

How have reforms to the UK state pension affected inequality?

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Abstract

We quantify the implications of reforms to the UK state pension system over the last 40 years for inequality in state pension income and wealth and the relationship between working-life earnings and state pension entitlements. We combine rich microdata from the English Longitudinal Study of Ageing with the rules of current and past system to simulate retirement incomes as they are under current rules and would have been in the absence of reforms. Despite an increase in inequality in the lifetime earnings of older workers, recent decades have seen the distribution of retirement incomes become more equal. A large part of this is due to reforms which have expanded entitlement to the flat-rate component of the state pension and made it more generous, while dramatically reducing and then eliminating the earnings-related component. At the same time, the present value of accrued state pension wealth has become more related to earnings for men. This is because more generous indexation is more valuable to those who have longer retirements and men with higher working life earnings, on average, live longer. For women, the life expectancy gradient is shallower with respect to their own earnings and recent reforms have equalised the distribution of state pension wealth.

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1. Introduction

Recent decades have seen a widespread push to move public pension systems towards greater fiscal sustainability. The UK has been at the forefront of trends internationally. The concern about affordability of the State Earnings-Related Pension Scheme (SERPS) lay behind the scaling back of some parts of the system not long after its introduction in the mid-1970s. In more recent times, the eligibility age for the UK state pension has been increased, and substantially so for women, – and is planned to increase further in future – limiting the additional public pension expenditure arising from increases in longevity at older ages.

The myriad of reforms of recent decades have potentially important implications for retirement income inequality. The effects of reforms on inequality is not straightforward. For example, the move to begin paying the state pension from a later point in life but with more generous indexation of the flat-rate component of the state pension system (on which lower lifetime earners tend to be more reliant) will tend to reduce retirement income inequality within the cross-section of pensioners at a single point in time. But an awareness of the differences in life expectancy between richer and poorer people has led some to question whether such a change could in fact increase lifetime inequalities in the total flow of public pension income received by a birth cohort as richer individuals will, on average, be more likely to benefit from more generous indexation into their 90s than younger individuals. These considerations make a careful examination of the role of the pension system reforms in driving inequalities in retirement incomes essential.

In this chapter, we quantify the impact of pension reforms on inequalities in retirement resources. We do this by combining data covering lifetime earnings histories and pension entitlements with a full pension calculator which allows us to simulate individuals' accrual of pension benefits under current and past state pension systems. By simulating the distribution of state pension entitlements under counterfactuals in which certain reforms to the state pension system had not taken place, we can quantify the impact of those reforms on inequality. Importantly, in making these calculations we incorporate inequalities in life expectancy between low-and high-earners, which we estimate within the same dataset. Building on the previous phase of the International Social Security Project (Coile and Borsch-Supan, 2022) we also take into account the indirect effects of policy reforms through their consequences for retirement incentives and therefore retirement behaviour and the accrual of pension entitlements.

Our main findings are as follows. The cross-sectional distribution of public pension income and social security wealth has become more equal over time, as measured by the Gini coefficient. This has happened despite an increase over time in inequality in lifetime earnings for those cohorts now in later working life. This is the result of a range of reforms expanding coverage and generosity of the flat rate component of the state pension. In 2007, the Basic State Pension (BSP) was moved from price indexation to earnings indexation. At the same time, the number of years of contributions required for entitlement for a full award fell from 44 (for men) and 35 (for women) to 30 for both. The announcement in 2014 that the BSP was to be replaced with the New State Pension (NSP), which was more generous to lower earners, the self-employed and those with incomplete histories of work, furthered this direction of travel. These had the effect of increasing the state pension

incomes at the lower end of the distribution. We have also seen a closing of the gap in pension incomes between men and women.

While the Gini coefficient measures of inequality show falls over time, with a large role for reform effects, this is not the whole story. When we look at differences between those at different points of the lifetime earnings distribution, we see that, for men, there is an expansion in the differences in social security *wealth* (i.e. the present value of expected state pension income over a lifetime) between high and low lifetime earners. This expansion is driven in part by increases in indexation which are more valuable to those who will live longer, meaning that once we account for differential mortality across the lifetime earnings distribution, reforms have led to state pension wealth being more strongly related to lifetime earnings. We do not find similar effects across the distribution of earnings for women because when we account for differences in longevity across the individual earnings distribution we find that for women there is a much weaker relationship between own earnings and longevity than there is for men.

Finally, when considering the impact of reforms, we quantify both a ‘mechanical’ and a ‘total’ effect of reforms, where the latter takes into account the fact that reforms can impact work incentives and therefore retirement behaviour and, in turn, the accrual of pension benefits. We find that in the UK context, the indirect impact of reforms through their impact on behaviour is a small proportion of the overall effect. This is because the modest effect of reforms on work incentives, combined with a moderate estimated responsiveness of work choices to incentives and the fact that many older workers do not stand to accrue more pension entitlements even if they work longer. These modest indirect effects are dwarfed by the mechanical impact of reforms.

This study builds on the previous phases of the International Social Security project. While recent phases (Banks and Emmerson, 2018; Banks, Emmerson and Sturrock, 2020) have sought to estimate the effect of pension reforms on retirement behaviour, in this phase we turn our attention to consider the impact of reforms on inequality. To do this, we draw and build on the insights of the literature which has estimated how life expectancy varies by socioeconomic status (Case and Deaton, 2015; Chetty et al, 2016; Banks et al, 2021). The closest paper in spirit to ours is Auerbach et al. (2017), which estimates the impact of increasing inequality in longevity for inequality in the present discounted value of retirement benefits received by different income groups. That paper also simulates the effects of potential reforms, taking into account differential mortality. We go beyond this by combining the estimation of differential mortality with our detailed pension calculator so that we can fully quantify the effect of past reforms on inequalities in social security entitlements, taking into account the complex ways in which reforms interact with individuals’ life histories. In doing so, we make the first such comprehensive estimation of the effect of pension reforms on retirement inequalities for the UK.

2. Data and methodology

2.1 Data

We use data from the English Longitudinal Study of Ageing (ELSA), a household panel survey which interviews a representative sample of the English household population aged 50 and older at 2-year intervals. The survey has been running since 2002–03 and we use the first nine waves, covering the period until 2018–19. ELSA contains a range of information about individual characteristics, earnings,

private pensions, health and demographic characteristics. As part of the imputation of earnings histories to ELSA respondents, we also use data from the UK Labour Force Survey (LFS). To estimate survival curves for different types of individuals, we draw on a link between ELSA and administrative mortality records. We also use Office for National Statistics Life Tables for England and Wales which give actual and projected mortality rates by sex, single year of age and birth year.

2.2 Estimating social security wealth

The estimation of entitlements under the state pension system combines the ELSA data with the pension calculator first constructed in Banks and Emmerson (2018). For each individual observed in paid work in the ELSA data, we construct measures of their social security wealth accrued to date under the existing and counterfactual state pension systems. The calculations are identical to those made in Banks, Emmerson and Sturrock (2023) and we refer the reader to that paper for the full details of these calculations.

In brief, accrued entitlements depend upon the state pension system rules that have been in place throughout an individual's adult life and their engagement in activities that can lead to pension accrual (such as paid work and certain formal childcare). ELSA contains detailed information about individuals' earnings and other relevant characteristics and activities during the period of the survey. In addition, the majority of the ELSA respondents have completed a 'life history' questionnaire which collects information about their past employment and, with certain assumptions, enables us to construct an earnings history for their entire adult life. For each individual, we calculate the pension income they would receive in each year of retirement if they were to stop working at the point of observation and begin claiming their state pension at the State Pension Age (the earliest age at which claiming can take place in the UK system and the age at which almost all begin to draw their state pension). We define an individual's social security wealth as the expected present value of that pension income stream, using a 3% real discount rate and survival probabilities as set out in the following section. Letting $p_{i,\tau}(R = t)$ denote the pension income that individual i could expect to receive in year τ , if they retired in year t , and letting $s_{i,\tau}$ denote individual i 's probability of survival to year τ , we define social security wealth of individual i in year t as

$$SSW_{i,t} = \sum_{\tau=t}^{110} s_{i,\tau} \frac{p_{i,\tau}(R = t)}{(1.03)^{(\tau-t)}}.$$

2.3 Estimating survival probabilities for different lifetime earnings groups

In our calculation of social security wealth, we account for heterogeneity in survival probabilities and therefore differences in the number of years that pension income is drawn. In particular, our focus on inequality means that we want to account for the variation in survival probabilities across the lifetime earnings distribution. This is the key advance on Banks, Emmerson and Sturrock (2023).

The ideal dataset would link lifetime earnings to mortality outcomes for the whole population, giving us a large sample from which to estimate survival curves varying by sex, year of birth, and position in the lifetime earnings distribution. The UK Office for National Statistics (ONS) publishes life tables for England and Wales that gives the mortality rates for each single year of age and sex group for each year from 1841 onwards but unfortunately there is no link between administrative death records and administrative earnings records. We therefore cannot use population-level data to estimate the mortality gradient in lifetime earnings. However, for all individuals in the ELSA sample we have data

on their mortality outcomes. In almost all cases this comes from a link of ELSA with NHS mortality records giving us their mortality status and date of death (if they have died) up to April 2018.² We therefore use the ELSA linked mortality data to estimate the gradient of mortality in lifetime average earnings.

We use the ELSA data in combination with the ONS life tables to estimate survival curves that vary by sex, year of birth and quintile of the lifetime average annual earnings distribution. Our approach is to estimate a Cox proportional hazard model on the pooled ELSA sample, under the assumption of a proportional difference in hazard rates between lifetime earnings quintiles which is assumed constant across years of birth but allowed to vary between men and women. We then apply the estimated proportional hazard ratios to the ONS life table survival curves for each year of birth and sex. We assume that from age 90 onwards there is no differential mortality by lifetime earnings. Models that allowed for differences in the mortality gradient by birth year were estimated but did not reveal strong evidence of a change in the gradient. That said, the ELSA sample is not sufficiently large to enable precise estimation of differences in the mortality gradient by birth year so we should not take this as definitive evidence that mortality gradients are not changing over time and/or across generations.

3. Context: pension policy reforms and trends in inequality

3.1 Pension policy reforms

In this section, we provide a brief overview of the most significant reforms to the UK state pension system over the period from 1978 to 2019 affecting accrual of state pension entitlement. These reforms are summarised in Table 3.1. For a fuller history of reform to the UK state pension system and a more detailed explanation of implications for state pension entitlements and accrual, see Banks and Emmerson (2018).

The 1975 Social Security Act put in place several elements that would produce the UK's most extensive and generous state pension system to date. First, the BSP, for which entitlement depended only on the number of years of contributions, was to be increased each year by the higher of growth in earnings or prices. The Act also introduced 'Home Responsibilities Protection' which reduced, for those undertaking certain formal caring responsibilities, the number of years of contributions required by in order to qualify for the full BSP. Finally, the Act introduced the SERPS from 1978. An individual's SERPS income replaced 25% of "band" earnings, averaged over their 20 best-earnings years. This reform was a response to concerns over the adequacy of the BSP alone to support individuals in retirement and the fact that around half of employees were not offered an occupational pension by their employer. We might expect that a system in which an earnings-related state pension played a substantial role would be one in which inequalities in earnings during working life would translate with some strength into retirement income inequalities.

² 96% of individuals consented to have their ELSA records linked to administrative death records. For those individuals still surviving in April 2018, their mortality record is right-censored at that point. For the remaining observations, we know mortality status either from the fact that an individual is surviving and responding to the survey, or because death is recorded as the reason for their attrition from the survey. When individuals attrit from the ELSA sample for reasons other than mortality and they have not consented to the administrative data link, this results in a right-censored mortality record at the time of attrition.

A consequence of the generosity of the system legislated in 1975 and in place from 1978 was that concerns quickly arose about the fiscal implications of the entitlements being accrued. During the 1980s and 1990s, reforms were introduced that sought to reign in the costs of the system by reducing its generosity. First, in 1980, the indexation of the BSP and SERPS (in payment) moved from earnings to prices. The 1986 Social Security Act reduced the rate of SERPS accrual to 20% of band earnings and based entitlement on average earnings over full working life (i.e. all years from 16 to State Pension Age, including periods not in paid work as having zero earnings) rather than the 20 highest-earning years. The SERPS formula was again altered in 1995 to reduce its generosity.

The turn of the millennium saw a renewed focus on adequacy of pension provision for low and middle earners and those with interrupted work histories, particularly due to caregiving responsibilities. The legislation of the State Second Pension (S2P) in 2000 (introduced in April 2002) marked a move towards a more progressive pension system which was more generous to low- and middle-earners and gave entitlements based on formal caring responsibilities. Following this, the 2007 Pensions Act made a range of changes with that had the effect of equalising state pension entitlements (and future accrual of entitlements) between those with different earnings histories. First, the Act restored the earnings-link for the BSP but not SERPS or S2P in payment, meaning a shift in relative importance towards the former in the long term. Second, the Act took several steps with the effect of increasing entitlements for those with partial earnings histories: it reduced the contributions required for a full BSP to 30 years, removed the requirement to contribute for at least 25% of a full working life to receive any state pension, and for those reaching the state pension age after April 2010 replaced HRP with a more generous system of credits for carers. The 2007 Act also accelerated changes to the indexation of parameters with the effect of speeding the movement of the S2P to being a flat-rate top-up to the BSP in the long-term.

At the same time as reforms were rolling out to shift the system to one that was more generous to lower and middle earners and those with caring responsibilities, there were the first substantial reforms since the introduction of the BSP in 1946 to the State Pension Age – the earliest age at which one can claim the state pension and the age at which almost all claim. First, in 1995, the female state pension age was legislated to be equalised with that of men over the period from 2010 to 2020, rising from 60 to 65. The 2007 Pensions Act legislated for the (equalised) SPA to rise to 66, 67 and 68 in the mid-2020s, mid-2030s and mid-2040s in order to offset partially the increased cost of restoring earnings-indexation of the state pension alongside an ageing population. The main effect of a reform that increases the state pension age is to reduce the time over which individuals (who reach the old state pension age) will receive the state pension. The effects of such a reform on inequalities in pension incomes and social security wealth depends on the extent – and timing – of differential mortality, a point we return to later.

The 2010s saw further important reforms. 2011 saw the introduction of the ‘triple lock’ mechanism which would increase the BSP by the greater of earnings growth, price growth, or 2.5%. In the same year, the government accelerated the increase in the female state pension age so that equalisation with the male state pension age of 65 would be completed by the end of 2018 and brought forward the increase in the equalised SPA to 66 so that it occurred between 2018 and 2020.

2014 saw the final reform occurring during the period we examine. It was both radical and yet the natural step given the direction the UK state pension system was moving. It was announced that for

those reaching the SPA after 2016 the state pension would begin to shift to a fully flat-rate system. Since 2016 there has been no new accrual of earnings-related pension benefits. Under the new system, entitlement to the flat-rate pension depends solely on the number of years of contributions (and not the level of those contributions in each year). 10 years are required to receive any pension and 35 years are required to receive the full amount (higher than the 30 that had been required for a full BSP but less than the full working life – i.e. from age 16 to the SPA which very few would achieve – required to get a full S2P). The level of the New State Pension (NSP) is such that it is more generous than the preceding system for low earners, those who spent time ‘contracted out’ of S2P, and those who are not covered by S2P, notably the self-employed. It is less generous for relatively high earners. This has the effect of making the system relatively more generous to women. Transitional measures mean that those reaching their SPA from April 2016 onwards receive the greater of what they would have accrued over their entire working life under the new system and what they had accrued under the prior system by April 2016 plus any additional accrual under the new system since 2016 (with the exception that there is a deduction for those who had spent years contracted out and therefore enjoyed a lower rate of National Insurance contributions).³ 2014 also saw the announcement that the increase in the SPA from 66 to 67 would be brought forward to take place between 2026 and 2028.

Table 3.1: Notable reforms to state pensions affecting accrual of state pension entitlement and retirement incentives in the period 1978 to 2019

Year	State pension reform
1978	State Earnings-Related Pension Scheme (SERPS) introduced
1980	Basic State Pension (BSP) moved from earnings to price indexation
1986	- SERPS moved to price indexation in payment - New accrual in SERPS reduced from 25% to 20% - SERPS entitlement based on lifetime earnings rather than 20 best years
1995	- Earnings test abolished from 1989 - SPA to be equalised between men and women with female SPA rising from 60 to 65 between 2010 and 2020 - SERPS measure of band earnings reduced
2000	State Second Pension (S2P) replaced SERPS. Reformed to give greater credit to caring and become more generous to lower earners from 2002
2007	- SPA to rise from 65 to 68 between 2024 and 2046 - State second pension will become flat-rate in long-run i.e. phasing out of earnings-related pension - BSP earnings indexed from April 2012 - Number of years required for full BSP reduced from 44 (men) and 39 (women) to 30

³ In 2016, the Department for Work and Pensions reported that 32% of those reaching State Pension Age had an entitlement that was more than the new state pension. They estimated that by 2025, this figure would fall to 13%, reaching 9% in 2030 and 1% in 2040. See <https://assets.publishing.service.gov.uk/media/5a803fde40f0b62302692669/impact-of-new-state-pension-longer-term-research.pdf>.

2011	• BSP credit given to carers • Female SPA rise accelerated to reach 65 in 2018 • Male and female SPA to rise from 65 to 66 over 2018 to 2020 • “Triple lock” indexation of BSP
2014	• New State Pension (NSP): No new accrual of earnings-related state pension from 2016 • 35 years required for full NSP • Increase in SPA from 66 to 67 brought forward to 2026 to 2028

3.2 Trends in inequality

Figure 3.1 and Figure 3.2 show the trends in the Gini coefficients for some key outcomes for the ELSA sample aged 55 to 69 who are in employment (Fig 3.1) or not in employment (Fig 3.2), in each wave of the survey. Average earnings is the mean annual earnings level that an individual has had over their working life up to age 55. Financial assets is the total value of all bank account balances, savings accounts, stocks and shares, and other financial assets, less unsecured debts such as loans, overdrafts and credit card debt. Real assets is the sum of all housing and business assets, less any debt secured on primary housing. State pension income is the individual’s current net State Pension income. Total pension income is the sum of current state and private pension income (including occupational pensions and any privately purchased annuity income). Social security wealth is the present value of current and future entitlements to the state pension accrued to date (as defined above). Financial and real assets are measured at the family level and so are the sum of the assets of the individual and their partner (if they have one). Figure 3.3 shows the evolution of gender differences over time, plotting the male to female ratio for average earnings and state pension income.

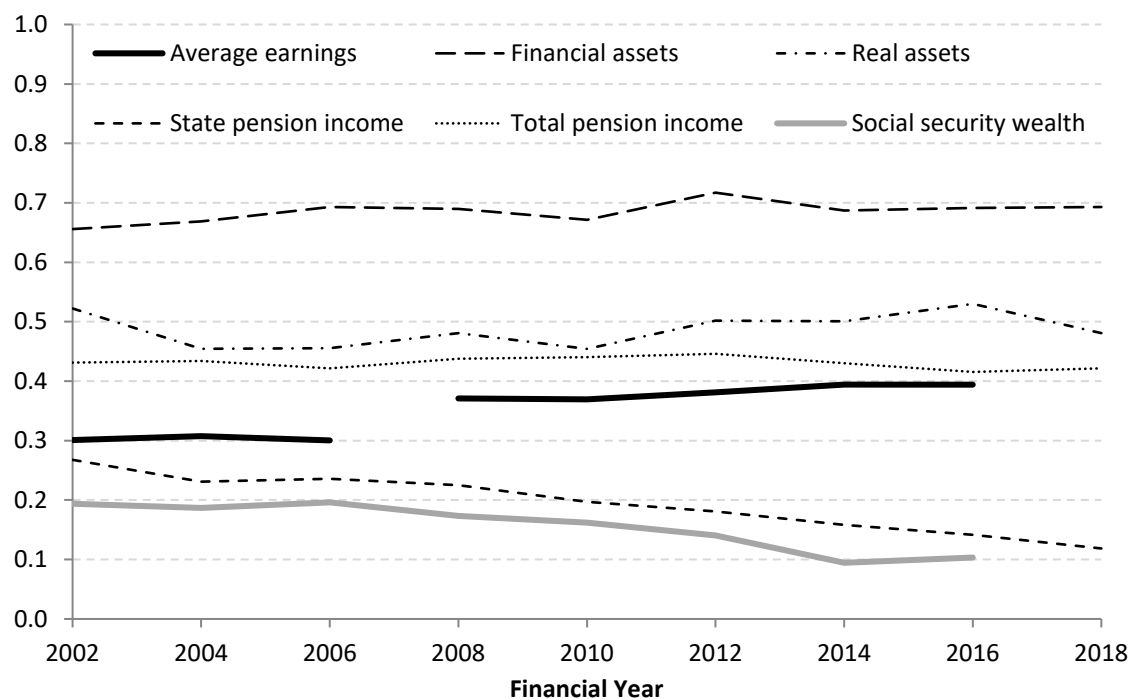
The following trends stand out. First, inequalities in working-life average earnings increased slightly between 2008 and 2016.⁴ There was a substantial increase in earnings inequality in the UK during the 1980s (see for example Blundell and Etheridge, 2010). Later-born individuals have spent longer in the labour market in its high-inequality years and our sample shifts towards younger birth cohorts over time. Second, the Gini coefficients for state pension income and social security wealth have fallen steadily and quite markedly over the sample period. This points towards a substantial role for either changes in policy or changes in the distribution of lifetime earnings. Given that earnings have become slightly less equal over time, this strongly suggests that reforms to the state pension system have more than counteracted this. Our interpretation, confirmed by our later analysis, is that the movement towards a flat-rate state pension system, with much more comprehensive crediting of the arrangements of many not in paid work, over the period we examine has reduced inequalities in state pension income and therefore social security wealth. This change is both the result of reforms during our sample period and the continuing effects of reforms that happened before 2002 gradually working through, with greater coverage of the flat rate state pension and reduced importance of earnings-related elements of the state pension for later-born generations. Changes in the structure of the pensions system also have implications for gender differences in pension entitlement. We see

⁴ Note that there is a break in the series between 2006 and 2008 because the new entrants into the sample from the fourth wave of ELSA did not take part in the ELSA ‘life history’ data collection and their earnings history is imputed using a greater number of assumptions about their employment history.

that while the ratio of average lifetime earnings has in fact been relatively stable over time, there has been a steady decline in the ratio of men's state pension income to women's state pension income, with by 2018 the average state pension income of women being almost the same as that of men.⁵ When interpreting these trends in the gender earnings gap, it is important to remember that our sample conditions on being in work. Due to increases in labour force participation among women across generations (and an increase in working past age 60 due to the increases in the female state pension age) this covers a changing part of the female population over time.

⁵ This was also found to be the case in the UK Family Resources Survey data:
<https://ifs.org.uk/publications/gender-gap-pension-saving>

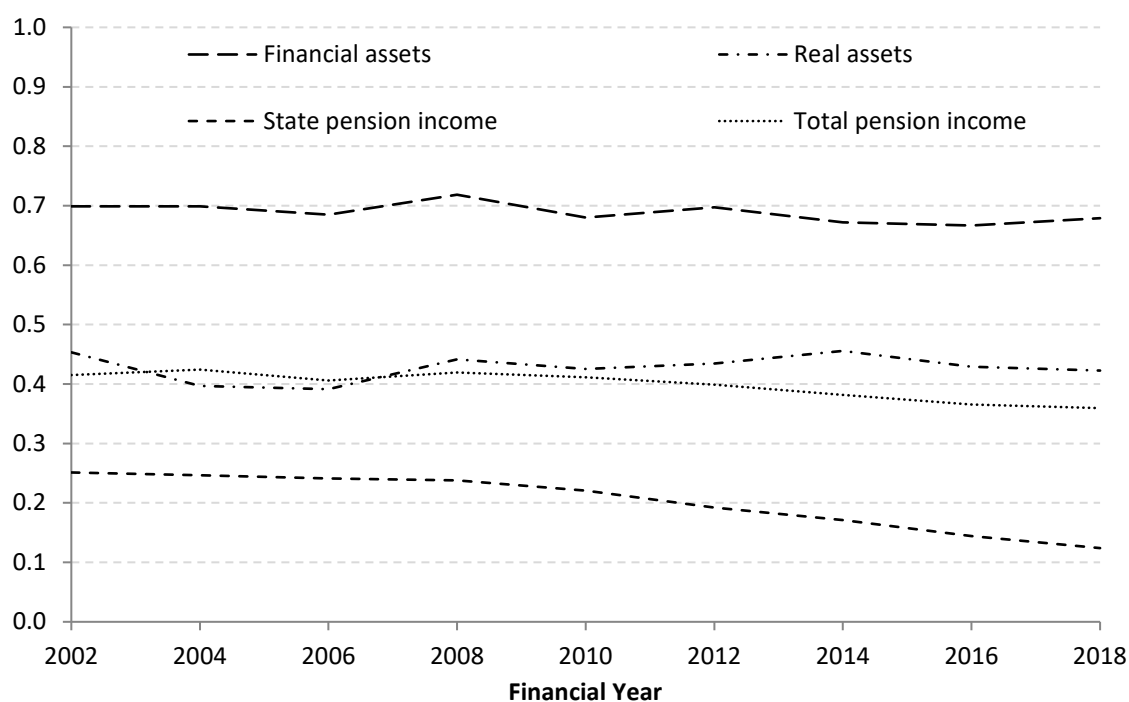
Figure 3.1 Gini coefficients for the distributions of average annual earnings, social security wealth, financial assets, real assets, state pension income and total retirement income, for individuals in work and aged 55 to 69



Source: English Longitudinal Study of Ageing, waves 1-8.

Note: Average earnings is shown as two separate time series (from 2002-03 to 2006-07 and from 2008-09 to 2016-17) because there is a step-change between wave 3 and wave 4 in the proportion of our analysis sample that has completed the ELSA life history survey which drives an increase in estimated average earnings inequality between these waves.

Figure 3.2 Gini coefficients for the distributions of average annual earnings, social security wealth, financial assets, real assets, state pension income and total retirement income, for individuals not in work and aged 55 to 69



Source: English Longitudinal Study of Ageing, waves 1-8.

Figure 3.3 Ratio of male average annual earnings to female average annual earnings for those in work and aged 55 to 69 and the ratio of male state pension income to female state pension income for those aged from State Pension Age to 69

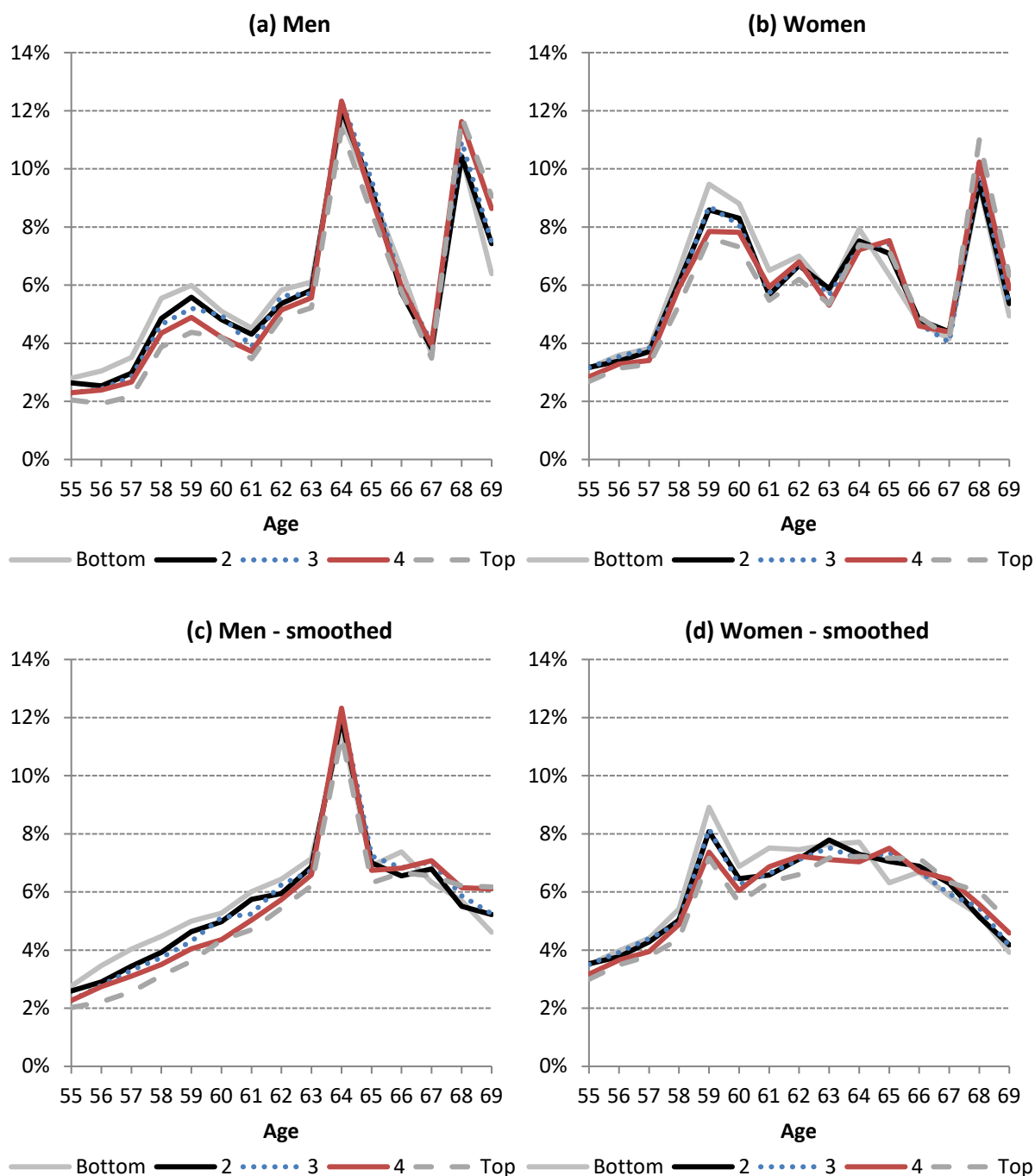


Source: English Longitudinal Study of Ageing, waves 1-8.

The distribution of retirement ages, and the way that this distribution varies across the lifetime earnings distribution, is an important determinant of differences in social security wealth accrued through later working life. Figure 3.4 shows the distribution of retirement ages for each quintile of the lifetime average earnings distribution for a man and woman in work at age 55. The figure is based on estimates from the model of retirement behaviour estimated in Banks, Emmerson and Sturrock (2023). Given the characteristics and distribution of retirement incentives that the state pension system provides for the individuals in our ELSA sample, we use the model to predict the proportion of individuals of a given age and quintile of the lifetime earnings distribution that will leave paid work in the following year. Under the assumption that these hazard rates would be faced by an individual in work at age 55, we obtain their distribution of retirement ages.

The figure shows a spike in retirement probability at age 64 for men, due to the fact that the state pension age for men is 65 throughout our sample period and many people leave work upon hitting this marker. For women, there is an increase in the retirement probability at age 59 because the female state pension age was 60 until April 2010. Relative to the male spike, the spike in female retirement at age 59 is less pronounced, and the retirement probability is also elevated at older ages, because the female state pension age increased from 60 to 65 between April 2010 and November 2018 (the period in which we observe individuals leaving work is up to summer 2018). For both men and women we see that those with higher levels of lifetime earnings are relatively more likely to retire at later ages. These differences in retirement timing are explained by differences in levels of health across the lifetime income distribution, with better health being a predictor of remaining in the labour force for longer at older ages. For both men and women there is a spike in the retirement probability at age 68. This appears to be an artifact of our data. Although the ELSA data do show a significant rise in exits (conditional on being in work) at this age, this same rise is not present in other datasets such as the UK Labour Force Survey. In panels (c) and (d), we therefore show the predicted retirement probabilities where the effect of age is parameterised to be quadratic along with an additional effect on retirement of crossing the state pension age.

Figure 3.4 Distribution of retirement ages for men and women in work at age 55, by lifetime average earnings quintile



Source: ELSA, waves 1-9.

3.3 Trends in inequality in longevity and implications for social security wealth

Figure 3.5 shows our estimates for life expectancy at age 55 for those born in 1930 and those born in 1960, for both men and women. Life expectancy at older ages expanded quite substantially across these generations, rising by 4.5 and 3.3 years for men and women, respectively.

We find a stronger gradient of life expectancy in lifetime earnings for men than for women. The life expectancy gap between the highest and lowest earning fifth of men is 7 years for those born in 1930. For women, it is 5 years. This does not reflect women's life expectancy being less closely linked to how well-off they are. Instead, it is likely because women's average earnings are a less good

indicator of their socioeconomic status and standard of living than for men. Men will be more likely to have been in paid work and to be the main earner in their household in the generations we use to estimate the gradients of longevity in individual earnings. Men's own earnings will therefore tend to more closely track their household economic resources than women's will.

There is no change in the life expectancy gradient by lifetime earnings across generations. As discussed in section 2, this is imposed by our estimation method. While we did not find any evidence that there has been a change in the longevity gradient across generations our limited sample sizes means that we cannot rule this out with much confidence. While we do see that there is less of a difference in mortality rates across the lifetime earnings distribution at older ages, we lack a sufficiently long time period to be able to assess whether this represents an age effect that happens to all birth cohorts as they reach older ages, or something that represents a widening of inequalities in life expectancy across generations.

Figure 3.5 Life expectancy at age 55 for men and women born in 1930 and 1960, by lifetime average earnings quintile



Source: Authors' calculations using ELSA, waves 1-9 and ONS Life Tables.

Figure 3.6 shows how the incorporation of differential mortality into our calculations of social security wealth impact the patterns in social security wealth over time and across the lifetime average earnings distribution. The figure shows average levels of accrued social security wealth for those who are in paid work in each year of our data, splitting by quintile of the lifetime average earnings distribution.

When we do not account for differential mortality, there is a much stronger difference in social security wealth across the lifetime earnings distribution for women than men. This is because there are bigger differences in the number of years worked between women, which drive differences in

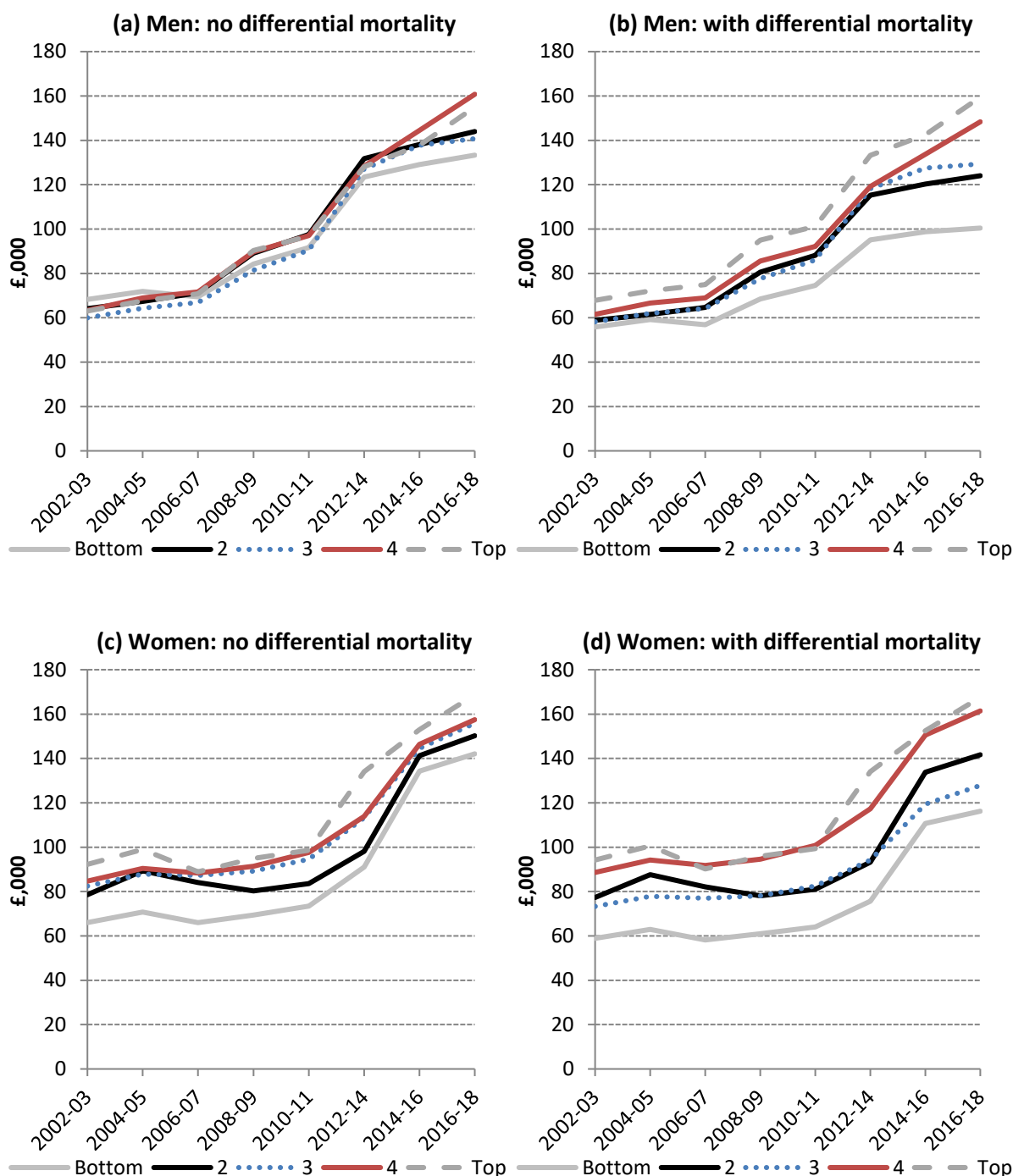
average annual earnings (note that average earnings are calculated based on all years, including years with zero earnings).

Accounting for differential mortality means that the distribution of estimated social security wealth widens in all years because those with higher earnings will, on average, live longer and so collect their state pension for a greater number of years. The effect of differential mortality in this regard is much larger for men – among whom there is relatively little difference in social security wealth by lifetime earnings when we do not allow for differential mortality – than for women. This is because the life expectancy gradient with respect to an individual's lifetime earnings is sharper for men than women, as seen in the previous figure.

Some important interactions between state pension reforms and the impact of differential mortality show up in the data. Changes to the indexation of the state pension in 2007 (a move from price to earnings indexation was scheduled to start from 2012) and in 2011 (the introduction of the triple lock) both made the system substantially more generous. This results in a step up in levels of social security wealth between 2006–07 and 2008–09 and, particularly, between 2010–11 and 2012–13. Importantly, increases to indexation are more valuable the longer someone expects to live. Consequently, we also see a substantial expansion in inequality in social security wealth between higher and lower lifetime earning men at these times. Women don't experience the same expansion in inequality on our measures because they have a shallower gradient of longevity in lifetime earnings.

As an aside, we note that social security wealth of women is at a level comparable to that of men, on average. This happens in spite of the fact that men tend to have higher annual state pension entitlements than women in our sample period, and happens because women have higher life expectancy than men. So when considering how the support provided by the state pension varies between men and women differences in average life expectancy means it can matter whether one is thinking about annual incomes or the amount received over an entire retirement.

Figure 3.6 Average social security wealth for men and women aged 55 to 69 and in work, by quintile of average annual working-life earnings, with and without accounting for differential mortality

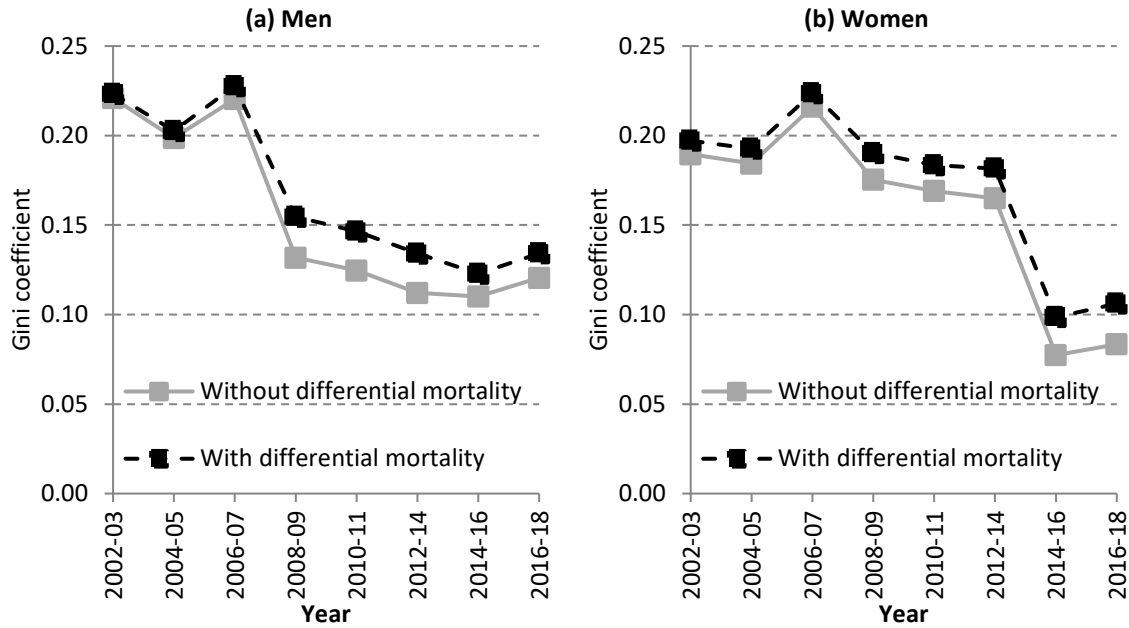


Source: Authors' calculations using ELSA, waves 1-8.

Figure 3.7 shows the Gini coefficients for social security wealth over time for men and women, both with and without accounting for the effects of differential mortality. This shows that the Gini coefficient for social security wealth has fallen over time quite dramatically for both sexes. In the case of men there is a smaller drop from 2006–07 onwards once differential mortality is taken into account. Given that this comes alongside the increase in inequality across the lifetime earnings distribution seen in Figure 3.6 it tells us that pension wealth has become both more equal but also more related to earnings over time, likely because of more generous indexation being of disproportionate benefit to those who are longer-lived (who are, on average, higher earning). We

see a particularly dramatic fall in the Gini for men – from 0.23 to 0.15 – in 2008, when the BSP, which is more important for low-earners, became earnings-indexed and when the number of years required for a full BSP fell from 44 to 30 for men. We see a dramatic fall in the Gini for women – from 0.18 to 0.10 – in 2014, the time of the introduction of the NSP. The falls in the Gini coefficient over time among women are slightly larger if not accounting for differential mortality.

Figure 3.7 Gini coefficients for Social Security Wealth by year and sex, with and without accounting for the effects of differential mortality



Source: ELSA waves 1-8.

4 Effect of pension reforms on social security wealth inequality

In this section we consider more closely the effects that reforms to the state pension system have had on inequalities in social security wealth. To do this, we compare social security wealth inequality under the 1979 system, at which the point the earnings-related component of the state pension system was at its most generous, with the current system. Concretely, for each year from 2002–03 to 2016–17, we calculate the ‘expected level of social security wealth’ for someone in paid work at age 55. We define expected social security wealth as

$$ESSW_{s,t} = \sum_{a=55}^{65} p_{s,a} \overline{SSW}_{s,t,a}$$

where s denotes a ‘type’ (here the combination of sex and third of the lifetime earnings distribution), t denotes year, a denotes age, $p_{s,a}$ denotes the probability of a 55-year-old working individual of type s retiring at age a and $\overline{SSW}_{s,t,a}$ denotes the mean level of social security wealth for individuals of type s and age a in year t (social security wealth for an individual at a given point in time is defined in section 2). $ESSW_{s,t}$ can be interpreted as the expected level of social security wealth at the point of retirement for a 55-year-old individual of type s who is in work at time t .

We calculate the values of ESSW by type and year for both the actual system and under a counterfactual in which the 1979 state pension system remained in place unreformed in every year after 1979. Reforms to the state pension system can be seen as having both a ‘mechanical’ and a ‘total’ effect on social security wealth. The mechanical effect is the change in social security wealth that results from the reform under the assumption of no change in retirement timing. The total effect also includes the change in social security wealth that happens because the reform induces changes in the timing of retirement and therefore more or less accrual of social security wealth conditional on the rules in place. In practice the design of the UK state pension system is such that those aged 55 and over can often accrue relatively little additional state pension entitlement from remaining in paid work so we should expect the difference between the two measures to be relatively small.

We can write ESSW and the elements that determine it as functions of pension rules. For any pension reform from system x_1 to system x_2 we can define the ‘mechanical’ effect of the reform as

$$\Delta_M = \sum_{a=55}^{65} p_{s,a}(x_2) \overline{SSW}_{s,t,a}(x_2) - \sum_{a=55}^{65} p_{s,a}(x_2) \overline{SSW}_{s,t,a}(x_1).$$

This is the effect of the reform, holding fixed retirement timing but allowing the accrual of benefits conditional on labour market histories to change. We can write the total effect of the reform as

$$\Delta_T = \sum_{a=55}^{65} p_{s,a}(x_2) \overline{SSW}_{s,t,a}(x_2) - \sum_{a=55}^{65} p_{s,a}(x_1) \overline{SSW}_{s,t,a}(x_1).$$

When examining the impact of reforms on inequality in ESSW, we look at how reforms affect the levels of ESSW for those in the top and bottom third of the lifetime income distribution among men and among women. We compare the top and bottom thirds within each sex and compare across sexes.

By examining the first points of the lines in Figure 4.1, we see that the 1979 system (labelled ‘without reforms - total’) was much more generous than the actual system that was in place in 2002. Recall that the earnings-related component of SERPS was scaled back substantially through reforms legislated in 1980, 1986 and 1995. While the 2002 system had introduced S2P, which was more generous to lower and mid-earners, the decades of price indexation left both the BSP and S2P at a far lower level than they would have been had earnings indexation been continued as under the 1979 system. The difference between the two systems is also greater for higher earners in line with the 1979 system being a more strongly earnings-related system.

Comparing the levels of social security wealth of men and women in Figure 4.1 under the 1979 system, women have greater social security wealth. This occurs not because their annual state pension entitlements are higher – women have lower average entitlements – but because they are expected to live longer and hence receive this pension income for a greater number of years.

We now turn to the profile over time. The grey lines in Figure 4.1, representing the actual system, show that for both men and women, and for lower and higher earners, the system in place in 2002

was substantially less generous than had the 1979 system remained in place unreformed. The system was then subsequently made more generous, for example, due to the introduction of more generous indexation of the state pension in 2008 and in 2011. There is a large increase in entitlements in 2014 with the introduction of the single tier state pension and this change is particularly pronounced for women. By construction, changes in the 1979 system over time are not attributable to policy changes but to changes in the population. In practice, most of the variation in the average entitlements within earnings tertiles over time in our simulations will be due to sampling variation. The sample sizes underlying each data point are not especially large. By the end of the sample period, the two systems are of broadly similar generosity with, if anything, the actual system being more generous than its 1979 counterpart. This may seem surprising given just how generous the earnings replacement was under that system, with 25% of the 20 best years of band earnings being received in SERPS. However, it is worth noting that a substantial portion of employees opted out of the SERPS system (in return for lower National Insurance Contributions). In our sample, just under three quarters of individuals have some form of private pension, which we use as a proxy for having opted out of SERPS. Further, the triple lock guarantee in the current system implies a rise in the value of the state pension that is above the growth in earnings in some years. While the uprating mechanism makes the extent of this future growth in the state pension uncertain, our simulations are based on an assumption that on average the state pension will rise each year by 0.58 percentage points more than earnings – this is the average boost to the value of the state pension relative to earnings indexation that would have been delivered by the triple lock if it had been in place since 1991–92⁶ –, implying a state pension that will grow 19% more than earnings over a 30-year period.

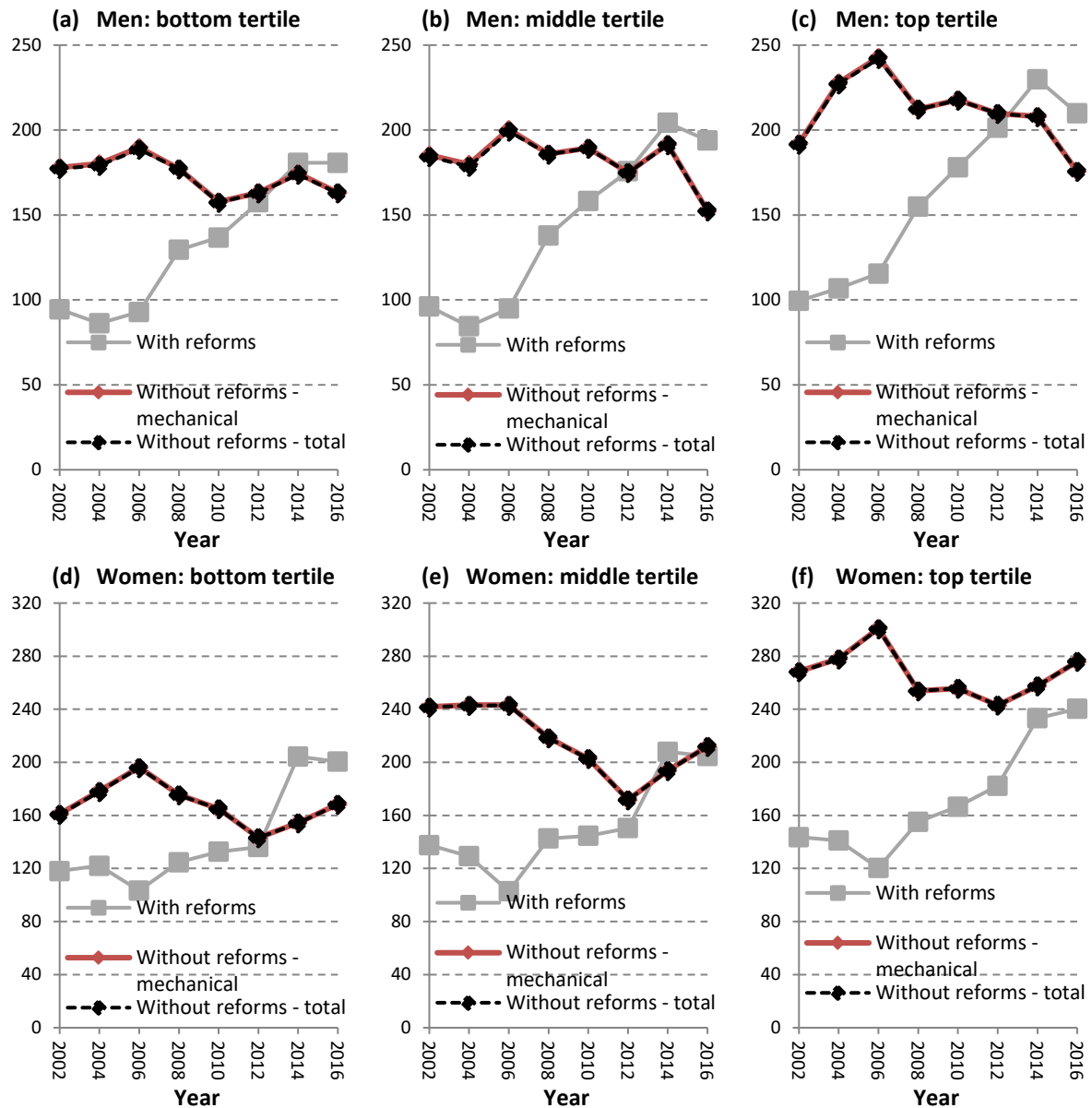
Figure 4.1 shows both the mechanical effect of moving to the 1979 system of rules as well as the total effect. The difference between these is essentially imperceptible – the red and black lines overlap. This implies that the retirement response to the change in incentives, and consequent change in accrual, that we would expect as a result of the reforms enacted is very small compared to the overall scale of social security wealth. This is an implication of the finding of Banks, Emmerson and Sturrock (2023) that, while there is a robust impact of retirement incentives on the probability of leaving work, the changes in incentives over time in the UK, and the impact that we would expect the resulting change in behaviour to have on state pension entitlements, are relatively modest.

The one exception to the modest impact of reforms on behaviour is the strong impact of increases in the state pension age on the retirement timing of women. In our sample period this resulted in significant increases in employment among those women aged between 60 and 65. Even in this case, where employment rates may be increased by 10 percentage points at certain ages, the fact that this will result in increased accrual of the flat rate component of the state pension only for those without a full history of contributing years (and potentially affect SERPS entitlement among the minority who are contracted in) means that only a small share of women will see a change in their accrual of social security wealth as a result of the behavioural response to reforms. In turn, this increased accrual in a small number of years is only a small fraction of their stock of social security

⁶ Office for Budget Responsibility (2023). The OBR calculate the average increase in triple lock indexation relative to average earnings between 1991–92 and the end of their medium-run forecast horizon, which was 2027–28 in July 2023.

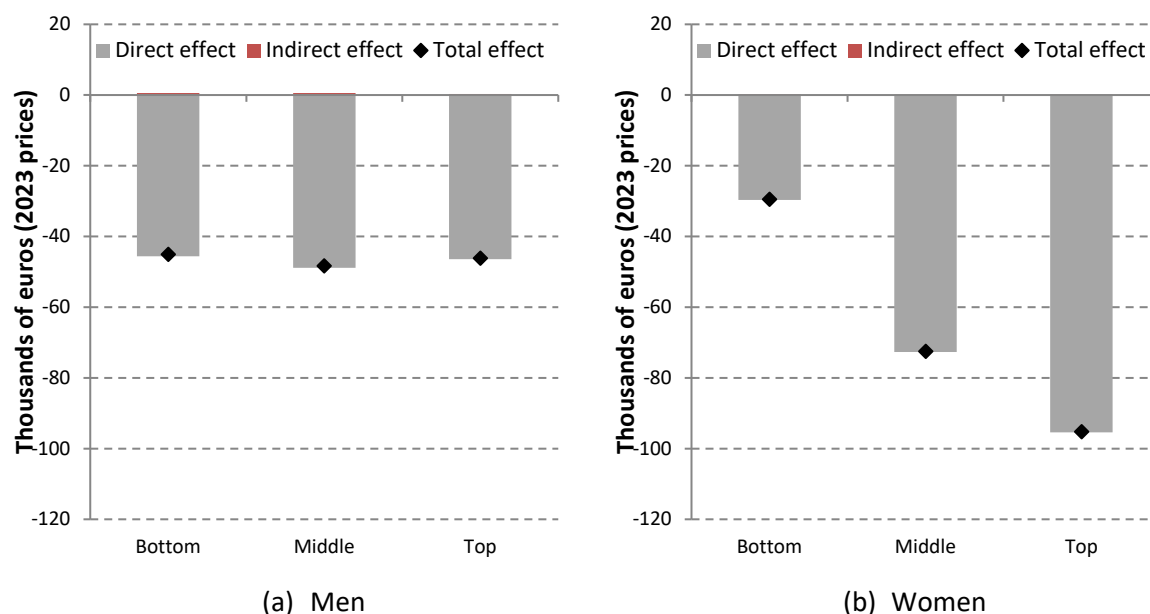
wealth. Figure 4.2 summarises the differences between the two systems and the contribution of direct and indirect effects.

Figure 4.1: Expected social security wealth at retirement for a 55-year-old person in work by sex, average lifetime earnings tertile and year (with and without reforms since 1979)



Source: Authors' calculations using ELSA, waves 1-8.

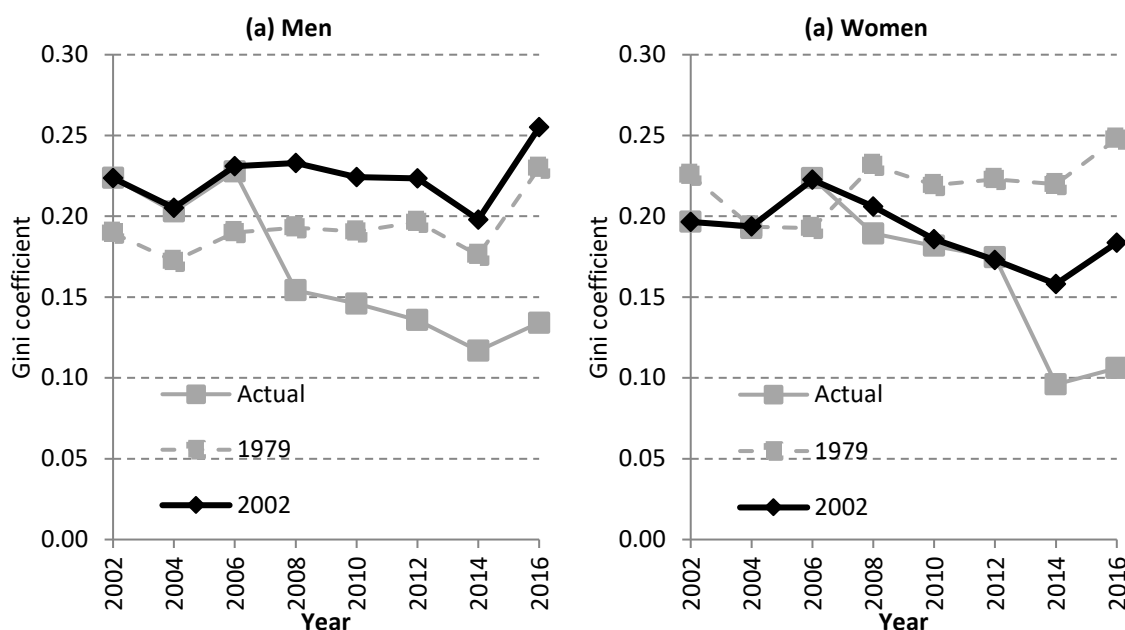
Figure 4.2 Mean change in expected social security wealth as a result of reforms since 1979 by lifetime average earnings tertile and sex



Source: ELSA, waves 1-8.

Figure 4.3 gives a summary of the impact of reforms on inequality within men and within women. Here, we not only show a counterfactual of the 1979 system but also the 2002 system. We see a substantial decline in the gini for men under the current system, between 2006-07 and 2008-09 and for women between 2012-13 and 2014-15. For men, 2007 saw changes to indexation that would make the BSP component (more important for low-earning men) more generous and also saw a reduction in the number of years of contributions required to attain a full BSP. In the case of women, the introduction of the NSP in 2014 is seen to have a very pronounced effect in reducing inequalities in social security wealth.

Figure 4.3 Gini coefficients for Social Security Wealth by year and sex, with and without reforms since 1979 and since 2002



Source: ELSA waves 1-8.

5. Conclusion

In this paper we have made the first comprehensive estimation of the effect of reforms to the UK state pension system on inequalities in retirement entitlements, accounting for the effects of differential mortality on the time that different groups can be expected to spend in receipt of a state pension.

In the UK in recent decades, the direction of reform was away from an earnings-related system and towards one that was more flat-rate, gave benefits to a wider set of individuals and, in recent years, was more generously indexed. These reforms have affected different dimensions of inequality in different ways. The overall distribution of state pension incomes has become more equal, as measured by the Gini coefficient. This is true even once differential mortality is accounted for. The gap in pension entitlements between men and women has also narrowed.

When we look across the distribution of lifetime average earnings, we find that the reforms of recent decades have been a substantial uplift to the social security wealth that individuals have accrued (and can expect to accrue) across the earnings distribution. Even though the current system is very different to the extensive earnings-related system in place in 1979, we calculate that the pension wealth that a worker can expect to accrue by retirement is, on average, similar to that under the 1979 system.

Despite a lower Gini coefficient for pension income and social security wealth, we calculate that there is slightly more inequality in social security wealth between high and low earning men than there would have been under the 1979 system. This may seem surprising given a system that is expected to deliver the same flat rate pension to most people but is because generous indexation of the state pension implies future pension benefits that will be of particularly great value to those who live for a long time. In the case of women, we have seen a closing of the differences in social security wealth between high and low earners, relative to the 1979 system. This is partly because the gradient in mortality by individual earnings is not as steep for women as it is for men, but also because recent reforms, particularly the introduction of the NSP, mean a significant step-up in pension benefits for low-earning women.

Finally, we note that while our evidence suggests that the gradient in women's mortality by their own earnings is not as steep as the gradient for men, the broader socioeconomic gradient in mortality for women may be different and perhaps steeper. For example, there may be a steeper gradient when analysing difference by household income and wealth. This is an example of a broader issue – that the impact of reforms on inequality could be importantly dependent upon the economic unit we examine and the axis along which we measure inequality. Further work could take forward this line of inquiry to unpack further the implications of recent pension reforms for inequality under different models of resource sharing within couples.

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