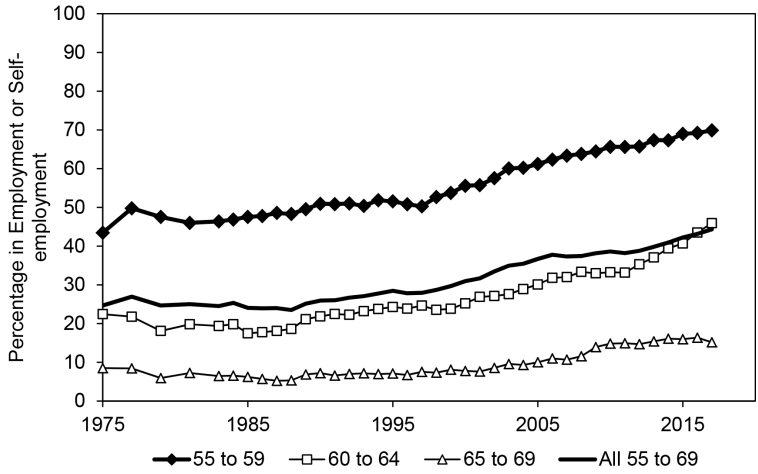

Fig. 11.2 Employment rates of women, by age band, 1975–2017
Source: Labour Force Survey.

April 2010 and March 2014, caused a sizeable 6.3 percentage point increase in the employment rate of women aged 60 and 61. Despite these increases in employment—and those seen among the other age groups presented in figure 11.2—the employment rates of older women still remain some way below those seen among older men.[1]

11.2.2 Institutional Changes and Pension Reforms

The modern UK state pension system came into being in 1948, when the basic state pension was introduced as a result of the National Insurance Act of 1946, which was the then Labour government's response to the Beveridge Report. Consistent with trying to tackle the five "giant evils" of want, disease, ignorance, squalor, and idleness, the intention was not that this pension would provide individuals with a standard of living related to that which they enjoyed during their working life but instead that it would provide insurance against income poverty in old age. Therefore, while the pension did depend on the *number* of contributions that had been made during working life, it did not depend on the *level* of those contributions. So those who paid national insurance contributions (NICs) for 90 percent (or more) of their working lives (post-1948) received the same flat-rate state pension from the state. This was payable from age 60 for women and from age 65 for men. And

1. While it is not the topic of this chapter, recent years of data from the English Longitudinal Study of Ageing or Labour Force Study reveal that all of this difference between male and female employment rates can be accounted for by different probabilities of self-employment. If one looks at employees only, then participation rates for older men and women aged 50–60 are now equal.

unlike in many other countries, individuals did not (and still do not) have to withdraw from the labor market to receive their state pension.

The next important reform was the Social Security Act of 1975, which had three major elements. First, the value of the state pension—which until then had been indexed on an ad hoc basis—was to increase each year by the greater of growth in prices or earnings (a "double lock"). Second, since married women with children would be particularly likely not to qualify for a full basic state pension (due to being in paid work for less than 90 percent of a full working life), the Home Responsibilities Protection (HRP) was introduced, which reduced the length of what was deemed to be a full working life due to periods spent with certain formal caring responsibilities (such as being in receipt of child benefit), though at least 20 years of paid contributions were still required to receive a full basic state pension. Third, from April 1978, it introduced SERPS, the UK's first significant earnings-related state pension arrangement. This was in response to a concern with the roughly 50 percent of the workforce that did not have access to any occupational pension, as their employer did not offer one.

In terms of significance, the second element of the 1975 act is the one that has best stood the test of time—with subsequent reforms consistently reinforcing this and moving in the direction of further increasing the generosity of how the basic state pension treats periods out of the labor market. But it was the third element, the introduction of SERPS, that was structurally and financially the most significant, and it was one that was gradually unpicked by successive reforms over the following 40 years.

The 1975 act had made the UK state pension system much more generous. But as the implications of this for the UK taxpayer became apparent (Hemming and Kay 1982), reforms in the 1980s and 1990s moved in the opposite direction: they reduced the generosity of the offer from the state and therefore the cost to the public purse. There were three major reforms over this period:

- The 1980 Social Security Act removed the earnings link. The value of the basic state pension was instead formally indexed in line with growth in prices (as measured by the Retail Prices Index). While SERPS accrual would still depend on average earnings growth during an individual's working life, once in payment it would also be formally indexed to growth in prices rather than to the greater growth in prices or earnings.
- For those reaching state pension age after 2000, the 1986 Social Security Act reduced the generosity of SERPS considerably through two changes. First, the accrual rate was gradually reduced from 25 percent of band earnings for years in work after 1988 down to 20 percent of band earnings, thereby at a stroke reducing its long-run generosity by a fifth. Second, entitlements became based on earnings over a full working life (from age 16 to state pension age, with years not in paid work

counted as having earnings of zero) rather than being based on the highest-earning 20 years of paid work (but years of working life prior to 1978 were still not included, so this did not affect those reaching the state pension age within 20 years of 1978). A further change was, from 1989, the abolition of the state pension earnings test. Prior to this, individuals who remained in paid work in the first five years of reaching the state pension age would, if their earnings were sufficiently high, see their state pension clawed back. Further details—and an assessment of its impact on labor supply—can be found in Disney and Smith (2002).

- The 1995 Pensions Act further reduced the generosity of SERPS. A technical change was made to the formula that had the effect of reducing band earnings. In addition, in response to a European Court of Justice ruling that pensionable ages that vary by gender should be phased out, this act legislated for a rise in the female state pension age from 60 to 65 over the 10 years from 2010 so that by 2020 it would be aligned with the male state pension age.

Concern with the UK pension system subsequently switched from being primarily about whether the implied cost of the state pension system would be one that the taxpayer was willing to bear, given projections of the aging population, to being about concerns regarding the overall adequacy of retirement provision (i.e., whether individuals were going to provide enough retirement support for themselves in order to offset the reducing state earnings–related benefits). The Child Support, Pensions, and Social Security Act of 2000, which came into force in April 2002, replaced SERPS with the State Second Pension (S2P). This provided a more generous second-tier state pension than SERPS to low and middle earners. In addition, for the first time, it provided a second-tier pension accrual to those with certain formal caring responsibilities (primarily those receiving child benefit in regard to a child under age five).

This was followed by the 2007 Pensions Act, which legislated for the restoration of the earnings link for the basic state pension (but not SERPS or S2P in payment), reduced the number of years of contributions required for a full basic state pension to 30 (for those reaching the state pension age after April 2010), removed the requirement to have to contribute for at least 25 percent of a full working life to receive any state pension, and going forward replaced HRP with a more generous system of credits for those with formal caring responsibilities. It accelerated the differential indexation of parameters in the system—which would, in the long run, return the UK to having a flat-rate state pension—and acknowledged that S2P was evolving to be, eventually, a flat-rate top-up to the (still flat rate) basic state pension. The cost of these reforms was partially offset by increases in the state pension age for men and women to 66, 67, and then 68 that were legislated to take place in the mid-2020s, mid-2030s, and mid-2040s.

Two further changes followed in 2011. First, the government announced that rather than index the basic state pension to earnings, it would instead move to a system of "triple lock" indexation, where it would be uprated each year by the greater of growth in prices (as measured by the consumer price index), growth in earnings, or 2.5 percent. Second, the increase in the female state pension age to 65 was accelerated so that it would be complete by the end of 2018, and the increase in the male and female state pension age from 65 to 66 was brought forward so that it would now be complete by October 2020.

Finally—at least for now—2014 saw a further very radical reform. For those reaching the state pension age from April 2016, the basic state pension, SERPS, and S2P are abolished and replaced with a new single-tier pension. This is a flat-rate pension for which 10 years of contributions (either paying NICs or receiving credits) are required to receive any pension (mainly removing state pension entitlements to some who work in the UK only for a relatively short time) and 35 years are required to receive the full amount. This is more than the 30 years required for a full basic state pension but fewer than that required for a full entitlement to S2P (which was 50 years for someone with a state pension age of 66). This will eventually make the UK state pension system much simpler: the only parameters will be the state pension age, the weekly amount of flat-rate pension per year of contributions (currently £164.35/35) and how it is indexed (currently triple-lock indexation), the contributions required to receive any pension (currently 10 years), and the number required to get the full pension (currently 35 years). This simplicity may—though this is as yet unproven—have the added benefit of being more stable over time.

The single-tier pension reform is backdated, so someone reaching the state pension age in April 2016 with 35 years of contributions up to that point could receive a full single-tier pension. But in addition, rights accrued up to April 2014 (when the legislation was passed) are protected: if, on reaching the state pension age, the amount of state pension already accrued up to April 2014 is greater than the amount of single-tier pension that person can qualify for, then he or she will receive the greater amount. The value of the full single-tier pension has been set such that it is more generous than the full basic state pension but less generous than the full basic state pension plus the maximum entitlement to S2P. Therefore, the new system is more generous to those who would not accrue any or much S2P (e.g., the lifetime self-employed who did not qualify for any SERPS or S2P and, in the near term, those who had long periods contracted out of the second-tier state system prior to this option being removed[2]) and less generous to those with

2. Contracting out was abolished for defined contribution arrangements from April 2011 and for defined benefit arrangements from April 2016. As a result, employees—and, where those employees had been contracted out into occupational pension arrangements, their employers—pay more NICs, but in return are not opting out of part of the state pension.

long working lives on higher levels of earnings. On average, over the longer term (once the protection for already-accrued rights has worked through), the reform makes the system less generous overall, with most individuals receiving a lower state pension than they would have done under the system it replaced—with the noticeable exception of the lifetime self-employed (Crawford, Keynes, and Tetlow 2016).

The 2014 Pensions Act also sped up the increase in the male and female state pension age to age 67, bringing it forward by eight years so that it will now occur between 2026 and 2028. This does not affect the generosity of the system in the long run but does make it less generous—and therefore less expensive—in the eight-year window, where the state pension age is now going to be higher than it would otherwise have been. The key features of these reforms are summarized in the timeline presented in figure 11.3.

One way of showing how these reforms have affected the generosity of the UK state pension system is to calculate the state pension entitlements of example individuals who are alike in many aspects but who differ in terms of their year of birth and who therefore at a given age face different state pension rules. Updating the calculations of Disney and Emmerson (2005), we take data on individuals born in the five years centered around 1952 (i.e., 1950 to 1954 inclusive) from the Family Expenditure Survey (FES) from 1968 to 2014, adjust for inflation, and calculate the median earnings among men and women who are in paid employment at each age. This provides us with a "midearning" profile for men and women from age 18 to age 62. We then assume that the earnings of earlier and later birth cohorts at the same ages are 2 percent per year higher or lower in real terms due to economy-wide real earnings growth. Adjusting back for inflation to each year's price level gets us nominal earnings at each age for each year of birth.

With an earnings profile for each cohort (defined by the year in which the cohort reaches age 65), we are then able to estimate the resulting state pension entitlements for our "midearning" men and our "midearning" women for different years of birth, with an additional assumption of their being in continuous employment from age 18 to age 62 (and not being in paid work outside those years). Since the reforms described above happen to each cohort at different ages in their lifecycle, there is considerable variation in the value of the resulting state pension by year reaching retirement age. The results for men, for those reaching age 65 between 1950 and 2050 (i.e., born between 1885 and 1985), are shown in figure 11.4. The equivalent results for women, for those reaching age 60 between 1950 and 2050 (i.e., born between 1890 and 1990), are shown in figure 11.5.

For those reaching the state pension age between 1950 and 1978, the generosity of the system is entirely governed by the value of the basic state pension. Over this period, it was indexed sporadically, increasing overall relative to both prices and earnings but with some years in which its value fell with respect to both. Since our midearning female earns less than our

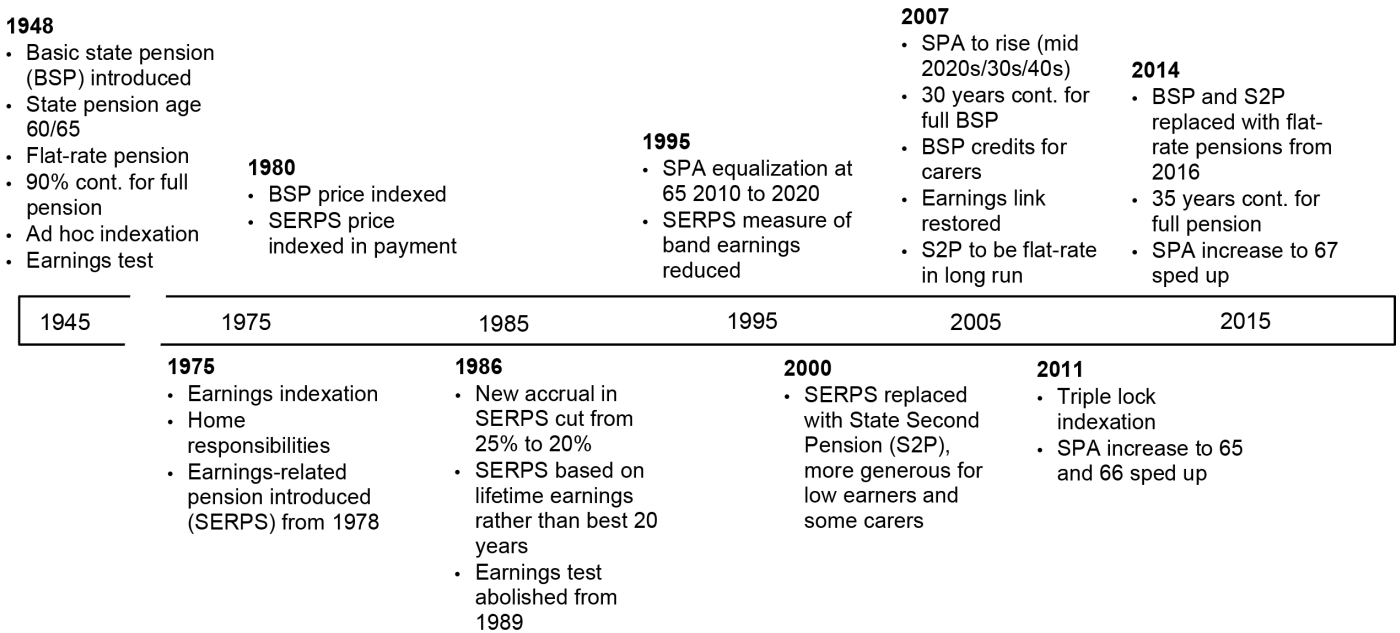

Fig. 11.3 Timeline of UK state pension reforms: Beveridge to 2017

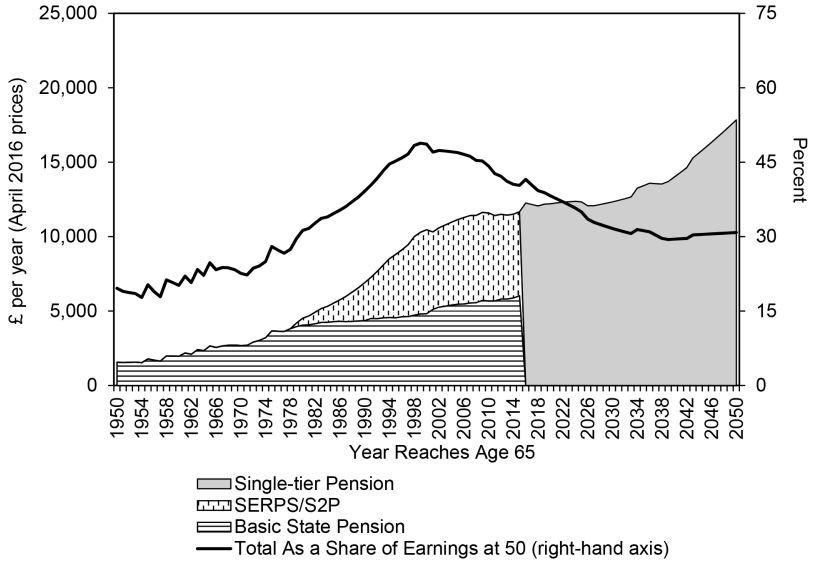

Fig. 11.4 Simulated value of state pension at state pension age over time, "midearning" male

Source: Authors' calculations using earnings profiles estimated from the Family Expenditure Survey, 1968–2014.

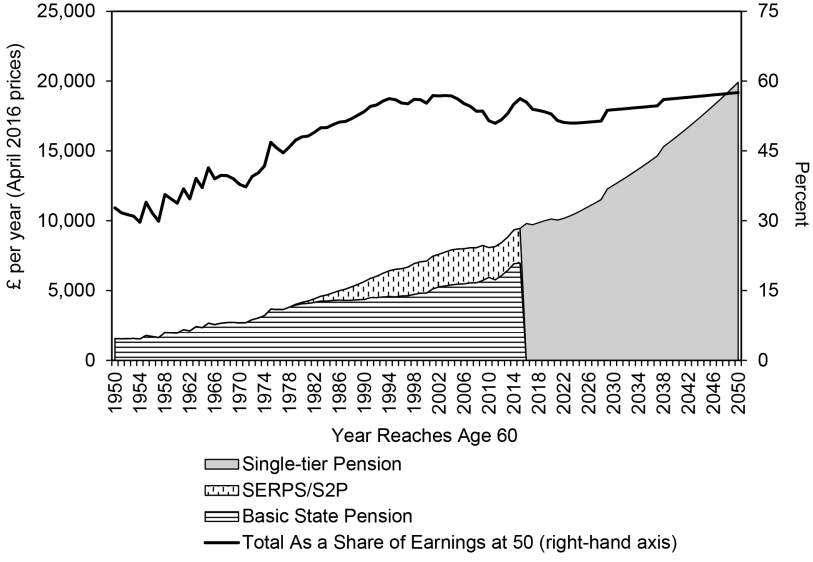

Fig. 11.5 Simulated value of state pension at state pension age over time, "midearning" female

Source: Authors' calculations using earnings profiles estimated from the Family Expenditure Survey, 1968–2014.

midearning male, the basic state pension is worth a greater share of her earnings at age 50 than his.

For those reaching the state pension age between 1978 and 2000, the system is more generous the later the individual's year of birth. This is because entitlement to SERPS depends on earnings in years beyond April 1978 (but before the state pension age), so those born later have more years of working-age life post-1978 in which to accrue entitlement. This is more than sufficient to outweigh the reduction in the basic state pension, relative to earnings, arising from it being indexed to growth in prices. This is especially true of our midearning male, as his greater earnings accrue him a larger SERPS entitlement than our midearning female.

As the original SERPS was based on the highest-earning 20 years and the subsequent cuts to SERPS only applied to those reaching the state pension age after 1998, the generosity of the UK state pension peaks for men reaching the state pension age around the turn of the century. But even then, for our midearning male, the UK state pension system does not provide a replacement rate above 50 percent of their earnings at age 50. Thereafter the generosity of the system is calculated to rise slightly in real terms but to fall relative to earnings at 50. This continues until the impact of triple-lock indexation, which causes the generosity of the state pension to ratchet up relative to earnings over time, starts to outweigh the impact of other cuts to the state pension.

For our midearning female, the cuts to SERPS are less important, since her lower earnings meant that she would have had a lower entitlement anyway. More important is the indexation of the basic state pension, with the triple lock boosting the value of the state pension after 2011, and the introduction of the single-tier pension, which is more generous to lower earners reaching the state pension age from 2016 onward.

The figures above focus on the annual state pension income that would be received by our example men and women in the first year after they reach the state pension age, with our example individuals being in paid work continuously from age 18 to 62. This means that the impact of two important aspects of the reforms of the last 40 years is not shown here. First, the treatment of periods out of paid work due to having certain formal caring arrangements has been made more generous. This will mean that, in particular, the system has become more generous for women with children in a way that is not captured in the figures. This will be particularly the case for married women who had children after 1977.[3] Second, the increase in the state pension age represents a significant cut to the total amount of state pension that some individuals can expect to receive but not a significant change to the amount

3. HRP was introduced from 1978. Note that women born after 1932—who therefore reached age 16 after the introduction of the state pension in 1948—are the ones who would have otherwise needed the most years in paid work to receive a full state pension.

per year received once the state pension age has been reached. Under current legislation between 2010 and 2050, the male state pension age will have increased by three years from 65 to 68, while the female state pension age will have increased by eight years from 60 to 68.

The remaining sections of this chapter simulate the pension wealth and work incentive consequences of these reforms in more detail and use the resulting information to quantify the extent to which the changes in financial incentives arising from these reforms have affected employment outcomes at older ages.

11.3 Simulations

11.3.1 Lifetime Earnings Profiles

For the main simulations in what follows, we not only take men and women with different years of birth but also construct our measures for low-, mid-, and high-earning individuals in each group in order to examine the differential effects of the pension reforms across the lifetime earnings distribution. The construction of the earnings profiles that crucially underlie the simulations is done in two different ways. First, as in other chapters in this volume, we utilize the common earnings profiles constructed for use across all countries, as described in the introduction to this volume. These provide us with a prototype "shape" of a lifetime earnings profile for men and women with low, mid, and high earnings (i.e., six person types in total), with each profile normalized to one at age 50. To apply these to the UK context, we pool data on 49- to 51-year-olds from the 2015 and 2016 waves of the LFS (with the 2015 data uprated to 2016 prices) and use these data to estimate median earnings at age 50 for those with low, middle, and high levels of education, split separately by sex.[4] These six earnings levels are then applied to the relevant common profile, which gives us the lifetime profile for each type of group within the cohort that reaches age 50 in 2016. We then assume that economy-wide productivity growth will be (and always has been) 2 percent per year—so that successive birth cohorts are assumed to earn 2 percent more than their predecessors at each age, giving us real earnings profiles for earlier and later cohorts. And to get nominal earnings in different years (since this will often matter for the rules governing the pension system), we reflate or deflate these profiles by the retail price index (RPI).

In order to consider the sensitivity of our calculations to the use of these common earnings profiles, we also compute a set of UK-specific earnings profiles. If we were running a full microsimulation or dynamic programming

4. Despite the large sample size of the LFS, we need to pool years in order to boost the sample size, since we are dealing with a very small age window and six types of people within that window.

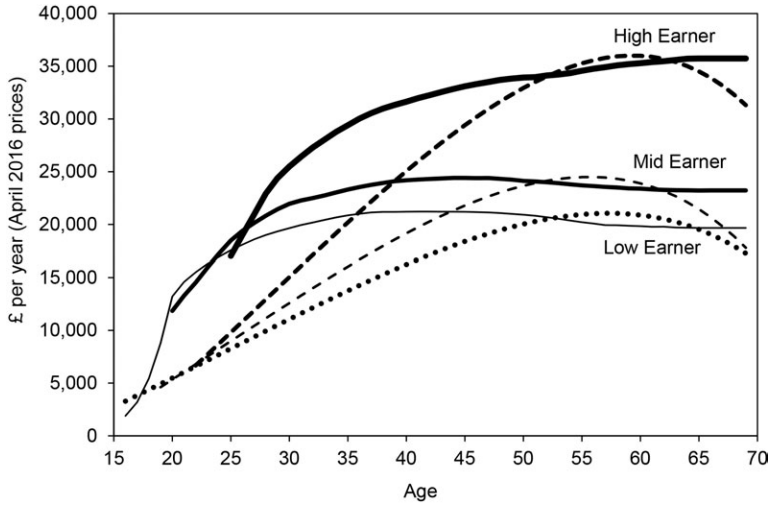

Fig. 11.6 Common earnings profiles and cross section profile against actual cohort profile, men born in 1952, by earnings

model of the effects of the pension reforms, we would want to pay particular attention to the estimation of earnings dynamics and ideally use a sophisticated econometric model of earnings processes estimated from the long time series of panel data available in the UK from the British Household Panel Survey and Understanding Society studies. But our goals in this chapter are different, and we want a UK-specific earnings process that is not too dissimilar to the common profiles in spirit, so we instead construct a simple shape for lifetime income based on the LFS data. We once again take the most recent two years of LFS data and, using data on all individuals aged 18–65, estimate a quantile (median) regression of earnings on age and age squared, with estimations carried out separately for each of the six groups (men and women interacted by three education groups). As with the common earnings profile, we then assume economy-wide productivity growth of 2 percent per year to get the shape of the real earnings profile for different birth cohorts and reflate/deflate by household inflation to get nominal earnings in earlier and later years.[5]

5. Ideally, we would use a long time series of repeat cross-sectional data to plot an actual earnings profile for a cohort, as was done for the construction of figure 11.4 in the previous section. Unfortunately, the FES only contains information on education from 1978 onward and therefore cannot yet provide an earnings profile for a full working life if we are to split by education level. In order to investigate this issue, we can, however, compare the earnings profile not split by education from the times series of FES cross-sections to an equivalent one estimated on the basis of the 2015–16 LFS cross section, for the same cohort born in 1952. This is presented in appendix figure 11.A.1 (men) and 11.A.2 (women).

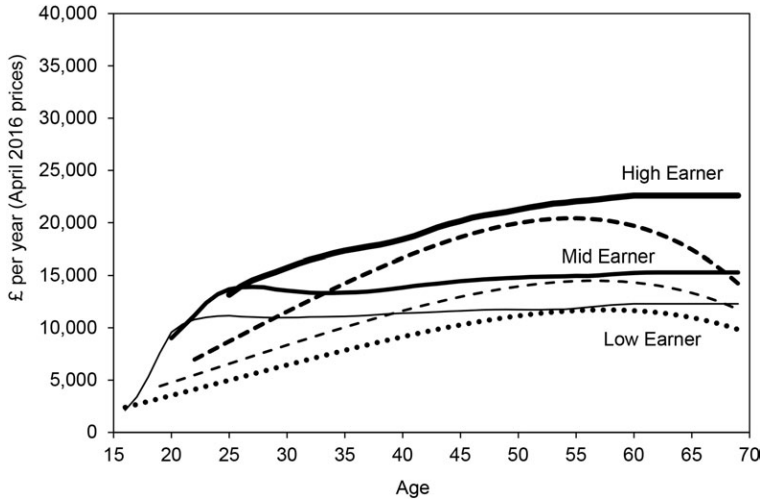

Fig. 11.7 Common earnings profiles v cross section, women born in 1952, by earnings

Sources: Solid lines from the common profiles combined with data from the Labour Force Survey (2015 and 2016). Dotted lines estimated using data from the Labour Force Survey (2015 and 2016).

A comparison of the profiles is shown for men (in figure 11.6) and for women (in figure 11.7). These are shown for the case of our example individuals born in 1952. The solid lines are the "common" profile, while the dotted lines are the profiles estimated from the UK cross-sectional data. The lines are shaded from lightest to darkest in ascending order of education level from low to high. For women, and especially for men, the profiles estimated from UK data show earnings at a lower level earlier in working life and then increasing more quickly with age than the common profile. The profiles estimated from UK data also exhibit more evidence of declining earnings at the oldest working ages. The former will have obvious effects on simulated pension wealth levels, and the latter will have effects on pension accrual at older ages and hence implicit work disincentives.

11.3.2 Social Security Wealth

Using the six common earnings profiles, we then calculate accumulated state pension entitlements at every age from 55 to 69 for men and women from each year of birth from 1881 through to 1995 given the particular set of pension contribution and benefit "rules" each cohort will have lived through by the time they reach retirement. Having done this, we then compute the present discounted value of the resulting future stream of state pension income. To do this, we need to make an assumption about when individuals will die: for this, we take the common life expectancy tables used throughout

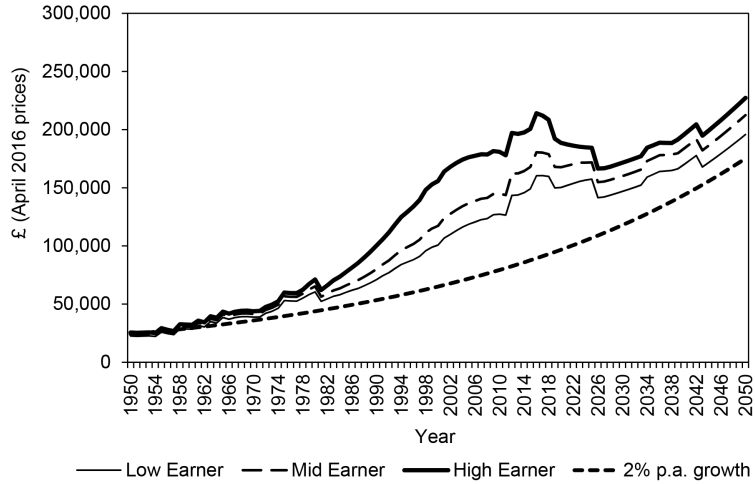

Fig. 11.8 Estimated social security wealth: Man at age 65, by year and earnings level

this volume, as described in the introduction. These give the chance of survival at each age, with a larger chance for women than men and for higher earners than for lower earners, but they do not allow for any improvement in longevity among later birth cohorts. In order to take the present discounted values, we assume a real annual discount rate of 3 percent.

The estimated accumulated level of social security wealth for 65-year-old men, in each year from 1950 to 2050 (under current policy), is shown by the three solid lines in figure 11.8. As before, the lines are shaded from lightest to darkest in ascending order of education level from low to high. The graph reveals that reforms have often changed the level of wealth quite markedly. In particular, the introduction of more generous indexation in 1975 (the double lock), less generous indexation in 1980 (the move to price indexation), and more generous indexation from 2011 (the triple lock) can all be seen. The gradual introduction—and subsequent move away from—an earnings-related state pension can be seen with the difference in entitlements between the lowest and highest education groups increasing over the period from 1978 to the turn of the century (as earnings-related pensions are worth more in cash terms to higher earners) before falling again. The introduction of the single-tier pension in 2016 also boosts average entitlements. Finally, the impact of increases in the state pension age (to 66 in the late 2010s, to 67 in the mid-2020s, and to 68 in the mid-2040s) on reducing accumulated social security wealth can also be clearly seen.

Despite the increases in the state pension age from 65 to 68 over the century from 1950, the generosity of the state pension system for our example

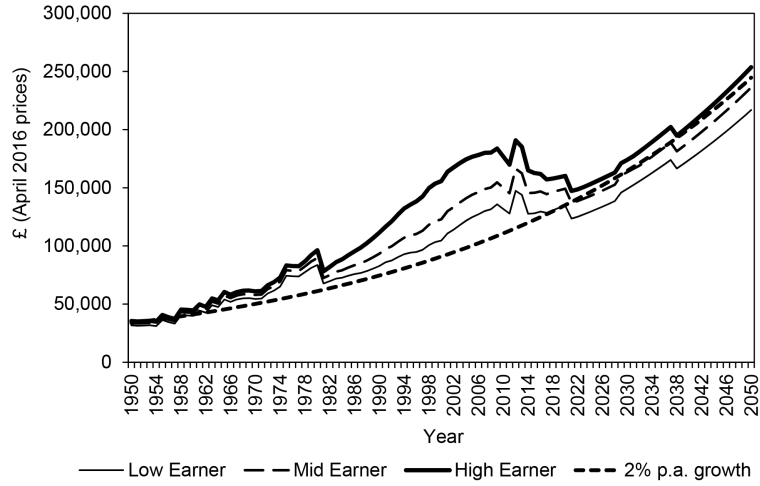

Fig. 11.9 Estimated social security wealth: Woman at age 60, by year and earnings level

men will, at least under current policies, still have grown by more than 2 percent per year in real terms on average.

The equivalent estimates for the accumulated social security wealth of women (instead looking at accumulated wealth at age 60 rather than age 65 given that the former is the most common state pension age for women over this period) are shown in figure 11.9. In many cases, the reforms highlighted above can also be seen to affect the accumulated state pension wealth of women. One notable difference is that the phasing in of SERPS over the 20 years from 1978 boosts the accumulated state pension wealth of women by less than it does for men. This is explained by women having, on average, a lower level of weekly earnings (despite the fact that women are able to receive SERPS for longer as a result of their greater life expectancy and, at least for the period up to the end of 2018, the fact that the female state pension age is lower than the male state pension age). Conversely, women receive a larger boost from the introduction of the single-tier pension (affecting women reaching the state pension age after April 2016), though this only partly offsets a decline in accumulated wealth for successive cohorts reaching age 60 through the 2010s, who have progressively higher state pension ages (the state pension age for women rising from 60 in March 2010 to 66 in October 2020).

In terms of the average increase in the generosity of the state pension system over the entire century from 1950, it is striking that, unlike for men, it will grow (at least under current policies) by less than 2 percent per year in real terms. This is due to the fact that there has been a larger increase in the

female state pension age than in the male state pension age over this period (eight years versus three years). It is, however, worth noting that women with children will have particularly benefited from the increasing generosity of the treatment of the state pension system to periods out of the labor market due to formal caring responsibilities (introduced from 1978), and these benefits are not valued in the example profiles shown here, since these calculations are for women who have been in the labor market for most of their adult lives.

11.3.3 Pension Wealth and Work Incentives

In order to characterize the effects of these pension reforms more fully and begin to document the variation that will be used in our empirical analysis that follows, we construct four different measures of the generosity of the UK state pension system and the financial incentive it provides to remain in paid work. We focus just on the period 1978 to 2017, which is the period where we have employment rates split by education and sex. And we also look at how these measures have been evolving for older adults at different ages in the run-up to the state pension age—that is, from 60 to 64 for males and from 55 to 59 for females.[6]

The evolution of these measures by age and year/cohort is shown in the four panels of figure 11.10 (for midearning men) and figure 11.11 (for mid-earning women), respectively. The top left panel shows the replacement rate, defined here as the present discounted value of state pension wealth divided by earnings at age 50. The top right panel shows accumulated social security wealth (corresponding to figures 11.8 and 11.9). Social security wealth and replacement rates are both typically rising over successive years from the mid-1970s to 2000 as SERPS matures. Older men and women have typically accrued slightly more wealth and therefore have a slightly higher replacement rate than younger men and women. The phasing in of the cuts to SERPS across birth cohorts for those reaching the state pension age after 2000 results in greater differences in accrued wealth, and therefore replacement rates, in the later years. Finally, among women, the impact of the rise in the female state pension age from 60 in 2010 to 65 in 2018 can be seen among successive cohorts of women starting with those aged 55 in 2005 (who are the first cohort to be affected).

The bottom left panel shows state pension accrual. This is defined as the (discounted) increase in social security wealth that individuals would expect to accrue if they were to remain in paid work for one more year and if there were no further reforms to the state pension system implemented net of any employee and employer NICs that would be paid on the earnings. So this is the value, in pounds, of the boost to state pension wealth that one

6. Of course, we have computed corresponding series for all ages between 55 and 69 for both men and women of each earnings/education type, and the full sets of series are used in the estimation that follows, but just these particular age ranges are selected for the purposes of the illustrative figures.

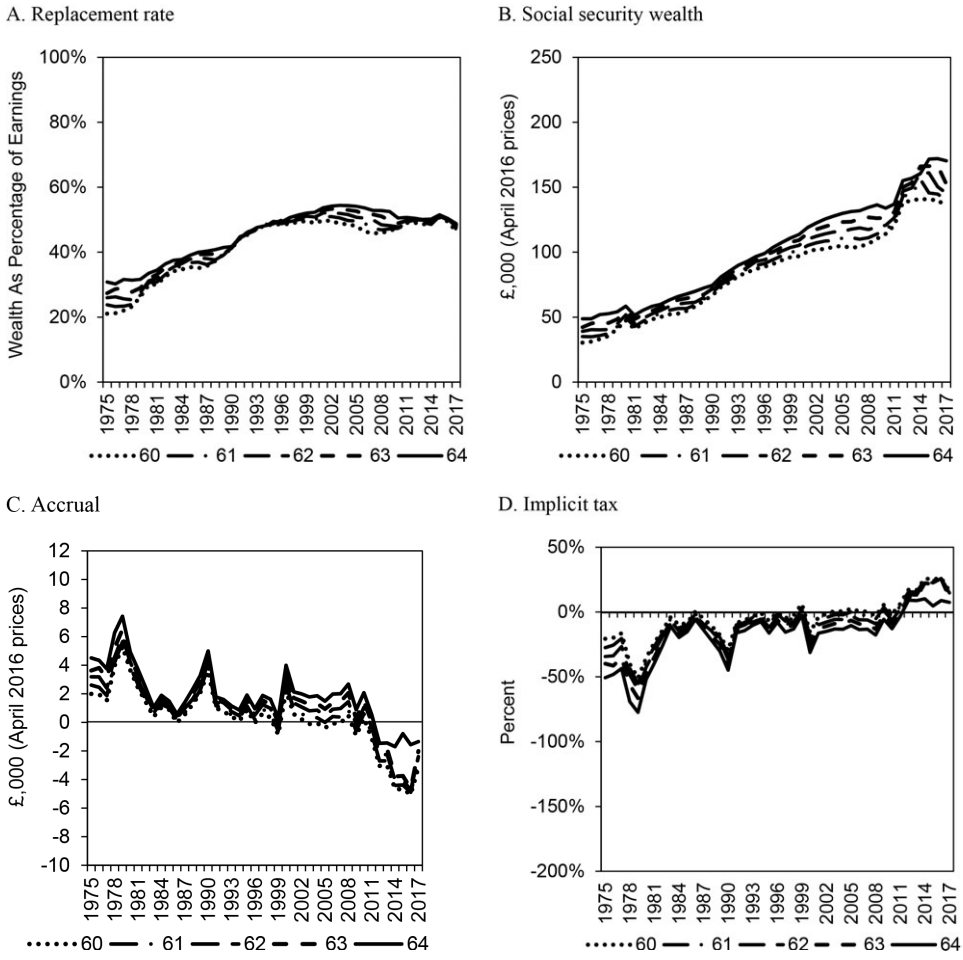

Fig. 11.10 Estimated social security replacement rate, wealth, accrual and implicit tax: midearning men aged 60 to 64, by single year of age; common earnings profile

might expect from remaining in paid work net of the payroll taxes required to finance this. Therefore, positive accrual shows that by remaining in paid work, state pension entitlement would rise by more than the amount of NICs paid, while negative accrual shows that state pension entitlements would rise by less than the additional NICs paid. An oddity for the UK analysis is that NICs payments are not exclusively used for, nor are they the sole funder of, the state pension. Rather, the revenues are pooled with those of other taxes and used as the government sees fit. Increases in the rates of NICs—for example, in 1993, 2002, and 2011—were motivated by other demands on public finances (such as a desire to reduce the deficit or to

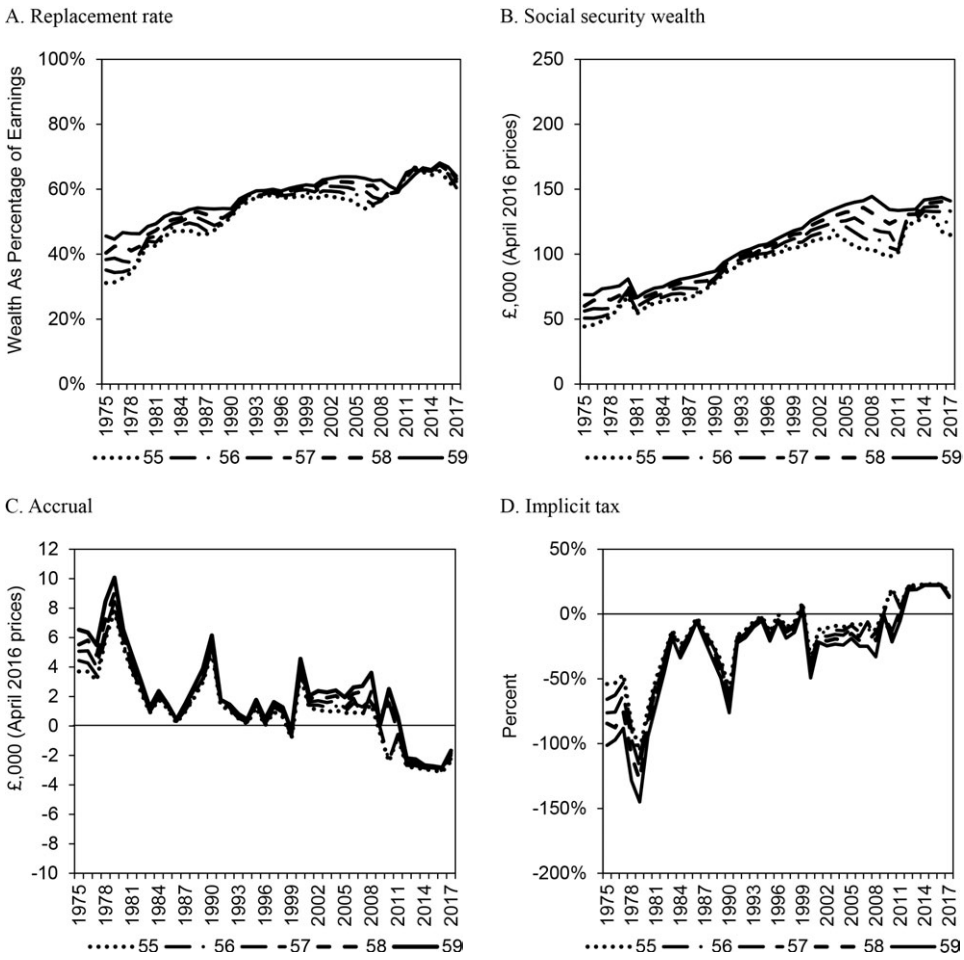

Fig. 11.11 Estimated social security replacement rate, wealth, accrual and implicit tax: midearning women aged 55 to 59, by single year of age; common earnings profile

increase spending on, for example, the National Health Service) rather than a need to finance an increase in spending on the state pension. Conversely, cuts to the state pension have not directly led to cuts in the rates of NICs.

Finally, implicit tax is defined as negative accrual less the impact of any earnings tests, all divided through by the earnings that the individual would expect to receive net of direct taxes.[7] Therefore, a positive implicit tax rate

7. These are computed using OECD statistics on direct taxes on earnings, which do not vary over time but do vary by earnings level. Total cost to the employer of employment is calculated using an employer social security contribution of 9.4 percent, 10.5 percent, or 11.3 percent for low, mid, and high earners, respectively. A direct tax wedge of 28.8 percent, 32.5 percent, and 35.5 percent—again for low, mid, or high earners—is then applied.

shows that the state pension system (combined with the NICs paid on earnings) is imposing, implicitly, a tax on remaining in paid work, whereas a negative rate implies that there is an implicit subsidy. It is worth remembering that, given the age groups presented in these particular figures, these are implicit taxes or subsidies on work in the five years before the state pension age rather than at or after it. At older ages, the key variation comes from the fact that prior to 1989, an earnings test applied to earnings in the first five years after the state pension age, which particularly affected higher earners, whereas from 1989 onward, individuals are free to draw their state pension and continue in paid work.

The evolution of accrual and the implicit tax rates over time can be affected in complicated ways depending on the type of reforms being implemented and when they are announced. Reforms only affect these measures after they have been announced, but even then, certain reforms may not affect these profiles and hence have no effect on marginal work incentives. Some reforms may announce effects that will be implemented sufficiently in the future so that certain cohorts are unaffected. Other potentially quite significant reforms may not affect the measures (much) if they have a similar impact on both current social security wealth and the level of wealth expected to be accrued if one were to remain in paid work for a further year. For example, changing the indexation of state pension rights or the state pension age, which can have a substantial impact on social security wealth, will have a more muted impact on accrual and implicit tax, as they will affect both wealth already accrued and that which can be attained from remaining in paid work for one more year.

In general, over the period from the late 1970s to the mid-2010s, once the early effects of the 1978 reform are out of the way, we do not see huge taxes or subsidies on work prior to the state pension age (SPA; i.e., on early retirement) that are often observed in other countries. Nor do we see huge differences in the evolution of these incentive variables by males or females (and by different levels of earnings, presented in appendix figures 11.A.3–11.A.6); the broad shapes of the changes over time are similar. There are small but noticeable differences among the patterns over time for different age, education, and gender groups, however, and these will be important in the identification of potential effects on employment rates in the analysis that follows.

With more specific reference to the broader time trends resulting from the reforms, rates of accrual have been falling and therefore the implicit tax rate has been rising for all groups. The introduction of SERPS in the late 1970s increases accrual and reduces implicit tax, with the reverse being true of the move to price indexation of the state pension from 1980. Spikes in accrual in the early 1990s and the early 2000s were due to the basic state pension rising by more than inflation. In the most recent years, accrual, on average, turns negative and implicit tax, again on average, turns positive. This is because fewer years of contributions are required to qualify for a full

flat-rate pension (30 years under the basic state pension and 35 years under the single-tier pension), meaning that our example individuals will have all qualified for a full amount before these older ages. A further contribution to falling accrual and rising implicit tax over this period has been successive increases in rates of NICs over this period: for example, with increases in April 2003 and April 2011 (which were not related to changes to the state pension system).

The appendix contains equivalent figures to figures 11.10 and 11.11 for low- and high-earning men (appendix figures 11.A.3 and 11.A.4) and for low- and high-earning women (appendix figures 11.A.5 and 11.A.6). In addition, the equivalent figures have also been constructed using the UK-specific earnings profile (described earlier in this subsection). These are presented for midearning men and midearning women in appendix figures 11.A.7 and 11.A.8.

11.4 Results

In this section, we analyze the degree to which the sequences of pension wealth and implicit tax rates for each of our six types of agents, at every age between 55 and 69, are associated with the employment rates for that group at that age. To describe and motivate the analysis and to compare with other chapters in this volume, we begin by carrying out a naïve analysis looking at the association between average employment rates and the time series for average implicit tax rates (i.e., averaged across individuals' type and across all ages in the 55–69 window). We go on to carry out a more detailed empirical analysis that allows us to exploit differences by individuals' type and the age at which their cohort is observed. These models are both carried out for our baseline case using the common earnings profiles as described above. Following that, we carry out two different variants of our analysis, with the former making some attempt to control for the possible confounding effects of private (occupational) pensions and the latter looking at how our conclusions would be affected if we use UK-specific as opposed to common earnings profiles.

11.4.1 Employment Rates and State Pension Accrual: Baseline Model

The first correlation we document is the time series of average employment against the time series of average implicit tax. For this, we take the average employment rate of those aged 55 to 69, by sex, from the Labour Force Survey. By interpolating the employment rate for a few early years (1976, 1978, 1980, and 1982) in which LFS data were not collected, this allows us to look at the period from 1975 to 2017 (inclusive, as shown in the left-hand panel of figure 11.12). The implicit tax rate is calculated as set out in the previous section and is constructed using the common earnings profile. To get the average implicit tax rate, we take the simple average of the low-,

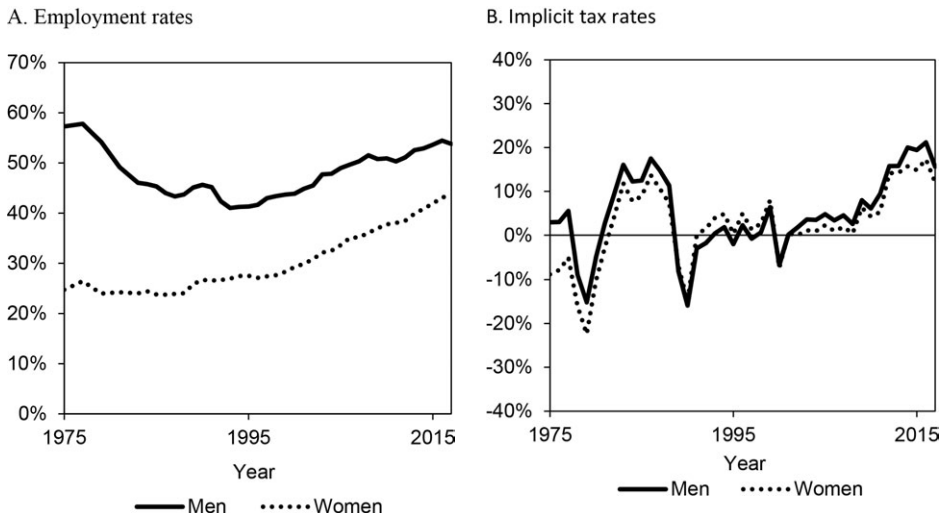

Fig. 11.12 Employment rates and implicit tax rates, by sex, 1975 to 2017

mid-, and high-earning groups for each sex/age in each year. These are plotted in the right-hand panel of figure 11.12. Among men, the employment rate falls from 1975 to the mid-1990s and rises again. But in most years, the implicit tax rate rises over this period, though there are years in which the implicit tax rate falls and the employment rate does rise (such as 1990). Among women, the employment rate is fairly stable from 1975 to the early to mid-1990s and then rises more quickly. But again, the average tax rate is typically rising through this period.

If anything, this suggests a positive correlation between implicit taxes and employment probabilities, counter to the predictions of the most elementary labor supply model. Simple time-series regressions of the tax rate on the employment rate for each sex yield the following estimates (with standard errors in parentheses):

$$\text{Male: Employment rate} = 0.478 + 0.090 * \text{Implicit Tax}$$
$$(0.008)\ \ (0.084)$$
$$\text{Female: Employment rate} = 0.293 + 0.347 * \text{Implicit Tax}$$
$$(0.009)\ \ (0.094)$$

These show that it is indeed the case that, on average, in years in which the estimated average tax rate faced by men and women is higher, the employment rate of men and women is also higher. This is particularly true for women, where the coefficient is large and statistically significant.

One final alternative way to see this correlation, presented for comparabil-

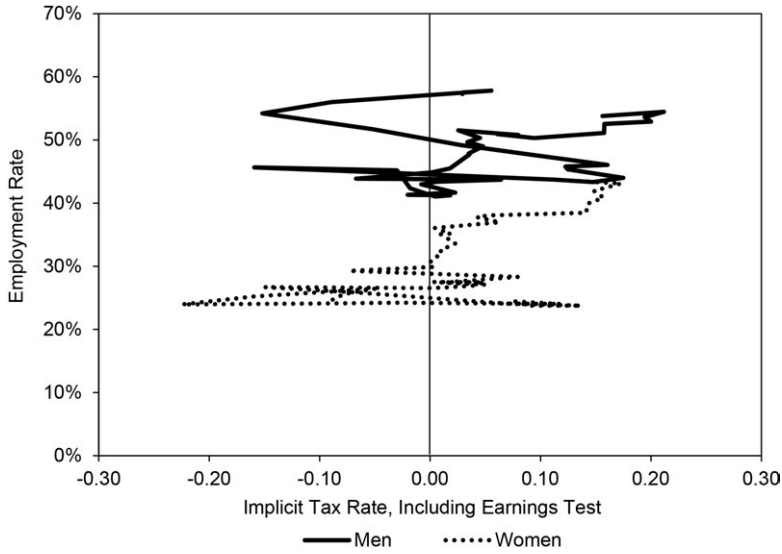

Fig. 11.13 Evolution of Employment rate and Average Implicit Tax Rate, 1975–2017

ity with other chapters in this volume, is by plotting the evolving relationship between the two variables over time, as in figure 11.13.

The rest of the analysis in this subsection uses the profiles estimated separately by education group and the time-series variation for each cohort-education group as they age. As a result, we focus on the period from 1978 to 2014, since that is the period in which we can construct the employment rate by education (and sex) from the FES. There are 15 ages (55 to 69) and three education groups covering the 37 years (from 1978 to 2014 inclusive). This would imply a total of 1,665 observations (15*37*3) for each sex, although there are a handful of missing cells in the earlier years of data due to the FES not containing any individuals of high education at older ages. Again we run regressions with the employment rate as the dependent variable. Given that we have variation in our pension wealth and incentive effects by age, cohort, and time, we are now able to control for a full set of age dummies, a full set of year dummies, and dummies for each education group, thus taking out the potentially confounding effects of other macroeconomic trends or any other age- or education-specific variables that may be simultaneously affecting pension wealth, earnings, or employment rates. Separate regressions are run for men and women. We also use weighted regression, using the number of observations in each cell that are observed in the FES as weights, so that our distribution of example types has the same average composition as the aggregate employment rate.

The results from these two regressions are shown in figure 11.13. For men,

both of the financial incentives have the "right" sign and are statistically significant at the 1 percent level. The coefficient on implicit tax is, however, economically small. It implies that a 10 percentage point increase in the tax rate would only reduce the employment rate by 0.91 percentage points.[8] The coefficient on social security wealth is more substantial, suggesting that a 10 percent increase in wealth would lead to a 1.5 percentage point fall in the employment rate.

For women, the coefficient on implicit tax has the opposite sign—and again is statistically significant—implying that an increase in implicit tax would *increase* the female employment rate, albeit by a modest amount. Social security wealth has the same sign as, and is of a similar magnitude to, that of men, implying that a 10 percent increase in wealth would reduce the female employment rate by about 1.5 percentage points.

11.4.2 Accounting for Private Pension Wealth

The analysis so far has focused on what the assumed earnings profiles mean for the level and accrual of state pension wealth and the extent to which changes in these are associated with changes in employment rates. But private pensions can—and do—also provide financial incentives to retire at particular ages. In particular, final salary pension schemes often provide a strong incentive to remain in paid work—or at least not to draw that pension—until the normal pension age (NPA) is reached. Prior to 2006 in the UK, it was also not possible to work for an employer and to draw a private pension from that employer at the same time. This meant that to draw a pension from an employer, individuals had to move to another employer or move out of the labor market altogether. From 2006 onward, that requirement has been removed, and individuals can now draw a private pension from an employer while continuing to work for that same employer.[9]

To attempt to control for any confounding effects of the final incentives from defined benefit arrangements, we modify our framework in a very crude way in order to include two different types of schemes. One has an NPA of 60 (such as many public service pension arrangements did for most of the period included in this study) and the other has a NPA of 65 (as was more

8. This would correspond to an elasticity that is almost certainly smaller than we might expect in a microeconometric analysis of labor supply at older ages but is perhaps explained by the fact that within each type, we have an employment rate that is in reality an average over a distribution of individuals of many different subtypes, each with different circumstances and earnings histories, whereas our pension measures for this type assume there is no such heterogeneity. Put differently, one might say the pension wealth variables are measured with considerable error. Hence we would not want to make serious quantitative microeconometric inferences about the overall magnitude of effects from such a model, but the sign of the resulting coefficients and qualitative conclusions would seem to us to be meaningful.

9. Note that the analysis in this chapter does not consider job-to-job moves. Instead, it is assumed that remaining in paid work means remaining in the same job or at least in the same pension arrangement.

common among private-sector employers who provided a defined benefit arrangement). Both schemes are assumed to offer accrual of 1/60th of the final salary scheme for each year of service, with this capped at 40 years. This implies a pension worth two-thirds of a final salary after a 40-year career. And both are assumed to reduce benefits by 4 percent for each year that they are drawn before the NPA is reached and no "bonus" for not drawing the pension until after the NPA.

Based on a crude characterization of the participation in private defined benefit pensions in the UK, we assume that 50 percent of both men and women have some kind of private defined benefit. Given the increased propensity of women to work in the public sector, we also assume that 25 percent of women are in each type of scheme, while 15 percent of men are in the first (NPA = 60) scheme and 35 percent of men are in the second (NPA = 65) scheme. Those without defined benefit arrangements may have no private pension coverage, or they might be members of defined contribution (DC) arrangements, but that should not matter for the focus of our analysis, as DC schemes do not provide strong financial incentives to retire at any particular age. More fundamentally, these assumed proportions do not vary over time/cohort (whereas in reality membership of defined benefit schemes among private-sector employees has been falling sharply) or over education levels (despite the fact that higher earners will be more likely to be members of a generous pension arrangement). While including weights with such variation would be advantageous, constructing them for the whole period of our analysis would not be straightforward. And if we were to move in such a direction, we would be moving increasingly further to a full individual-level microeconometric analysis of reforms and incentives, which is our goal for future work in this project as opposed to this particular chapter.

With our private-sector scheme rules characterized and assumptions on the fraction of each group in each type of scheme, we can calculate private pension wealth and private pension accrual following a similar methodology as state pension wealth and accrual. These are then added to state pension wealth and state pension accrual to obtain measures of total pension wealth and total pension accrual. Our task is made simpler because there are no interaction effects in the state pension whereby which an individual's private pension wealth would affect their state pension wealth or accrual (or vice versa).

Figure 11.14 (right-hand panel) shows the average implicit tax rates over time equivalent to those presented in figure 11.12 but now includes the estimated incentive from private defined benefit pension arrangements. This has the effect of increasing the tax rate, and by a roughly similar amount (around 12 to 14 percentage points for men and around 14 to 16 percentage points for women), in each year for the period from 1975 to 2005 (inclusive). This is because in those years, individuals who have already built up the maximum 40 years of pension tenure in a final salary scheme and reached their NPA

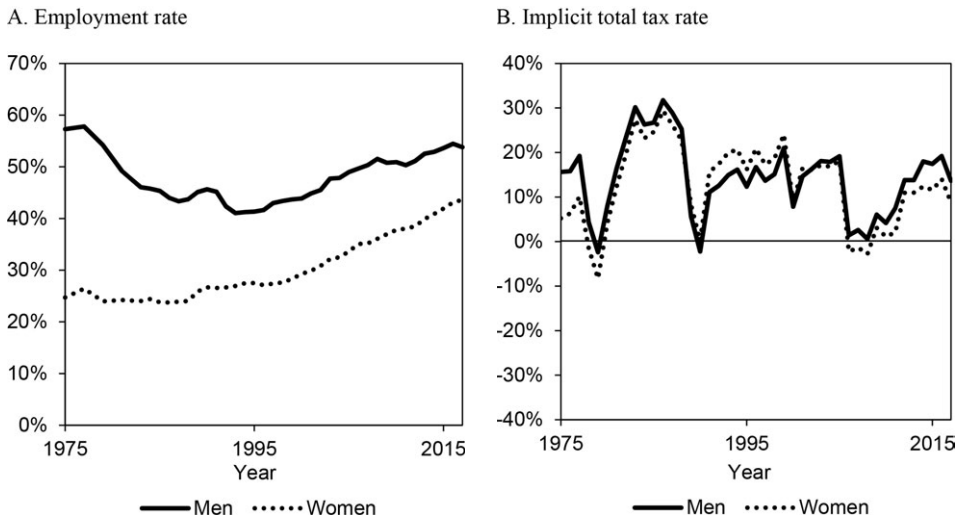

Fig. 11.14 Employment rate and implicit total tax rate, including private pensions, by sex, 1975 to 2017

will be disincentivized to remain in paid work. For years beyond 2005, the inclusion of these schemes makes no difference to the average tax rate, since individuals are now able to draw their defined benefit pension and continue to work for the same employer if they wish. Rather than falling over the period, once these defined benefit pension arrangements are included, the implicit tax rates are more stable—and are possibly on a downward trend.

The inclusion of defined benefit pension incentives in the implicit tax calculations therefore has a significant impact on the time-series correlation between employment rates and average tax rates. Whereas before the regression, the coefficient on the implicit tax rate was positive for both men and women (and statistically significant for women), once defined benefit pensions are included, the coefficient on implicit tax becomes negative for both men and women:

$$\text{Male: Employment rate} = 0.504 - 0.152 * \text{Implicit Tax}$$
$$(0.014)\ (0.087)$$
$$\text{Female: Employment rate} = 0.329 - 0.219 * \text{Implicit Tax}$$
$$(0.015)\ (0.098)$$

As before, we now switch to the FES employment data from 1978 to 2004, which allow us to exploit variation by age cohort and education levels. Equivalent regressions to those presented in table 11.1 are run, but this time controlling for the implicit tax rate, including defined benefit pension

Table 11.1 **Main regression results, employment and state pension wealth and implicit tax**

	Men	Women
Implicit tax	–0.091***	+0.052***
	(0.016)	(0.012)
Log social security wealth	–0.153***	–0.146***
	(0.039)	(0.026)
Other controls:		
Age dummies	Included	Included
Year dummies	Included	Included
Education dummies	Included	Included
R-squared	0.902	0.882
Sample size	1,660	1,660

Note: *** denotes that the coefficient is significantly different from zero at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

Table 11.2 **Main regression results, including defined benefit pensions**

	Men	Women
Implicit tax	–0.079***	+0.053***
	(0.013)	(0.010)
Log pension wealth	–0.381***	–0.228***
	(0.070)	(0.038)
Other controls:		
Age dummies	Included	Included
Year dummies	Included	Included
Education dummies	Included	Included
R-squared	0.902	0.883
Sample size	1,660	1,660

Note: *** denotes that the coefficient is significantly different from zero at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

arrangements, and for the log of total pension wealth (i.e., the sum of state pension wealth and private defined benefit wealth). Here we find that the estimated coefficients on implicit tax are changed remarkably little. The coefficients continue to be negative and significant for men and positive and significant for women (and both economically quite small). The coefficients on wealth both become more negative, now implying that a 10 percent increase in wealth would reduce the employment rate of men aged 55 to 69 by 3.8 percentage points and of women aged 55 to 69 by 2.3 percentage points.

11.4.4 UK-Specific Earnings Profiles

Finally, we move from using the common earnings profiles to using those constructed from UK data (as shown in figures 11.6 and 11.7 and described in the surrounding text), and the resulting incentive measures for mid-earning men and women are shown in the appendix in figures 11.A.7 and 11.A.8. The

Table 11.3 **Employment, implicit tax, and wealth, with and without private pension wealth included, UK-specific earnings profiles**

	Social security wealth only		Private pension wealth included	
	Men	Women	Men	Women
Implicit tax	–0.116***	+0.054***	–0.079***	+0.053***
	(0.017)	(0.011)	(0.012)	(0.009)
Log wealth	–0.1520***	–0.170***	–0.381***	–0.216***
	(0.037)	(0.026)	(0.064)	(0.038)
Other controls:				
Age dummies	Included	Included	Included	Included
Year dummies	Included	Included	Included	Included
Education dummies	Included	Included	Included	Included
R-squared	0.902	0.883	0.902	0.884
Sample size	1,660	1,660	1,660	1,660

Note: *** denotes that the coefficient is significantly different from zero at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level.

results from this analysis are presented in table 11.3 (and can be compared to those in tables 11.1 and 11.2). Qualitatively, they are remarkably similar to those estimated using the common earnings profile. For men, we continue to find a statistically significant but economically small negative impact of implicit tax on employment. And this effect continues to be little changed by the inclusion of private defined benefit pension wealth. For women, the coefficients on implicit tax are also little changed by the inclusion of private wealth, and in both cases, they remain statistically significant. For all cases, we find that higher wealth is associated with lower employment, with this relationship being statistically significant. And—again as before—we find that the effect is stronger once private-sector defined benefit pension wealth is included.

11.5 Conclusions

The UK has implemented substantial pension reform over the last 50 years, having first supplemented the basic (flat-rate) state pension with an earnings-related scheme and then made successive reforms to its generosity and design, before effectively abolishing it and going back to a flat pension. And while the disincentives to work implied by the UK pension system have perhaps never been as large as those observed in some countries, we have, for a few years now, been in a situation where the pension system is largely neutral with regard to work incentives both before and after the state pension age. These headlines are well known, at least within the UK economics and policy communities. In this chapter, we have gone beyond such a headline description and used a set of illustrative example types of individuals to model the effects of the sequence of reforms for different birth cohorts

who will have been "hit" by the various pension reforms at differing points in their working lives.

To a certain extent, we have been repeating and updating analyses that have previously been carried out prior to the most recent policy developments in the last 10 years, such as those contained in the studies of Blundell and Johnson (1999) or Disney and Emmerson (2005). But in addition to updating the evidence base with regard to the effects of recent pension reforms on the public pension wealth of cohorts and on their implicit incentives to work at older ages, however, we have also used a long and detailed series of information on employment rates by various types of individuals and age groups to examine the extent to which the sequence of pension reforms might be correlated with, and even a potential explanation for, trends in labor market participation at older ages. And the recent (post-1995) trends in labor market participation for all older adults in the UK, which have occurred over the period in which there have been a number of pension reforms, make it tempting for commentators to attribute trends in the labor market with trends in pension arrangements, particularly changes in the state pension age, so it is important to identify any such effects in a concrete manner.

We have deliberately limited our analysis to a crude "example individual" type of analysis, distinguishing six types of people within each date-of-birth cohort (three education levels for each sex) and simulating the effects of pension reforms for each type using a very crude approximation to a lifetime earnings profile and assuming each "type" is in paid work at all ages over the lifecycle. Even this simple exercise is fairly laborious, however, given the extensive and rather complex history of pension reform in the UK. And despite our crude and somewhat aggregate method, we are able to show that the reforms have generated variation in pension wealth and implicit tax rates by age, cohort, education, and sex, which, as well as being important to document in their own right as indicators of the effects of the reform, can be used to show that the pension variables and hence the pension reforms have had statistically significant effects on employment probabilities even when controlling very flexibly for any potential age and time effects that might be thought to confound such an analysis. Increased pension wealth is shown to reduce the likelihood of work at older ages and, if the work disincentive (as measured by the implicit tax) is higher than this, will also tend to lead to lower levels of labor market participation.

It is clear that a more detailed fully microdata-driven individual-level analysis should be carried out, and we leave this as a direction for future research and a natural continuation of the research agenda in this chapter. The pension wealth and accrual calculations we carry out in this chapter can be applied to all individuals in a microdata survey sample and can also be based on a more sophisticated model of past and future earnings dynamics. Long panel data, such as that in the British Household Panel Study, Understanding Society, or the English Longitudinal Study of Ageing, can also be used to look better at the effects of reforms for those with spells in an out of

the labor market or to account for more individual-specific heterogeneity in earnings processes. Such an analysis, which might also control much more concretely for the precise incentive effects of any private pension arrangements each individual might have, would be a major exercise but also a useful step forward from what we have done here.

Appendix

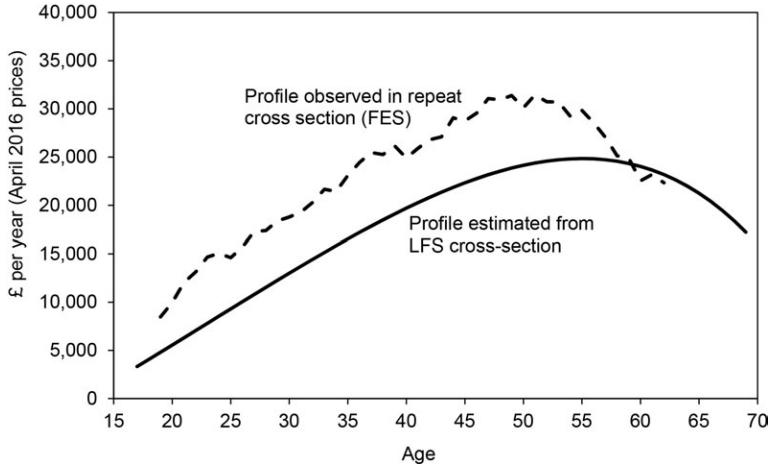

Fig. 11.A.1 Men born in 1952: comparison of actual cohort profile (from repeat cross section) with cohort profile estimated from cross-sectional data

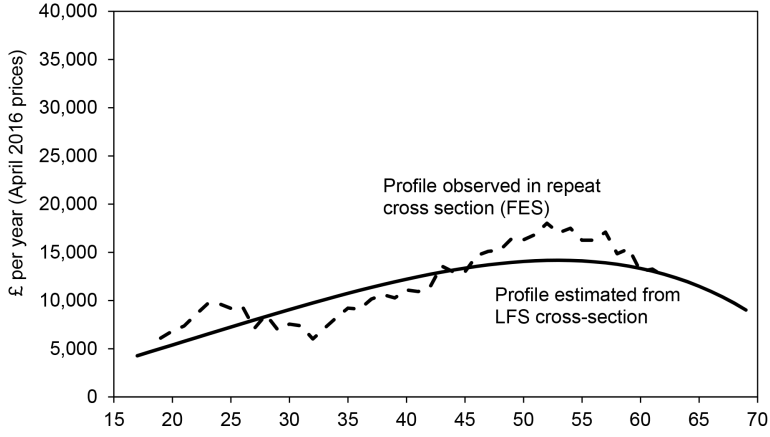

Fig. 11.A.2 Women born in 1952: comparison of actual cohort profile (from repeat cross section) with cohort profile estimated from cross-sectional data

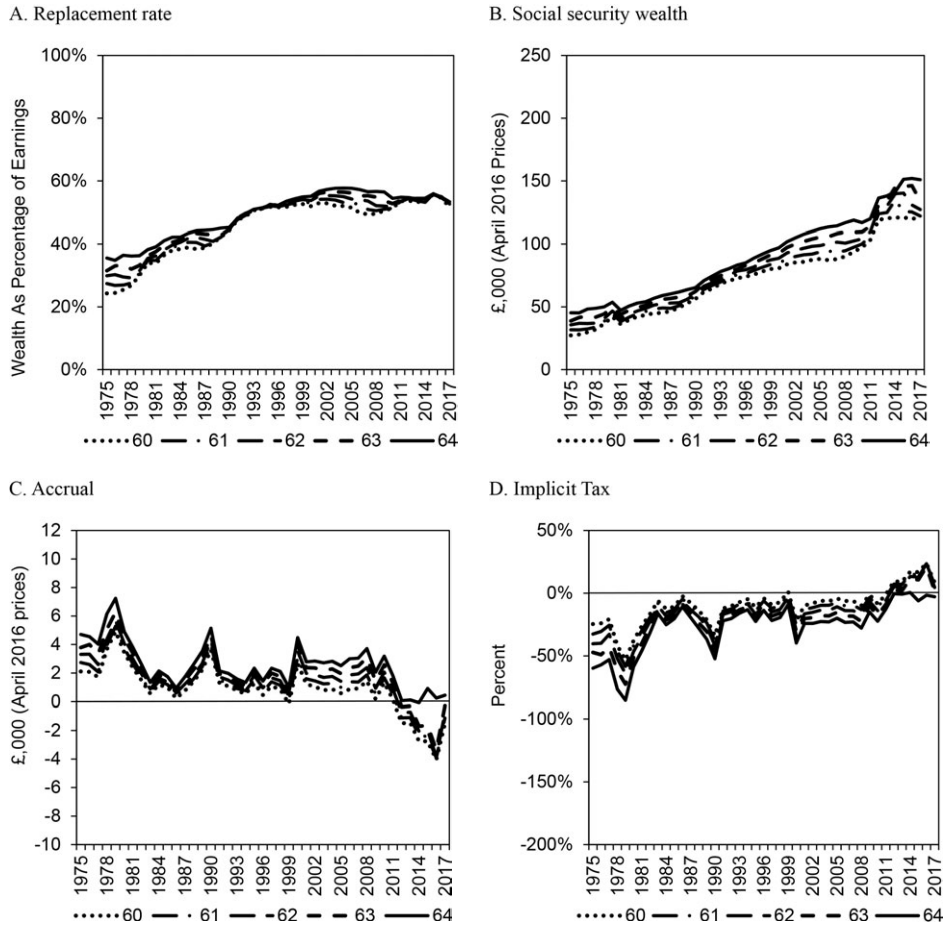

Fig. 11.A.3 Estimated social security replacement rate, wealth, accrual and implicit tax: low-earning men aged 60 to 64, by single year of age; common earnings profile

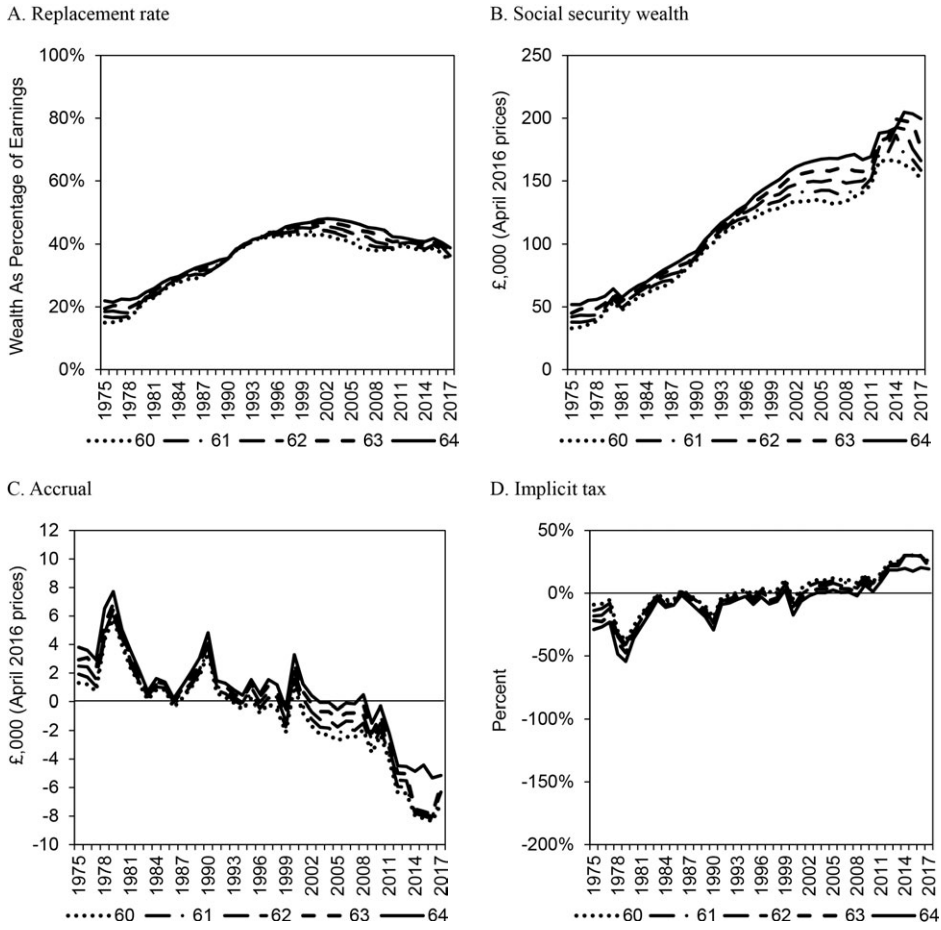

Fig. 11.A.4 Estimated social security replacement rate, wealth, accrual and implicit tax: high-earning men aged 60 to 64, by single year of age; common earnings profile

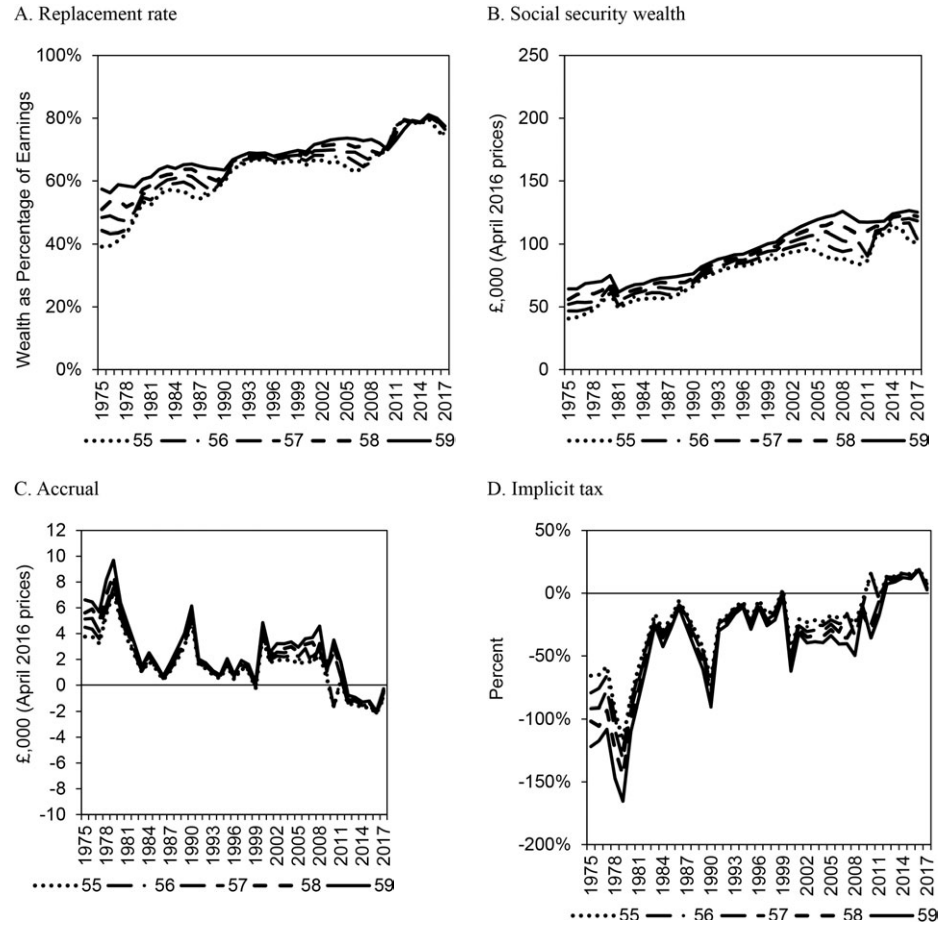

Fig. 11.A.5 Estimated social security replacement rate, wealth, accrual and implicit tax: low-earning women aged 55 to 59, by single year of age; common earnings profile

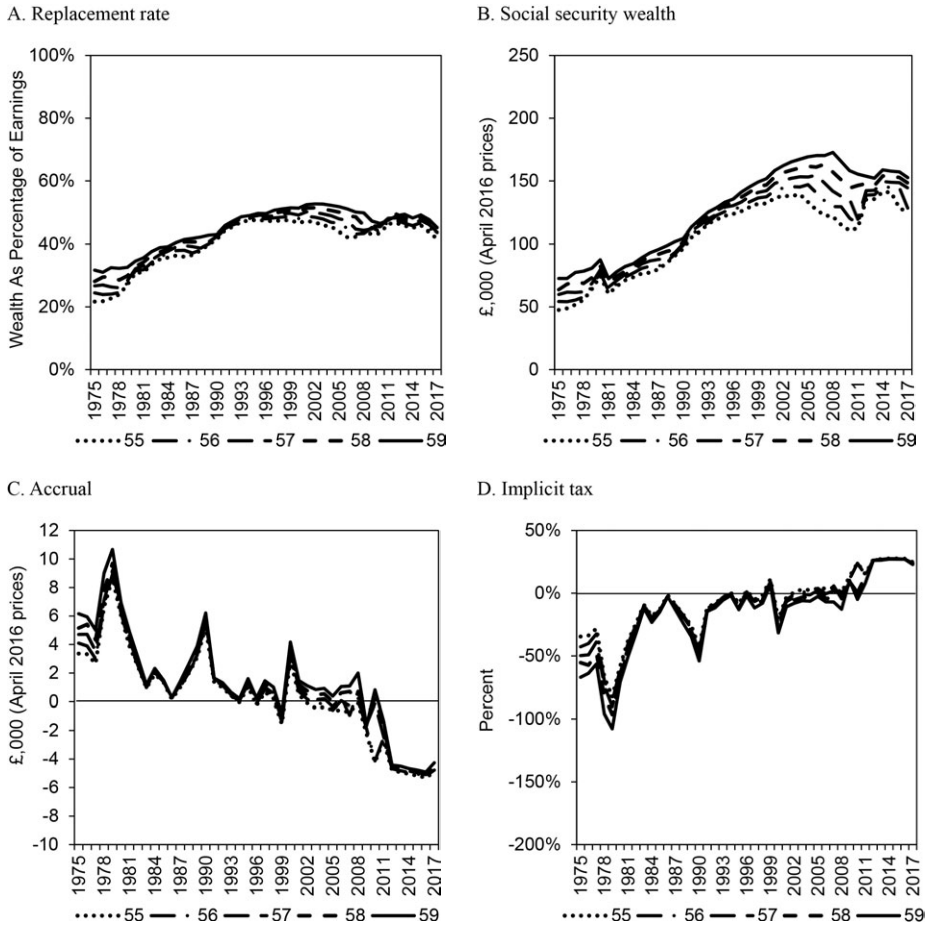

Fig. 11.A.6 Estimated social security replacement rate, wealth, accrual and implicit tax: high-earning women aged 55 to 59, by single year of age; common earnings profile

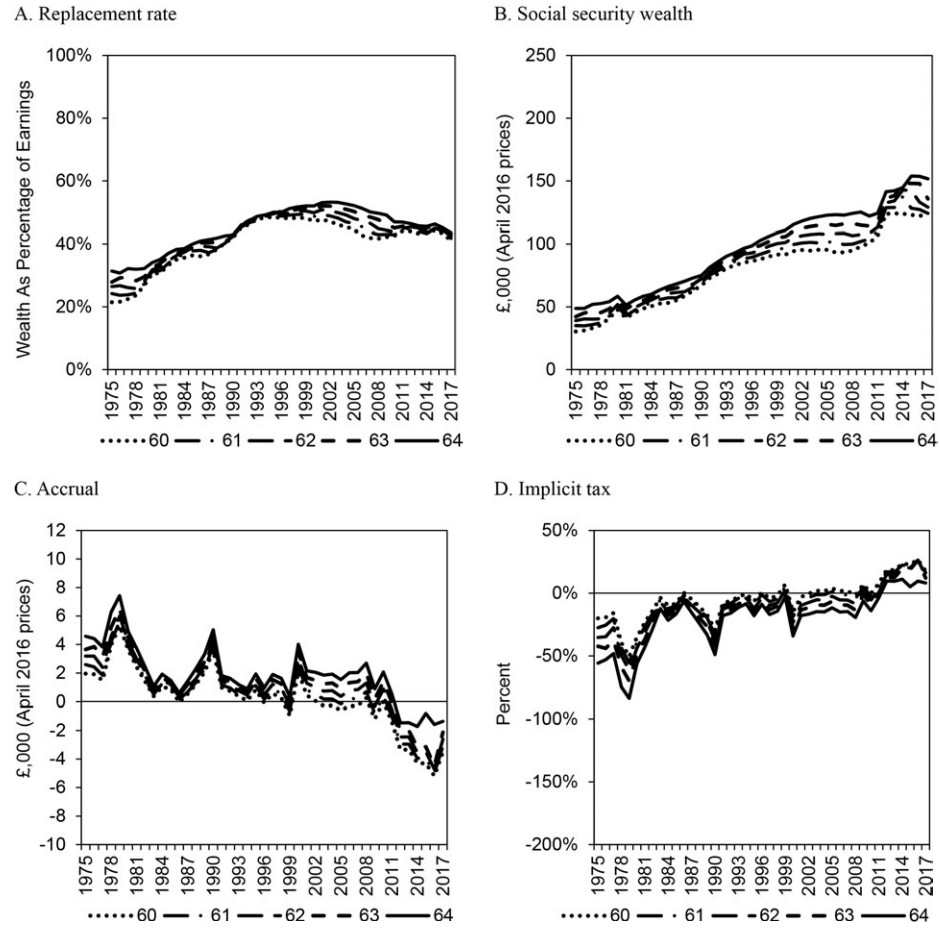

Fig. 11.A.7 Estimated social security replacement rate, wealth, accrual and implicit tax: mid-earning men aged 60 to 64, by single year of age; UK cross-sectional earnings profile

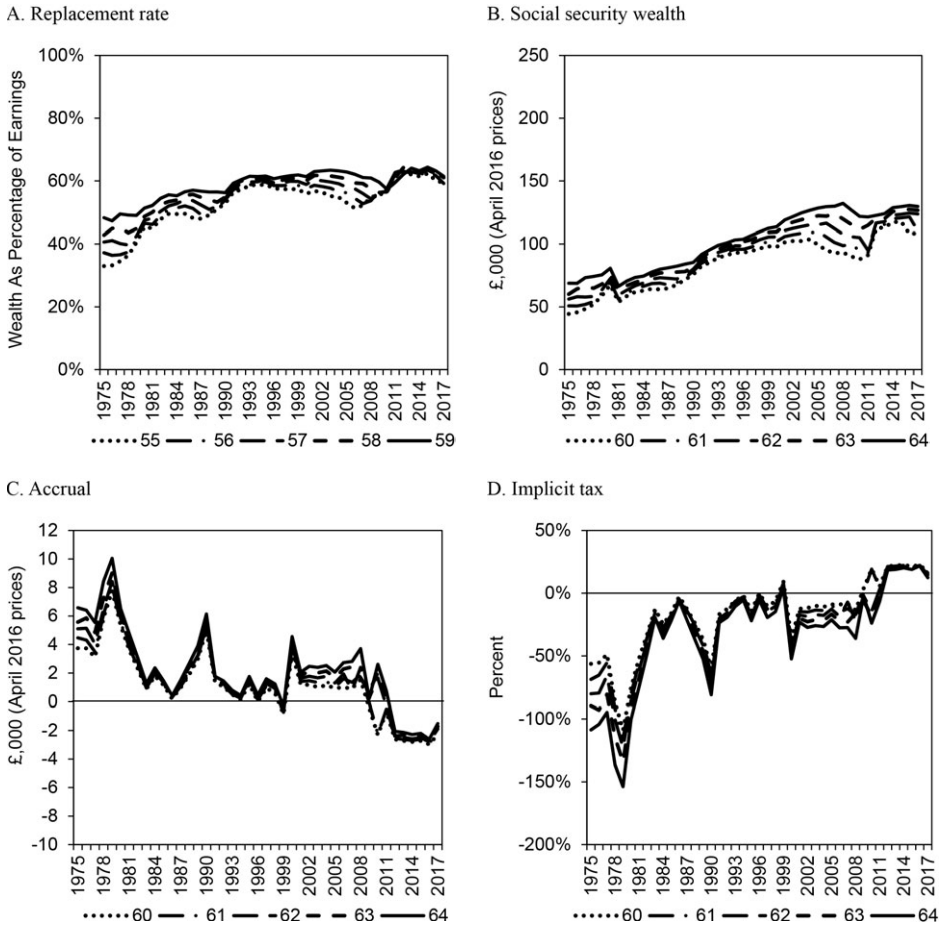

Fig. 11.A.8 Estimated social security replacement rate, wealth, accrual and implicit tax: mid-earning women aged 55 to 59, by single year of age; UK cross-sectional earnings profile

References

Banks, J., C. Emmerson, and G. Tetlow. 2019. "Long-Run Trends in the Economic Activity of Older People in the United Kingdom." In *Social Security Programs and Retirement around the World: Working Longer*, edited by Courtney C. Coile, Kevin Milligan, and David A. Wise, 267–97. Chicago: University of Chicago Press.

Blundell, R., and P. Johnson. 1999. "Pensions and Retirement in the UK." In *Social Security Programs and Retirement around the World*, edited by J. Gruber and D. Wise, 403–35. Chicago: University of Chicago Press.

Blundell, R., C. Meghir, and S. Smith. 2004. "Pension Incentives and the Pattern of Retirement in the United Kingdom." In *Social Security Programs and Retirement around the World: Micro-estimation*, edited by J. Gruber and D. Wise, 643–89. Chicago: University of Chicago Press.

Crawford, R., S. Keynes, and G. Tetlow. 2016. *A Single-Tier Pension: What Does It Really Mean?* IFS Report No. 82. https://www.ifs.org.uk/comms/r82.pdf.

Cribb, J., C. Emmerson, and G. Tetlow. 2016. "Signals Matter? Large Retirement Responses to Limited Financial Incentives." *Labour Economics* 42:203–12. https://doi.org/10.1016/j.labeco.2016.09.005.

Disney, R., and C. Emmerson. 2005. "Public Pension Reform in the United Kingdom: What Effect on the Financial Well-Being of Current and Future Pensioners?" *Fiscal Studies* 26:55–81. https://doi.org/10.1111/j.1475–5890.2005.00004.x.

Disney, R., and S. Smith. 2002. "The Labour Supply Effect of the Abolition of the Earnings Rule for Older Workers in the United Kingdom." *Economic Journal* 112 (478): C136–C152.

Meghir, C., and E. Whitehouse. 1997. "Labour Market Transitions and Retirement of Men in the UK." *Journal of Econometrics* 79 (2): 327–54.

Hemming, R., and J. Kay. 1982. "The Costs of the State Earnings Related Pension Scheme." *Economic Journal* 92:300–319.

O'Dea, C. 2018. "Insurance, Efficiency and the Design of Public Pensions." Mimeo, Yale University.

Wise, D., ed. 2017. *Social Security Programs and Retirement around the World: The Capacity to Work at Older Ages*. Chicago: University of Chicago Press.