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Life-cycle patterns in pension saving

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Preface

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The Nuffield Foundation is an independent charitable trust with a mission to advance social well-being. It funds research that informs social policy, primarily in Education, Welfare and Justice. It also funds student programmes that provide opportunities for young people to develop skills in quantitative and scientific methods. The Nuffield Foundation is the founder and co-funder of the Nuffield Council on Bioethics and the Ada Lovelace Institute. The Foundation has funded this project, but the views expressed are those of the authors and not necessarily the Foundation. Visit http://www.nuffieldfoundation.org/.

This work was produced using statistical data from the Annual Survey of Hours and Earnings, provided by the Office for National Statistics (ONS). The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data.

Executive summary

Most people need to save privately for retirement if they want to enjoy a comparable standard of living in retirement to that which they have enjoyed during working life. How much to save, and when, is largely up to individuals to decide. While there has been lots of discussion among policymakers, industry and researchers about how much people should save privately for retirement, and whether individuals' actual savings are adequate, there has been much less focus on *when* individuals should save, and whether they behave this way in practice.

In an ongoing programme of research, kindly funded by the Nuffield Foundation, we aim to address this evidence gap – examining in detail how pension saving might be expected to change over working life, and how employees and the self-employed behave in practice. In particular, we will analyse how saving rates change with age, with changes in earnings, and with other changes in people's circumstances.

How might people be expected to behave?

In a related publication, we quantify how one might expect the saving rate to change over working life, given factors such as the arrival and departure of children, changes to earnings, or the ending of student loan repayments (Crawford, O'Brien and Sturrock, 2021). The findings of that work are clear: there are good reasons to expect individuals would dramatically increase pension contributions in later working life, rather than saving a constant proportion of their income every year. But how do people behave in practice?

How do employees behave in practice?

In this briefing note, we present initial evidence on the 'big picture' of how employees' pension saving changed over the course of working life before automatic enrolment started to be rolled out in October 2012. (These patterns will be explored in more detail in the ongoing research programme.) Why is this still of

interest, when automatic enrolment is known to have affected pension saving behaviour, substantially increasing the proportion of private-sector employees saving in a pension? Well, many people were saving in a pension before automatic enrolment, and their behaviour – for example, when and why they change their contribution rates – may be unaltered by the introduction of automatic enrolment. It is therefore important to understand this behaviour, in order to project the future retirement resources of these people, and to understand how possible future policy reforms may affect them. If automatic enrolment has altered behaviour, then we need to know how individuals previously acted in order to fully appreciate the effects (intended and otherwise) of automatic enrolment.

In this briefing note, using data from the Annual Survey of Hours and Earnings (ASHE) from 2005 to 2012, we document how average pension contributions to workplace pensions evolve with age – estimating 'age profiles' that abstract from differences in levels of pension saving in different years.

Key findings

1 Before automatic enrolment was introduced, there was an age profile in defined contribution (DC) pension saving among private-sector employees. However, the increase in average contributions as a share of earnings through working life was small. Across all private-sector employees, including those not saving in a DC pension at a particular point in time, we estimate that mean contributions into DC pensions increase by around 2 percentage points of gross pay between the early 20s and mid-50s.

2 Much of this increase in average contributions with age was driven by net movements into saving in a workplace DC pension, particularly among those in their 20s and early 30s. We estimate an increase in the membership rate of DC pensions of 10 percentage points during people's 20s, but smaller increases in membership rates with age thereafter.

3 Average pension contributions among those saving in a DC pension increased steadily but slowly throughout the whole of working life – by around 5 percentage points of gross pay between the early 20s and

late-50s. This arises from increases in both average employer and average employee contributions – by around 3 percentage points and 2 percentage points of gross pay, respectively,

4 Automatic enrolment has increased private pension membership, particularly among younger individuals. The effect of this will be to have further flattened the age profile of pension saving.

5 Comparing the age profile of pension saving as a share of earnings between male and female private-sector employees before automatic enrolment, average pension saving was broadly similar until the mid-30s, but then diverged sharply as average pension contributions continue to increase with age for men but plateau for women. This will have driven a gender pension gap over and above that arising from differences in labour market attachment or average earnings.

6 This pattern was driven by differences in the age profiles of pension membership. Before automatic enrolment was introduced, male and female private-sector employees were similarly likely to be saving in a pension until around age 30, but then the proportion saving continued to increase with age for men but not women. The age profiles for average contributions as a percentage of gross pay conditional on being a member of a workplace pension are much more similar (and, in fact, are higher for women than men).

7 Automatic enrolment will have changed the nature of the gender pension gap going forwards, by substantially increasing pension membership, and resulting in a difference in pension membership between male and female employees that is more uniform with age. Understanding the drivers of the previous gender pension gap is therefore important for fully assessing the impacts of automatic enrolment, and the channels through which it affects individuals

While these findings reveal that pension saving as a share of earnings does increase over working life, the picture is more gradual, and saving less concentrated in later life, than a simple economic model might suggest. Automatic enrolment will likely

have further flattened age profiles, as it has increased pension membership particularly among younger individuals.

In the remainder of our research programme, we will be exploring in depth the drivers behind the empirical trends presented here – examining what causes individuals to start saving in a pension when they do, when and why people change their pension contributions, and how that correlates with changes in individuals' employment circumstances or other household characteristics. In particular, we will examine what drove the divergence in the behaviour of male and female employees in their 30s.

These questions are important. While this evidence is based on behaviour before the introduction of automatic enrolment, this is likely to still be informative of how those more 'active' savers (who would have been saving in the absence of the reform) continue to save. This is important in order to project the likely retirement resources of these individuals, and to understand better the impact of automatic enrolment and the likely effects of potential new policies to encourage greater retirement saving.

1. Introduction

Most people need to save privately for retirement if they want to enjoy a comparable standard of living in retirement to that which they have enjoyed during working life. But how much to save, and when, is up to individuals to decide. Very few private-sector employees these days are offered access to a defined benefit (DB) pension, with a fixed benefit and contribution schedule. Instead, most people have access to pensions that operate on a DC basis, where there is much greater flexibility regarding annual contributions (and investment strategies).

Economic models suggest how a rational and well-informed individual would be expected to save for retirement. If individuals decide how much to spend and how much to save each year in such a way as to smooth their standard of living over time, then for most people we would expect the proportion of income saved for retirement to vary with changes in their circumstances. In a companion briefing note, we quantify how one might expect the saving rate to change over working life, given factors such as the arrival and departure of children, changes in earnings, or the ending of student loan repayments (Crawford, O'Brien and Sturrock, 2021). The findings of that work are clear: there are good reasons to expect people to dramatically increase pension contributions in later working life, rather than saving a constant proportion of their income every year. This conclusion holds even when people can benefit from a contingent employer contribution to their pension (that depends on them making employee contributions), and is robust to a range of assumptions about rates of return.

But how do people in the real world behave? There is relatively little recent evidence on how, when and why people change their pension saving over their working lives. Reviews of the literature on retirement savings choices by Gough and Niza (2011), and on interventions to raise household saving more generally by Crossley, Emmerson and Leicester (2012), identify many papers that have examined factors associated with contribution levels, with individual characteristics, social norms, match rates, defaults and financial education all being found to be important. But the effect of changes in personal circumstances and their effects on contributions remain understudied. Notable exceptions for the UK

context include McKay and Kempson (2003) and Smith (2006), who provide evidence (although now somewhat dated) on some aspects.

In an ongoing programme of work, kindly funded by the Nuffield Foundation, we are examining in detail how pension saving changes over the life cycle for both employees and the self-employed. In particular, we will analyse how saving rates change with age, with changes in earnings, and with other changes in people's circumstances.

This matters for those concerned with projecting future retirement resources given current saving behaviour – understanding how individuals' saving rates are likely to change across working life is vital for the accuracy of such projections. For example, if people tend to increase their saving rate in later life, one needs to factor that in, otherwise projections based on early-life saving rates will underestimate future retirement preparedness. But one would also need to stay attuned as to whether more recent generations were indeed ramping up their pension saving as they aged in a similar way as previous generations.

It also matters for those designing or proposing new policies to encourage greater saving, such as adjustments to automatic enrolment. For example, to understand the impact of policies such as contributions that increase automatically when earnings increase, or communication strategies that aim to encourage retirement saving when loan repayments finish, one needs to understand how individual behaviour would respond to such a change in circumstances in the absence of any policy reform.

In this first briefing note, we present initial evidence on the big picture of how employees' pension saving changed over the course of working life before the introduction of automatic enrolment. To do this, we examine how average pension contributions to workplace pensions change with age, by using data from the Annual Survey of Hours and Earnings (ASHE), which is a survey completed by employers that provides annual data on around 1% of employees across Great Britain.[1] We estimate an 'age profile' of pension savings, that is, a representation of how an average employee changes their pension contributions as they age, by

[1] See Office for National Statistics (2020). Further detail on the ASHE is provided in Appendix A.

abstracting from any effects of time or differences in saving rates between people born in different years.

The patterns documented in this briefing note draw on data from the period 2005 to 2012, that is, before automatic enrolment was introduced. The introduction of automatic enrolment into workplace pensions will, of course, have changed pension saving decisions for many employees. Automatic enrolment has been shown to have substantially increased workplace pension membership, particularly among groups who were less likely to save before.[2] However, understanding more about how people changed their pension saving over their lifetimes before automatic enrolment is still important. Many employees saved in a private pension before automatic enrolment was introduced. In April 2012, 37% of private-sector employees were members of a workplace pension. While these people may have been affected by the introduction of automatic enrolment (for example, due to the introduction of defaults, signalling, or peer effects), a good guide to their future saving behaviour – such as whether or how they change their pension contributions as their circumstances change – may still be how they and similar individuals used to behave in such situations. There is still therefore a need for evidence on this behaviour in order to fully appreciate how future policy reforms may affect them.

The rest of this briefing note is organised as follows. In Section 2, we analyse how average pension saving changes over working life, distinguishing between public- and private-sector employees. In Section 3, we examine the extent to which patterns for private-sector employees are due to changes with age in 'membership' (i.e. whether or not an individual saves anything in a pension at a given age), or to changes with age in the level of contributions made among those who do contribute. In Section 4, we explore differences by gender in the patterns documented in Section 3. We discuss the findings, and highlight our ongoing research in this area, in Section 5.

[2] See Bourquin, Cribb and Emmerson (2020) and Cribb and Emmerson (2020).

2. Average pension saving across working life

We start by exploring how pension saving varies over working life, averaging across all employees whether they are saving in a pension or not. We measure an individual's pension saving as the total contribution to their workplace pension – including both individual contributions and those made on their behalf by their employer, if applicable – expressed as a share of the individual's total gross earnings.[3] In doing so, we are examining whether the average proportion of earnings saved in a pension changes over working life. We start by considering all employees, before separately analysing private- and public-sector employees and highlighting the key differences between them.

All employees

A natural starting point when considering how pension saving varies over the life cycle is to compare the pension saving of people at different ages at a given point in time (for example, in 2005 or in 2012). A potential problem with doing this is that someone aged 25 in 2005 might save differently by the time they get to 40 than someone aged 40 in 2005 – for example, because the person aged 40 already had access to a type of pension that is now no longer available to new entrants, or because the person aged 40 already is from a generation with different saving habits. To address this concern, rather than simply comparing average pension

[3] An alternative approach would be to illustrate pension contributions as a percentage of total remuneration – that is, as a percentage of gross earnings plus employer pension contributions. If we were to express pension saving in this way, our estimated age profiles that are upward-sloping would be slightly flatter, and differences in the levels of pension contributions between groups would be slightly smaller.

saving by people of different ages, we first divide people into 'birth cohort' groups, where each group contains all individuals born within a given five-year period. We then exploit the fact we have several years of data to examine how average pension saving changes within each birth cohort, as they age over time.

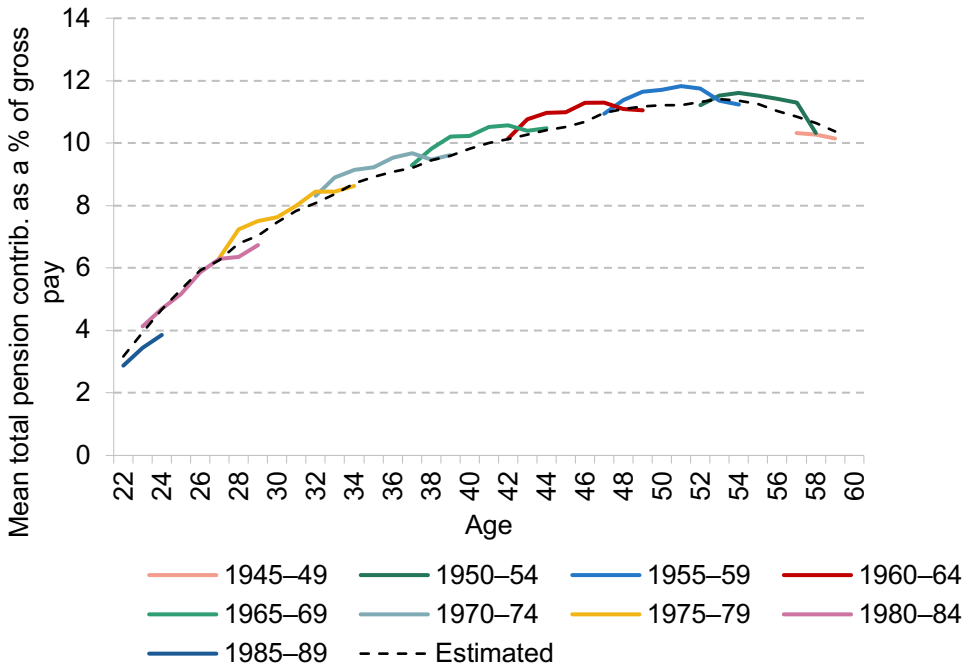
Figure 2.1 shows the resulting picture for how mean total pension contributions vary with age between 22 and 59.[4] Specifically, for each year between 2005 and 2012, we plot the mean total pension contributions for each birth cohort against the average age of employees in that cohort at that same point in time. On average, pension saving as a share of earnings appears to increase with age – those born in the late 1950s, who were in their early 50s during the analysis period, contributed around 8 percentage points of pay more than those born in the late 1980s, who were in their early 20s. (Recall that because this average includes those not currently saving in a pension, whose contributions are zero, the average contribution among those who are saving at that point in time will be higher. This is explored in more detail in Section 3.)

In order to infer from Figure 2.1 how pension saving actually changes with age, we need to make further assumptions. In particular, even for any particular birth cohort, while we might expect saving to change with age, it could also be affected by the year of observation (and by date of birth within a five-year cohort group). For example, saving in a particular year might be affected by macroeconomic conditions, such as the financial crisis, or because of a trend decline in pension saving over time. It is not possible to separate all three effects – what is due to age, year or date of birth – without making some assumptions.[5] Simple assumptions are to assume that there are no time effects, or that there are no differences between birth cohorts. More complex approaches make modelling assumptions about the form of the time or cohort effects.

[4] We focus on this age range to avoid the large compositional changes in the work force at younger ages due to completion of higher education, and at older ages due to retirement.

[5] This difficulty is known in the economics literature as the 'age–period–cohort' problem. For a further discussion, see Appendix B.

Figure 2.1. Average pension saving among all employees, by age and birth cohort



Note: Mean is calculated across all employees, whether saving in a pension or not. Estimated age profile includes average estimated year effect and average estimated birth cohort effect.

Source: ASHE, 2005–12.

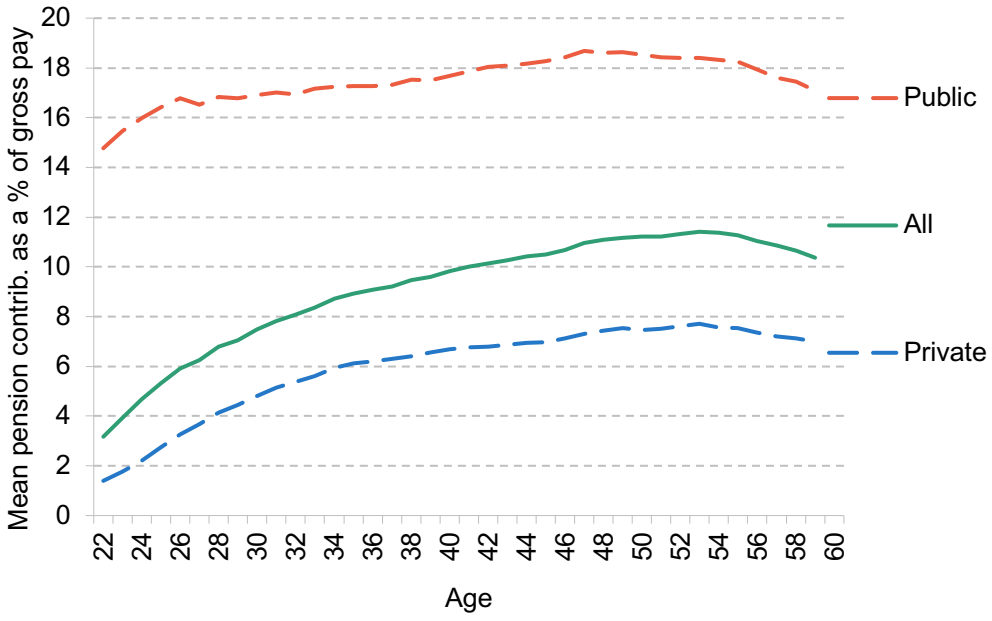
Throughout this briefing note, we model age profiles by making the assumptions that that the underlying age profile of saving has stayed the same over this period (2005–12), but that the level of the profile can differ for different years and for different five-year birth cohorts. In other words, we assume: (i) that there are differences between people in different five-year birth cohort groups, but not for individuals in the same birth cohort group; and (ii) that there are year effects. We further assume that these birth cohort and year effects have the same effect on all employees regardless of age – that is, they only affect the level of the age profile and not the shape. The technical detail of this methodology is described in more detail in Appendix B together with a comparison of how the results of this method compare to the results of other assumptions that have been commonly been used to address this sort of problem. For each estimated age profile presented in this briefing note, we also provide the underlying 'raw picture' (akin to Figure 2.1) in Appendix C.

The estimated age profile of average pension saving across all employees is illustrated by the dashed line in Figure 2.1. Average pension saving is estimated to increase steadily over working life. The increase is relatively rapidly at younger ages – around 6 percentage points of gross pay between the early 20s and mid-30s – before being more gradual at older ages – around 2 percentage points between the mid-30s and mid-50s.

Public- versus private-sector employees

The solid line in Figure 2.2 shows the estimated age profile for average total pension contributions across all employees. However, one would expect the age profile of pension saving to look different for those working in the public sector, compared with those working in the private sector. First, earnings profiles differ between the two sectors. Disney, Emmerson and Tetlow (2009) show that for higher-educated employees, average earnings increase more rapidly with age in the private sector than in the public sector. In Crawford, O'Brien and Sturrock (2021), we show that those with steeper earnings profiles would be expected to have savings rates that increase more later in working life. Second, most public-sector employees have access to DB pension schemes, where pension benefits in retirement depend on the number of years an individual has contributed to the scheme, and where contribution levels are set by the scheme rules. In contrast, in the private sector, only a minority of employees has access to a DB pension, and many therefore have greater discretion over their contribution amounts. We therefore examine separately the patterns of pension saving among employees in each sector.

Figure 2.2. Average pension saving among all employees, by sector



Note: Estimated age profile including average estimated year effect and average estimated birth cohort effect. The 'raw' description of average pension contributions by age, birth cohort and sector is provided in Figure C.1 in Appendix C.

The estimated age profiles for employees in the public and private sectors are shown by the dashed lines in Figure 2.2. While our focus is on age profiles,[6] what stands out most is the difference in the levels: the average pension contribution at any given age is substantially lower for private-sector employees compared with public-sector employees. In terms of age profiles, the shape of how pension contributions change over the life cycle also differs for the two groups. For private-sector employees, we see a similar pattern to that in Figure 2.1, with average contributions as a percentage of gross pay increasing steadily up to around the mid-50s. Between the early 20s and the mid-50s, mean pension contributions increase by around 7 percentage points of gross pay. However, the profile of the average contribution among public-sector employees is much flatter with age.

[6] Our focus is on the age profiles – the increase in pension saving over working life – rather than the level of pension saving at any particular age, as the latter is estimated to vary by year. All the figures presented in this work are plotted at the average level for 2005–12, rather than the level in any particular year.

Private-sector employees

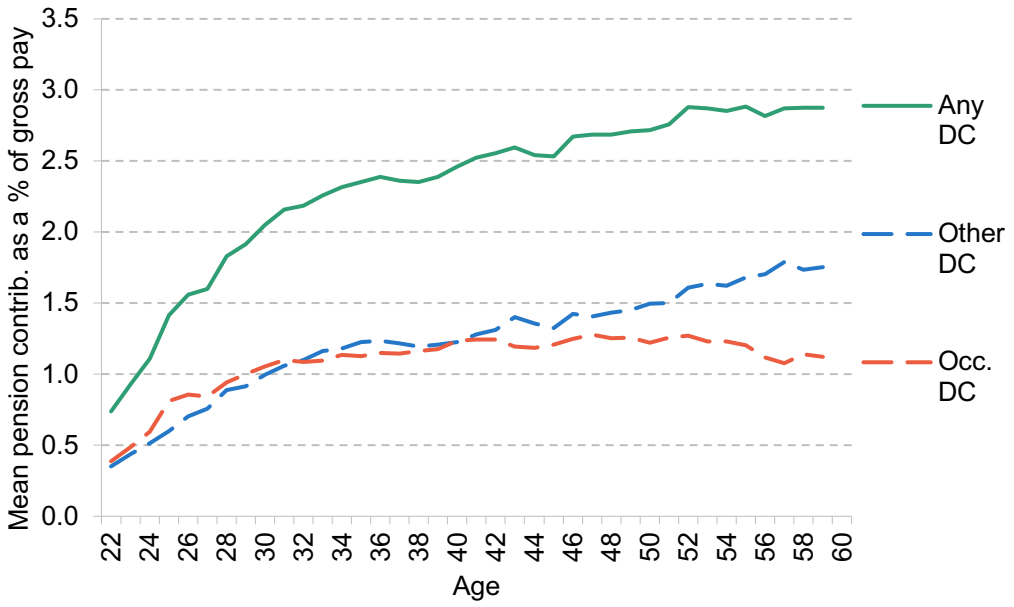
Much of the difference in age profiles of pension membership between public- and private-sector employees will be driven by the different pension arrangements on offer. However, within the private sector, there are also different types of workplace pension arrangements – broadly speaking, occupational DB pensions, occupational DC pensions, and other workplace DC pensions (including group personal pensions, group stakeholder pensions, personal pensions and stakeholder pensions). Among private-sector employees who were contributing to a private pension in 2012, 33% were in an occupational DB scheme, 25% were in an occupational DC scheme, and 38% were in other occupational DC schemes.[7] If the different types of pension are what cause different age profiles in pension saving between the public and private sectors, then we would also expect differences in the age profiles of pension saving between private-sector employees, depending on which pension scheme they have access to.

We therefore turn now to estimating an age profile for saving in DC pensions only among private-sector employees. (An age profile for saving in DB pensions is no longer relevant as most private-sector schemes are closed to new entrants, and the age profiles of saving among members are going to be effectively determined by scheme rules.)[8] Figure 2.3 shows the result. Note that these average saving rates are calculated across all private-sector employees – where anyone not making contributions to a DC pension has a saving rate of 0% of gross pay, even if they are contributing to a DB pension. There is still an upward-sloping age profile in average DC pension saving, but the size of the increase is much smaller, at around 2 percentage points over working life, and somewhat more heavily concentrated at younger ages.

[7] Around 3% of private-sector employees were contributing to a workplace pension where their employer did not report the type of pension.

[8] Estimating an age profile for DB pension saving is also challenging, due to the very large observed differences in the proportion of different birth cohorts who are members of a DB pension, even when observed at the same age. This is because private-sector DB schemes closed over time. Also, because closures often applied to new entrants only, rather than to all employees, there are large 'birth cohort' effects as well as time effects. This makes it particularly difficult to estimate an age profile of DB pension saving, given the fundamental 'age–period–cohort' difficulty described in Section 2.

Figure 2.3. Average DC pension saving among private-sector employees, by pension type



Note: Estimated age profile including average estimated year effect and average estimated birth cohort effect. The 'raw' description of average DC pension contributions for private-sector employees by age, birth cohort and pension type is given in Figure C.2 in Appendix C.

3. Drivers of the age profile in DC saving

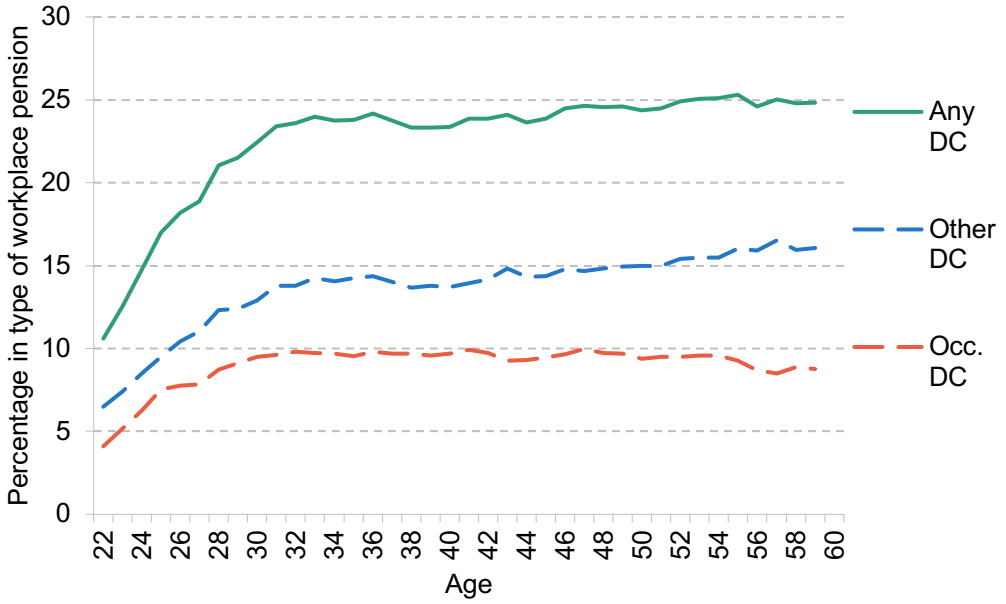
The analysis in Section 2 examined average workplace DC pension saving across all private-sector employees, whether they were members of a workplace pension scheme or not. The increases in average pension contributions over the life cycle estimated in Figure 2.3 could therefore be the result of two behaviours. One possibility is that rates of membership of a workplace DC pension change with age, while the other is that average contribution rates, conditional on being a member of a workplace DC pension, increase with age. In this section, we explore both of these drivers, starting with membership.

Age profiles in DC pension membership

Individuals are counted as being a 'member' of a workplace pension if they are reported to have positive employer or employee contributions (in the pay period in April to which the ASHE relates). Figure 3.1 presents the estimated age profile of DC pension membership for private-sector employees. The percentage of employees with a DC pension increases by around 12 percentage points between the ages of 22 and 32, and is fairly constant thereafter. Figure 3.1 also presents estimates for how the share of private-sector employees in each of occupational DC pensions and other workplace DC pensions varies with age. Membership of both types of pensions shows a similar pattern – increasing until around age 30 or so and then being much more constant over the rest of working life.

Net movements into saving in a workplace pension are therefore an important driver of the increase in average DC pension contributions with age that were shown in Figure 2.2. This is particularly true for the increases in pension saving at younger ages; the role at later ages looks lower.

Figure 3.1. Membership of different types of pensions over working life for private-sector employees



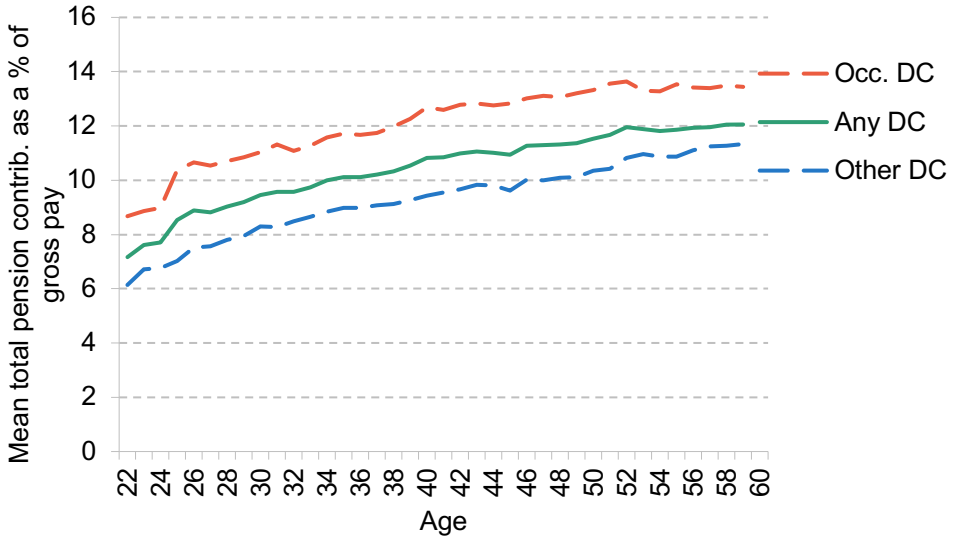
Note: Estimated age profile including average estimated year effect and average estimated birth cohort effect. The 'raw' description of membership by age, birth cohort and pension type is provided in Figure C.3 in Appendix C.

Age profiles in contribution rates

We turn now to examine how pension contribution rates change with age for those who are saving in a private pension. To what extent do such changes in contributions contribute to the age profile in pension saving shown in Figure 2.2? To start, we estimate an age profile for average pension contributions for private-sector employees who are members of a DC workplace pension, in an analogous way to the approach described so far. We examine different types of pensions, and separately estimate profiles for both employer and employee contributions. Then, to help explore whether the results we see are driven by employees increasing their contributions from year to year while in a pension, or by a 'compositional effect' of those who join a pension at later ages making higher than average pension contributions, we repeat the analysis for a 'balanced sample' of private-sector employees who are members of a workplace pension in all years from 2007 to 2011.

Figure 3.2 shows the estimated age profile for total pension contributions. Conditional on being in a workplace DC pension, average total pension contributions increase steadily throughout working life – by around 5 percentage points of gross pay between the early 20s and late-50s. This pattern is broadly similar both for contributions to occupational DC schemes and for contributions to other workplace DC schemes, though the average level of contributions to occupational pensions is higher.

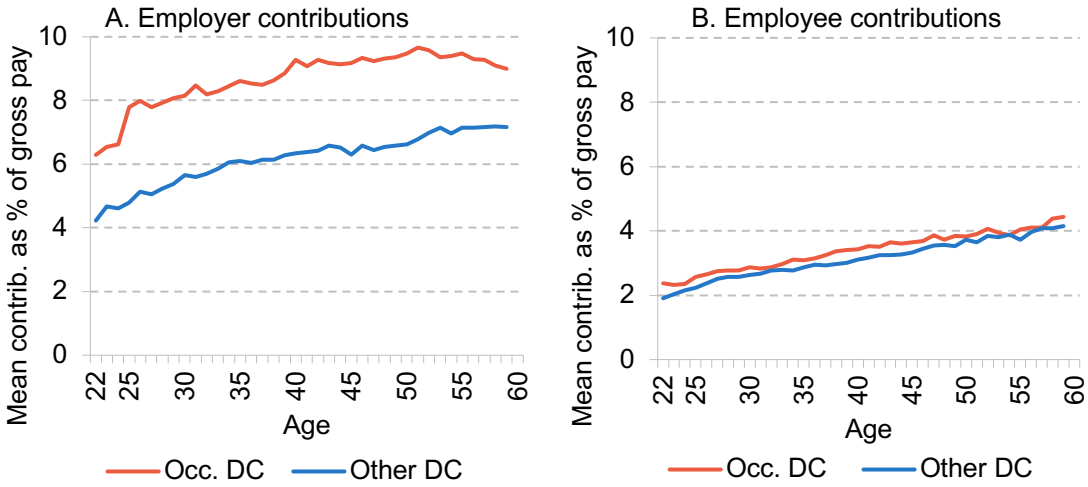
Figure 3.2. Average total pension contributions over the life cycle for private-sector employees in a workplace pension, by pension type



Note: Estimated age profile including average estimated year effect and average estimated birth cohort effect. The 'raw' description of average contributions by age, birth cohort and pension type is provided in Figure C.4 in Appendix C.

Figure 3.3 shows the age profiles that are estimated separately for employer and employee contributions (in panels A and B, respectively). The increase in average contributions seems to be fairly continuous with age for both employee and employer contributions, increasing by around 2 percentage points over working life for employee contributions and around 3 percentage points for employer contributions. While our focus is on how pension saving changes with age, we can also see that the higher levels of total contributions for those with occupational DC pensions compared with other workplace DC schemes is driven almost solely by higher average employer contributions for those in occupational DC pensions; average employee contributions are very similar for employees in the two pension types at all ages.

Figure 3.3. Average contributions over the life cycle for private-sector employees in a workplace pension, by pension type



Note: Estimated age profiles including average estimated year effect and average estimated birth cohort effect. The 'raw' descriptions of average employer and employee contributions by age, birth cohort and pension type are in Figures C.5 and C.6 in Appendix C.

Increases with age or compositional effects?

Although Figure 3.2 and Figure 3.3 show that average pension contributions, conditional on being in a pension, increase with age throughout working life, the question remains whether this is a compositional effect – that is, those joining a pension at later ages do so at higher than average contribution rates – or whether employees who continually save in a pension increase their contributions as they get older.

Why might there be such a compositional effect? Imagine a world where employees never leave a pension after joining a scheme, where different employees join a pension scheme at different ages, and where employees cannot change their pension contribution rates once they have joined. In this set-up, it might make sense for those employees that join a pension scheme at age 20 to contribute a lower proportion of their pay each year than those that join at, say, age 40, because those who join at younger ages are saving for many more years. In this case, no individual employee increases their contributions as they get older, but average pension contributions across all members increase with age – as those who join later choose to contribute a higher proportion of their salary.

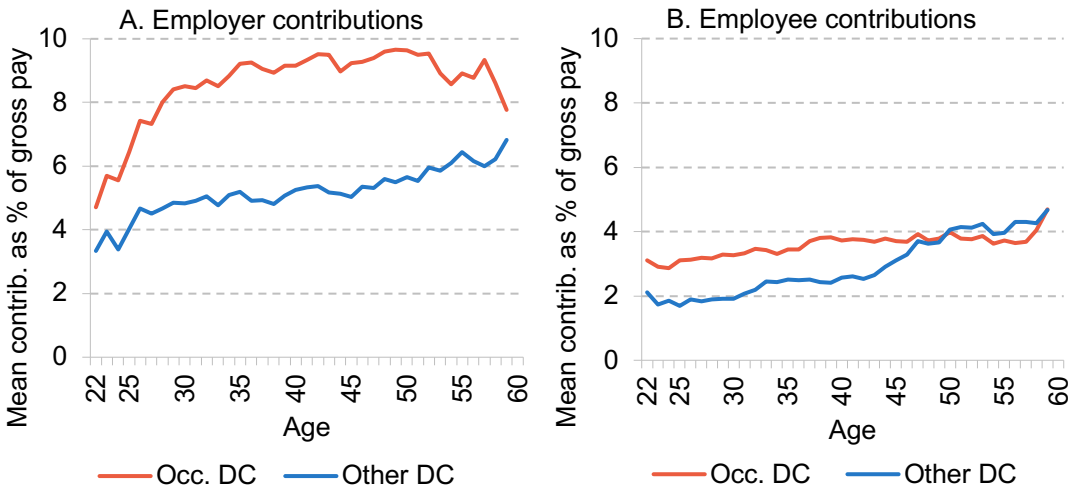
To help examine whether employees are, on average, increasing their pension contributions with age once in a pension, we restrict our sample to a 'balanced

sample'. For each pension type, the balanced sample is restricted to those employees who are a member of the same type of pension for all years from 2007 to 2011, inclusive.[9] When we plot average pension contributions over time for five-year birth cohorts in this balanced sample (Figures C.7 and C.8 in Appendix C), this illustrates the change in average contributions for a stable group of individuals over a five-year period as they age.

Figure 3.4 shows the estimated age profiles for employer and employee pension contributions, for our balanced samples. The age profiles for employer contributions estimated from the balanced sample are broadly similar to those estimated for the full sample (illustrated in Figure 3.3), though with a slightly higher level, and a more smoothly increasing profile, in the case of contributions to other workplace DC pensions. This suggests that the increases in average contributions over working life are due to changes in contributions for those already saving in a pension, rather than a compositional effect. For employee contributions, the estimated profiles are slightly different. The estimated age profile for contributions to occupational DC pensions is slightly flatter when the balanced sample is used, increasing by around 1 percentage point over working life rather than around 2 percentage points. The estimated age profile for contributions to other DC pensions is rather less smooth when estimated using the balanced sample, with average contributions increasing less quickly during early working life, but then increasing more rapidly around the late-40s. In the ongoing programme of research, we will examine whether this pattern is a genuine reflection of individual behaviour or the result of sampling variation.

[9] It should be noted that in doing so we substantially reduce our sample size, which makes our age profiles here rather less precisely estimated. Our sample may also not be perfectly representative of all individuals who stay in a pension for five consecutive years, due to attrition from the ASHE.

Figure 3.4. Average pension contributions over the life cycle for private-sector employees in a balanced sample, by pension type



Note: Estimated age profiles including average estimated year effect and average estimated birth cohort effect. The 'raw' descriptions of average employer and employee contributions by age, birth cohort and pension type among the balanced sample are provided in Figures C.7 and C.8 in Appendix C.

Overall, the evidence from the balanced sample suggests that employees in the private sector do, on average, seem to increase their DC pension contributions gradually with age. However, at only around 3 percentage points and 1–2 percentage points, respectively, the increases in average employer and employee contributions are small.

It is also interesting that it is not just average employee contributions that increase over working life but also employer contributions – the latter being less obviously under the discretion of employees themselves. This is unlikely to be driven by salary-sacrifice arrangements, meaning that employee contributions are classed as employer contributions, because the ASHE documentation explicitly asks for these to be counted as employee contributions. It could be driven by pension-matching arrangements, which we cannot explicitly observe in the ASHE data, or it could be the result of compositional effects that we cannot control for in this style of analysis. In the ongoing programme of research, where the drivers of increases in pension contributions are being examined, the relationship between employer and employee contributions, and changes in these, will be explored in more detail.

Summary and potential implications of automatic enrolment

Prior to the introduction of automatic enrolment, the average rate of saving in DC pensions was increasing with age – but only gradually, by around 2 percentage points over working life. This is both a much smaller increase, and much more gradual over working life, than would be expected given economic theory (Crawford, O'Brien and Sturrock, 2021). The results in this section show that the main driver of this increase is increasing pension membership, which is estimated to increase particularly sharply until around age 30. Among those saving in a pension, on average, contributions as a percentage of gross pay increase by around 5 percentage points over working life – driven by increases in both the average employer and average employee contributions.

Automatic enrolment has increased private pension membership, particularly among younger individuals. This will therefore have dramatically reduced one of the key drivers of the age profile in pension saving. While it is not yet possible to estimate an age profile of pension membership or pension contributions after the introduction of automatic enrolment, this change will have made the age profile of pension saving flatter.

While automatic enrolment is known to have increased pension membership substantially, it is less clear cut what the introduction of automatic enrolment has done to the pension contribution behaviour of individuals who were previously saving in a pension (or who would have saved in a private pension at some point in the absence of automatic enrolment) – what one could call 'active savers'.[10] The phased roll-out of contributions makes it challenging to examine the big-picture changes in contribution behaviour, and it will be some time before we can observe individuals' saving behaviour over a period with stable contribution defaults (and a stable economic environment – for example, where the prevalence of private-sector DB arrangements is not changing). In the meantime, it remains important to

[10] Cribb and Emmerson (2020) show that if some individuals are saving less than they would otherwise have done as a result of automatic enrolment, then this is more than outweighed by increased saving among those brought into pension saving at more than the default minimum. However, this does not necessarily rule out some individuals saving less. Furthermore, altered saving behaviour of 'active savers' may take longer to be revealed if it is future changes to saving rates that are affected by the introduction of automatic enrolment, rather than current saving rates.

understand more about how previous ‘active savers’ were behaving. In particular, who increased their contributions once in a pension, and what are the drivers of that behaviour? Did individuals increase their saving in response to earnings increases, or tax incentives, or with other changes in their wider circumstances, such as children leaving home? Such behaviour could be expected to persist after automatic enrolment, and would have implications for predicting pension resources in retirement, and understanding the likely implication of any future reforms. To name just one example, were policy to introduce ‘auto-escalation’ (whereby contributions increase with increases in earnings) by default, it is important to understand the extent to which some individuals already do this, in order to estimate the effects of the policy across all individuals. Digging into the drivers of changes in the average pension saving described in this section is therefore an area of ongoing interest in this research programme.

4. Gender differences

Recent policy research – see, for example, Pensions Policy Institute (2019) and Prospect (2020) – has highlighted that a 'gender pension gap' still exists in the UK: pension income is lower for retired women than retired men, while among working-age individuals average pension wealth is lower for women than men. This issue has received much attention, and many commentators have suggested policies to address the situation.[11] However, understanding the drivers of any gender pension gap are important, for two reasons. First, whether and what form of policy intervention may be desirable will depend on the drivers of differences between male and female pension wealth. Second, there are many labour market trends and policy reforms (including automatic enrolment) that mean drivers may become more or less important over time for different generations.

There are four main potential drivers of a difference in private pension wealth or income between men and women: different labour market experiences (the 'gender pay gap', combined with differing lengths of working life), different pension availability, different pension contribution behaviour, and different investment strategies. In this ongoing programme of research, we focus on examining the second and third of these – in other words, is there a gap between male and female pension saving, over and above that which arises due to the gender pay gap, and if so, what are the drivers of that? Here, in line with Sections 2 and 3, we highlight the big-picture differences between the age profiles of pension saving for male and female employees. Unpicking the drivers of these differences in more detail is the subject of ongoing research.

We start by showing that female employees actually have higher average pension contributions, as a proportion of earnings, than male employees. This is driven principally by the fact that women are more likely to work in the public sector than men, and public-sector pensions have, on average, higher total contributions (and,

[11] See, for example, Chartered Insurance Institute (2019) and Now Pensions (2019). An Early Day Motion on this issue was tabled in January 2021 (https://edm.parliament.uk/early-day-motion/58003/the-gender-pension-gap).

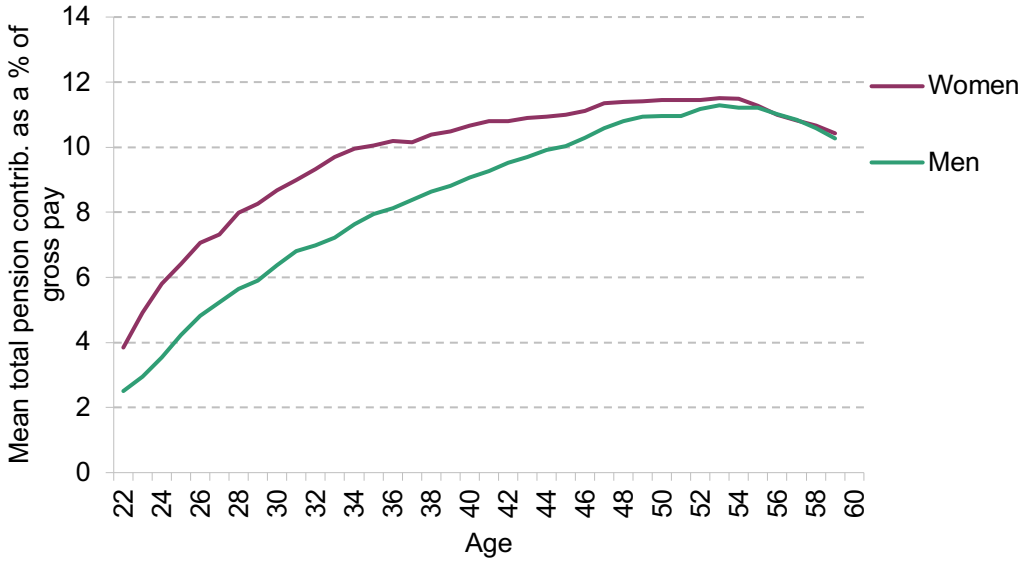
in particular, higher employer pension contributions) than private-sector pensions. We then show that, conditional on sector, men have higher average contributions than women from age 35, and that this is driven solely by higher pension participation for men.

Across all employees

Figure 4.1 shows the age profile for average total pension contributions, as a percentage of gross pay, estimated separately for male and female employees. We can see that, on average, female employees actually contribute a higher proportion of pay than male employees do at all ages.[12] (Men, however, contribute more when pension contributions are measured in pounds, rather than as a proportion of pay, because on average they earn more. This is shown in Figure D.1 in Appendix D.) The age profiles are also somewhat different, with increases with age persisting more through the late-30s and 40s for men than women. The gap between men and women in terms of the level of contributions is therefore highest while workers are in their 30s, and narrows at older ages.

[12] Note that this does not necessarily imply that women as a whole make higher contributions than men, as women have a lower employment rate than men.

Figure 4.1. Average total pension contributions over the life cycle for men and women

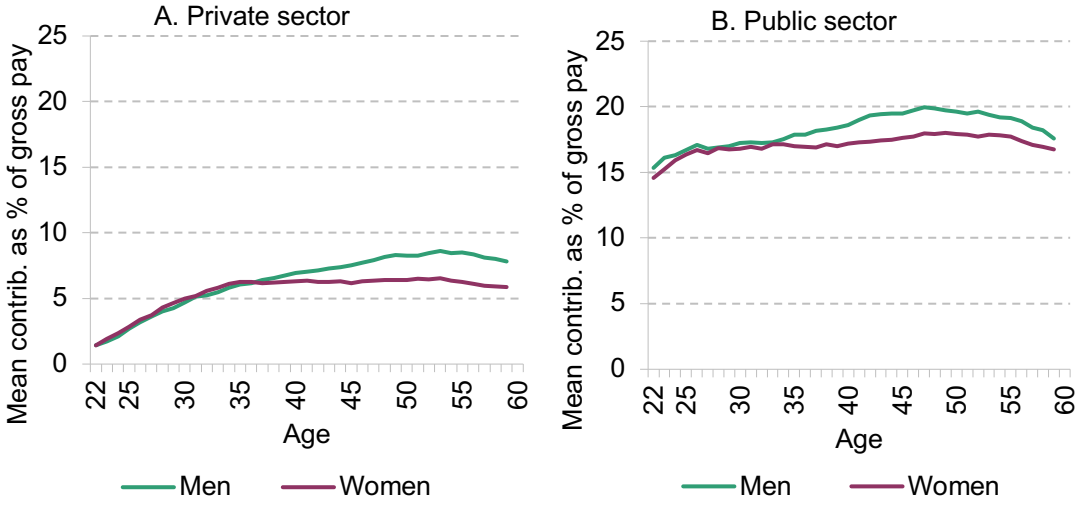


Note: Estimated age profiles including average estimated year effect and average estimated birth cohort effect. The 'raw' descriptions are provided in Figure C.9 in Appendix C.

Differences within sector of employment

One reason why female employees contribute more towards their pensions, as a proportion of earnings, is that they are more likely to work in the public sector. In 2012, 66% of female employees worked in the private sector, compared to 82% of male employees. Figure 4.2 shows the estimated age profiles for average pension saving for women compared with men, employed in the private sector (Panel A) and employed in the public sector (Panel B). Both graphs show that, on average within each sector, women and men contribute a similar share of earnings up until age 35 or so. However, after this age, the age profiles for male and female employees diverge – the average contribution among men keeps increasing while the average contribution among women increases much less. This indicates that all of the difference in contributions seen in Figure 4.1 can be accounted for by the fact that female employees are more likely to work in the public sector, and increasingly likely with age.

Figure 4.2. Average total pension contributions over the life cycle for men and women, by sector type



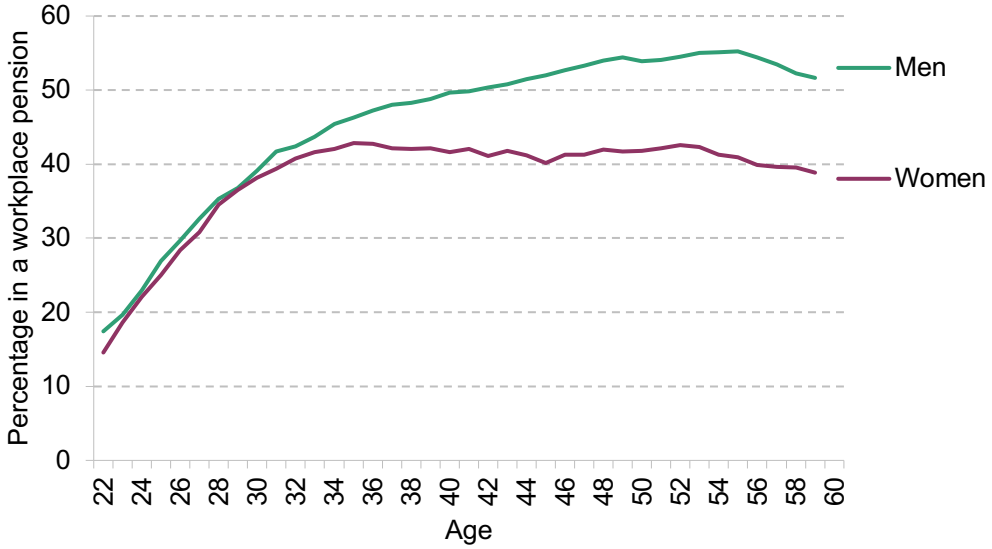
Note: Estimated age profiles including average estimated year effect and average estimated birth cohort effect. The 'raw' descriptions are provided in Figures C.10 and C.11.

Drivers of the differences in the age profile for private-sector employees

We turn now to unpicking the drivers of the difference in the age profile for men and women, focusing on private-sector employees. In particular, we ask whether the continuing increase in average pension contributions with age for male but not female employees after the mid-30s is due to higher pension membership or higher contributions conditional on being in a workplace pension.

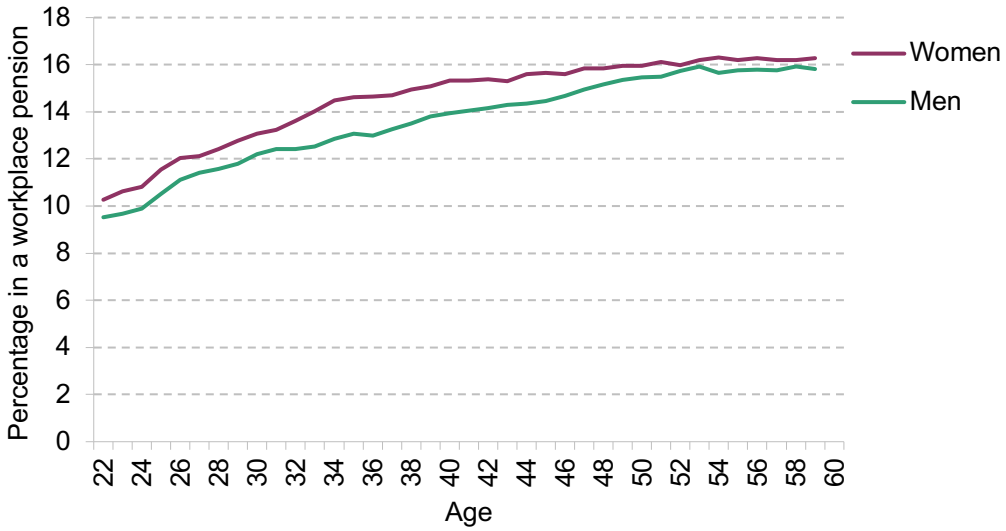
Figure 4.3 plots the proportion of men and women in the private sector who are members of a workplace pension scheme, while Figure 4.4 plots average pension contributions, conditional on being in a workplace pension. These graphs show that the difference in the estimated age profiles seen in Figure 4.2 is driven entirely by differences in membership rates. We see that similar proportions of men and women are in a workplace pension up until age 30 or so, but for older ages a higher proportion of men are members of a scheme than women. However, Figure 4.4 shows that the age profiles of average contributions, conditional on being in a pension, are similar between male and female employees, and in fact the average contribution among female employees is slightly higher than among male employees at virtually all ages.

Figure 4.3. Proportion of men and women in the private sector in a workplace pension



Note: Estimated age profiles including average estimated year effect and average estimated birth cohort effect. The 'raw' descriptions are provided in Figure C.12 in Appendix C.

Figure 4.4. Average total pension contributions for men and women in the private sector who were saving in a workplace pension



Note: Estimated age profiles including average estimated year effect and average estimated birth cohort effect. The 'raw' descriptions are provided in Figure C.13 in Appendix C.

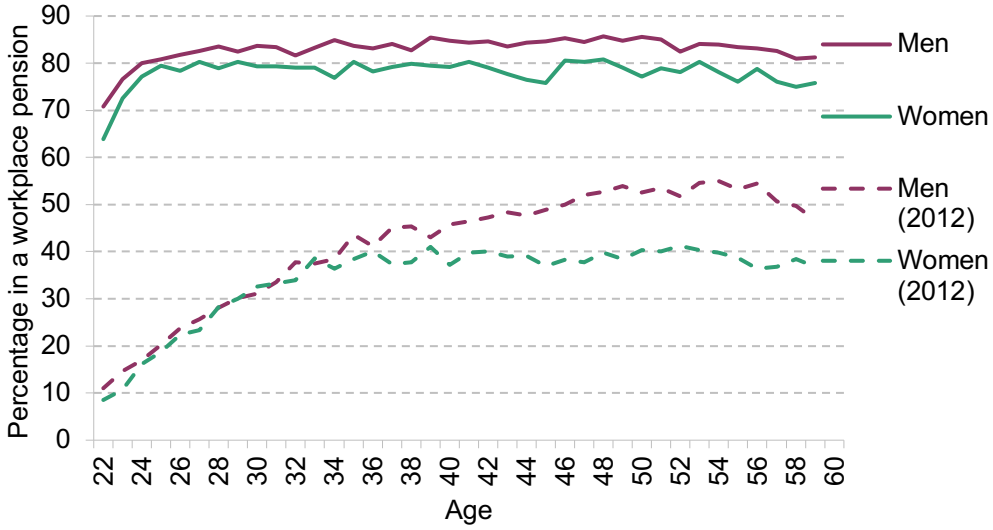
Summary and potential implications of automatic enrolment

These estimated age profiles indicate that – prior to the introduction of automatic enrolment – there were differences in pension saving, measured as a percentage of gross pay, between male and female employees working in the same sector. These will drive differences in accumulated pension wealth, over and above that which would be expected to arise due to the gender pay gap and differences in labour market attachment.

What effect might automatic enrolment have had? Automatic enrolment has increased pension membership among those eligible, particularly among groups less likely to be saving initially (Cribb and Emmerson, 2020). While we cannot yet estimate age profiles of pension membership or contribution rates after the introduction of automatic enrolment, Figure 4.5 describes how pension membership differed between male and female private-sector employees of different ages in 2012 and 2019 (i.e. before and after the introduction of automatic enrolment). The pattern of membership by age and gender in 2019 is different to the previously estimated age profiles: rather than having a similar membership rate at younger ages and then women falling behind, women are now around 5 percentage points less likely than men to be in a workplace pension across working life. Automatic enrolment will therefore have changed the nature of the gender pension gap going forwards.

There is still much still to be gained by understanding the drivers of previous outcomes. In particular, why did pension membership diverge for male and female employees above age 30? Was this due to the nature of employment, or the availability of pension schemes, or different membership decisions even conditional on the same pension offer? It is important to understand this in order to fully assess the impacts of automatic enrolment, and the channels through which it affects individuals. Therefore, this is the subject of ongoing research in this programme.

Figure 4.5. Proportion of male and female private-sector employees who were members of a workplace pension scheme in 2012 and 2019



5. Discussion and implications

While there has been lots of discussion among policymakers, industry and researchers about how much people should save for retirement, and whether individuals' actual savings are adequate, there has been much less focus on *when* individuals should save, and whether they behave this way in practice. It is these questions we will address in this research programme.

Theoretically, there are good reasons for people to vary their savings over their life cycle in response to earnings growth, children, and student loan repayments, to name a few examples. This is demonstrated in another publication from this research programme (Crawford, O'Brien and Sturrock, 2021).

In this briefing note, we take an important early step in understanding how people behave in practice – examining the big-picture patterns in how average pension saving changes over working life prior to the introduction of automatic enrolment. Using data for the period 2005–12, we find that there is an age profile in DC pension savings, with average total contributions increasing through working life. However, the magnitude of the increase in average contributions is relatively small.

Across all private-sector employees, including those not saving in a pension, we estimate that average DC contributions increase by around 2 percentage points of gross pay between the early 20s and mid-50s. This is driven by two margins. First, membership rates increase with age, particularly until around age 30. Second, average contribution rates, conditional on pension membership, increase with age, by around 5 percentage points of gross pay over the whole of working life. Interestingly, this comes from increases in average employer contributions as well as increases in average employee contributions.

Given that much of this age profile in pension saving was driven by membership decisions, the introduction of automatic enrolment will have significantly flattened the increase in average pension saving with age. This is in contrast to how an

economic model would suggest that individuals might want to organise their savings over their life cycle. This is not to suggest that automatic enrolment is not a good policy that will improve lifetime living standards. Automatic enrolment may overcome behavioural biases that prevent people saving as they might like (or as a simple model says they should). The relatively flat saving profile encouraged by automatic enrolment may result in better lifetime living standards than a saving profile that increases with age but results in a lower level of retirement resources. However, as automatic enrolment is developed going forwards, the issue that it might benefit individuals if default contributions vary over working life, or with individual circumstances, should be carefully considered in light of emerging evidence.[13]

It is less clear how automatic enrolment might have influenced the pension contribution behaviour of those who were previously saving in pensions. It therefore remains important to understand the drivers of previous increases in average pension contributions over working life – who increases their pension saving and when – and this will be explored in the ongoing research programme. This behaviour will have implications, both for predicting pension resources in retirement of previous 'active savers' and for understanding the likely implications of any future reforms.

Another particular area of concern in the current public debate that has been touched on in the big-picture patterns presented in this initial briefing note is the 'gender pension gap'. A comparison of the estimated age profiles of pension saving rates between male and female employees before the introduction of automatic enrolment reveals some interesting differences. Overall, female employees actually contribute a higher proportion of pay than male employees do at all ages, but this is driven by a higher proportion of women than men being employed in the public sector, where pensions are typically much more generous. Among private-sector employees, the age profile of average pension saving is broadly similar between men and women until the mid-30s, but then diverges sharply as average pension contributions continue to increase as a share of earnings with age for men but plateau for women. This is driven by differences in the age profiles of pension membership with age – membership rates are similar for male and female employees up to around age 30 or so, but then increase for men while being flat for

[13] This is discussed in more detail in Crawford, O'Brien and Sturrock (2021).

women. The age profiles for average contributions conditional on saving are much more similar (and, in fact, are higher for women than men).

Again, automatic enrolment will have changed this picture somewhat. The biggest driver of the difference in pension saving rates between male and female employees – the difference in pension membership – looks to have been reduced. However, understanding the drivers of the previous profiles – in particular, why did pension membership diverge for male and female employees above age 30 – remains important for fully understanding the impacts of automatic enrolment, and the channels through which it affects individuals. This is therefore also a subject of ongoing interest in this research programme.

Overall, the big-picture patterns documented in this briefing note raise many more questions. What causes individuals to start saving in a pension when they do, when and why do people change their pension contributions, and how does that correlate with changes in individuals' employment circumstances or other household characteristics? What causes the diversion in savings rates between male and female employees, and how does that vary according to people's characteristics and circumstances? The answers to such questions are important considerations in the discussion of potential new policies to encourage greater retirement saving. In the remainder of our ongoing research programme, we will explore in depth the drivers behind the big-picture empirical trends that we have presented here in order to provide such answers. In addition, we will examine in detail how the self-employed change their pension saving over their working lives – behaviour that is particularly important to understand more about given the dramatic decline in pension saving among the self-employed in recent decades.[14]

[14] See Crawford and Karjalainen (2020), Nest Insight (2020) or Department for Work and Pensions (2020) for recent discussions of pension saving among the self-employed.

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Appendix A

The Annual Survey of Hours and Earnings (ASHE)

The Annual Survey of Hours and Earnings (ASHE) is an annual survey that has been conducted each April since 1997. The data are collected directly from employers and, as such, contain accurate information on earnings and job characteristics, but only a limited set of individual characteristics. Particularly relevant for our analysis, we observe membership of workplace pensions and, from 2005 onwards, a consistent measure of pension contributions. The survey aims to collect data on around 1% of employees and thus has a large sample size (around 180,000 individuals per year).

As we are interested in both whether and how much someone contributes to a pension, and how this changes over working life, we only use ASHE data from 2005 onwards.

Our focus is on pension saving in a 'workplace pension' – that is, a pension provided or facilitated by an employer (including both occupational pensions and all forms of group personal pensions and group stakeholder pensions). This is because we do not observe in the ASHE any other pension saving, such as personal pensions where individuals deal directly with a pension provider.

All the results presented here relate to pension saving associated with a main employment, for those who hold multiple jobs. Our results are little affected by this simplification.

It is worth noting that for those who make pension contributions through salary-sacrifice arrangements, the ASHE requests that employers record as an employee contribution any salary sacrificed, rather than recording these as part of an employer contribution. Finally, employers are requested not to include additional voluntary contributions in the measure of employee pension contributions.

Appendix B

Estimating age profiles

We describe in Section 2 that we model age profiles by making the assumptions: (i) that there are differences between people in different five-year birth cohort groups, but not for individuals in the same birth cohort group; and (ii) that there are year effects. We assume that these birth cohort and year effects have the same effect on all individuals regardless of age. In other words, we assume that the *shape* of the underlying age profile of saving is identical across all observations, but that the *level* of the age profile might be higher or lower in different years and for people in different five-year birth cohorts.

To estimate age profiles of pension saving, we estimate a linear regression with the following general specification

(1) $$y_{iatg} = \beta_a + \gamma_t + \theta_c + \varepsilon_{iatc},$$

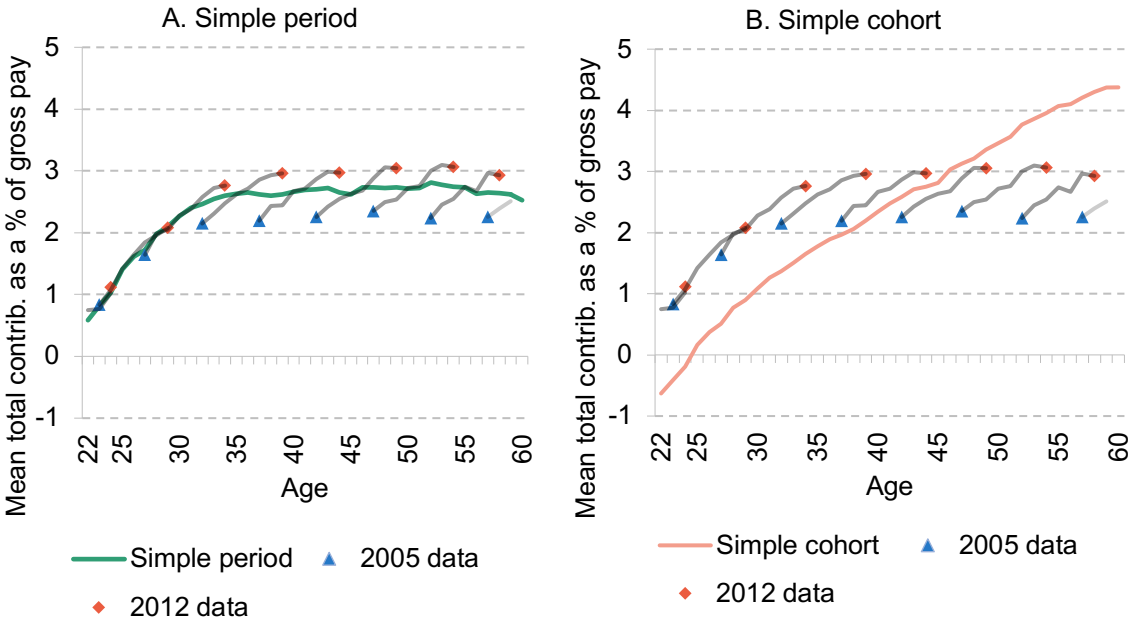
where y_{iatg} is the outcome of interest (for example, in the case of Figure 1.3, DC pension contributions as a percentage of gross pay) for an individual i from birth cohort c observed at age a in year t; β_a is a set of age effects, γ_t is a set of time dummies, and θ_c is a set of date-of-birth cohort dummies.

It is mathematically impossible to simultaneously control for age, year of observation and birth cohort, all with single year dummies, in a linear model such as this. This is because there is an exact linear relationship between the three. For example, if you know someone's age and the current year, you can calculate the year in which they were born. This is commonly known as the 'age–period–cohort' (APC) problem. Extracting an age profile from observed data therefore requires some assumptions to be made.

There are different assumptions that can be made. Depending on the setting, sometimes a 'period view' is taken, which emphasises the role of time effects, while sometimes a 'cohort view' is taken, which emphasises the role of cohort

differences. The simplest version of the period view is to assume that there are no cohort differences. We can see an illustration of this in Panel A of Figure B.1. Because this approach allows for arbitrary time effects, the average slopes of the cohort lines, which correspond to the difference in pension savings for those born in a given year between 2005 and 2012, are attributed to time effects. Instead, it is the average *levels* of the cohort lines at each age that determine the shape of the age profile. This is because we assume that the shape of the age profile is identical for all cohorts with this approach. The simplest version of the cohort view is to assume there are no time differences. This is illustrated in Panel B of Figure B.1. This approach allows for arbitrary cohort effects, which capture any difference between the average levels of the cohort lines. However, because this approach includes no time effects, the slopes of the cohort lines are attributed to the age profile. For example, the difference in pension saving for the 1960–65 cohort between the ages of 43 and 49 is assumed to contain information about how the age profile of saving changes between these ages, rather than being driven by time effects over the years 2005–12.

Figure B.1. Average DC pension saving among all private-sector employees: illustration of simple period and simple cohort methods



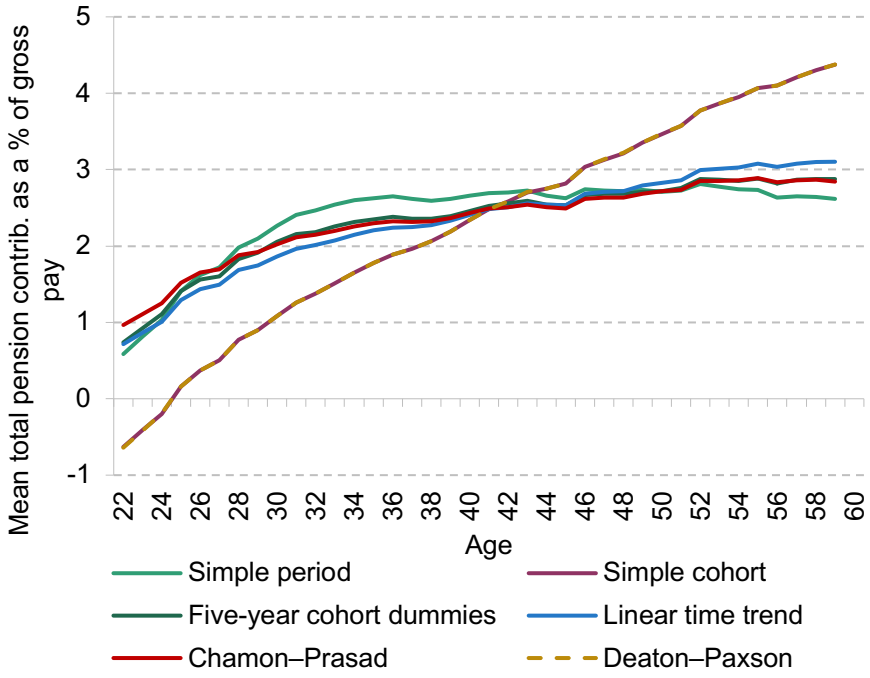
Note: Mean is calculated across all private-sector employees, whether saving in a pension or not. Grey lines indicate average saving by age for five-year birth cohort groups.

Source: ASHE, 2005–12.

For the outcome of interest illustrated in Figure B.1 (average DC pension contributions as a percentage of gross pay), there is a significant difference between the age profiles estimated using the simple period and simple cohort assumptions. As there are reasons to believe there could be both time and birth cohort effects, we decide on a method that strikes a balance between the two simple approaches. Specifically, we take the simple period approach, and include dummies for the five-year birth cohort (rather than the one-year birth cohort, which would be impossible, as explained earlier). The results of this approach, together with the simple period approach, the simple cohort approach, and other approaches commonly used in the literature, are illustrated in Figure B.2. The different assumptions are:

- 'simple time' – flexibly controls for age and year with single year dummies, but assumes that there are no birth cohort effects (i.e. no θ_g in equation 1);
- 'simple cohort' – flexibly controls for age and birth cohort with single year dummies, but assumes there are no time effects (i.e. no γ_t in equation 1).;
- 'linear time trend' – flexibly controls for age and birth cohort with single year dummies, but assumes that time effects are a linear trend;
- 'five-year cohort dummies' – flexibly controls for age and year with single year dummies, and controls for birth cohort with five-year year-of-birth dummies;
- 'Chamon–Prasad' – flexibly controls for age and year with simple year dummies, and controls for birth cohort effects that are orthogonal to a trend, $\sum_g \theta_g * g = 0$, and sum to zero, $\sum_g \theta_g = 0$;
- 'Deaton–Paxson' – flexibly controls for age and birth cohort with single year dummies, and controls for time effects that are orthogonal to a trend, $\sum_t \gamma_t * t = 0$, and sum to zero, $\sum_t \gamma_t = 0$.

Figure B.2. Average DC pension saving among all employees over the life cycle



Source: ASHE, 2005–12.

We can see that the simple cohort and the Deaton–Paxson assumptions lead to an age profile that is particularly different to the other assumptions. We believe this is because these approaches do not suitably control for the time trends in pension saving during the period 2005–12 (such as the decline in DB pensions and the rising popularity of other DC pensions). In all other cases, the age profile of DC pension saving is increasing throughout most of working life, and more rapidly so between the 20s and mid-30s than at older ages.

Appendix C

‘Raw’ descriptions of average pension saving by age and birth cohort

Figure C.1. Average pension saving among all employees, by sector

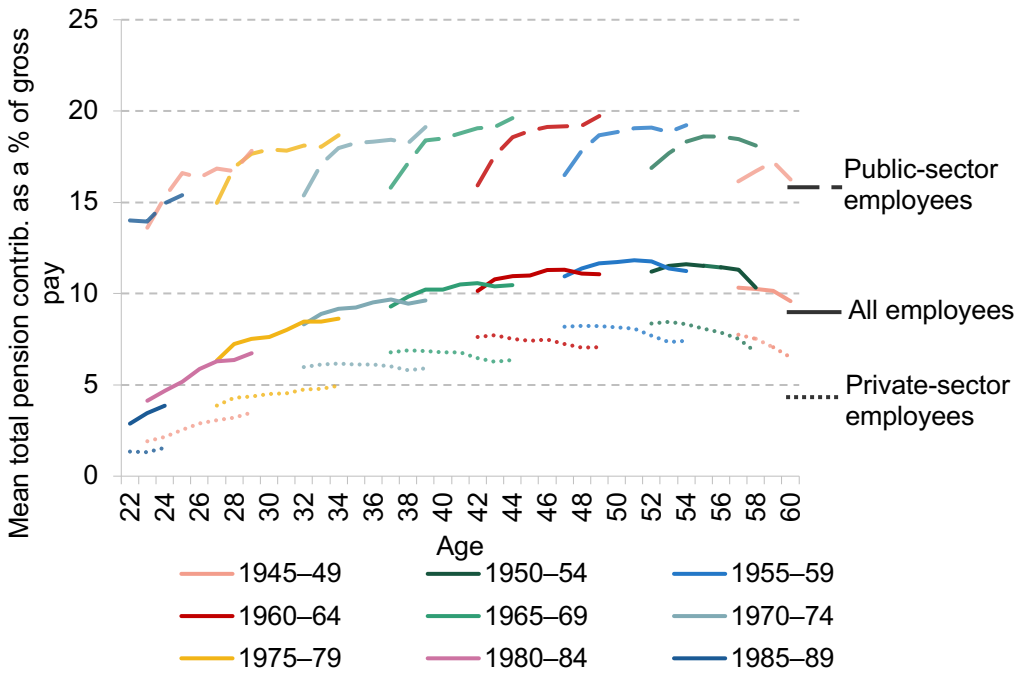


Figure C.2. Average pension saving among private-sector employees, by pension type

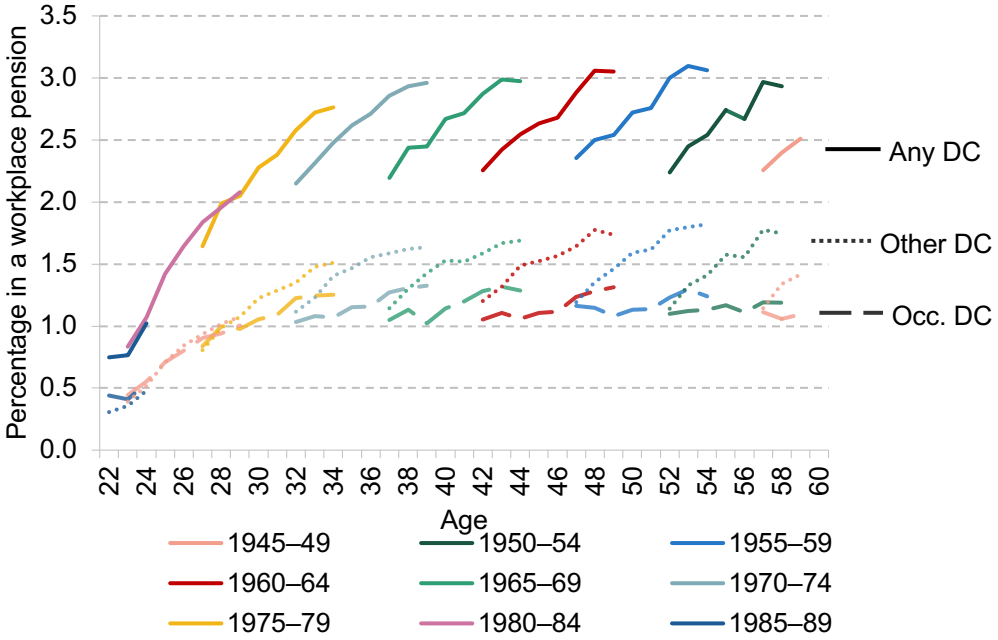


Figure C.3. Percentage of private-sector employees with different types of workplace pension

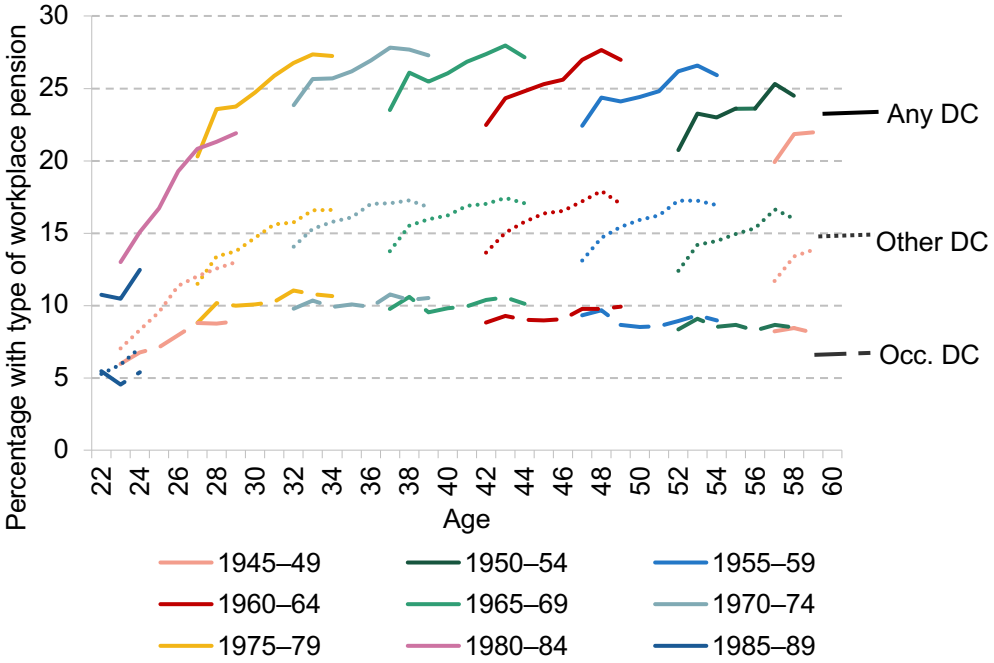


Figure C.4. Average total pension contributions for private-sector employees with a workplace pension, by pension type

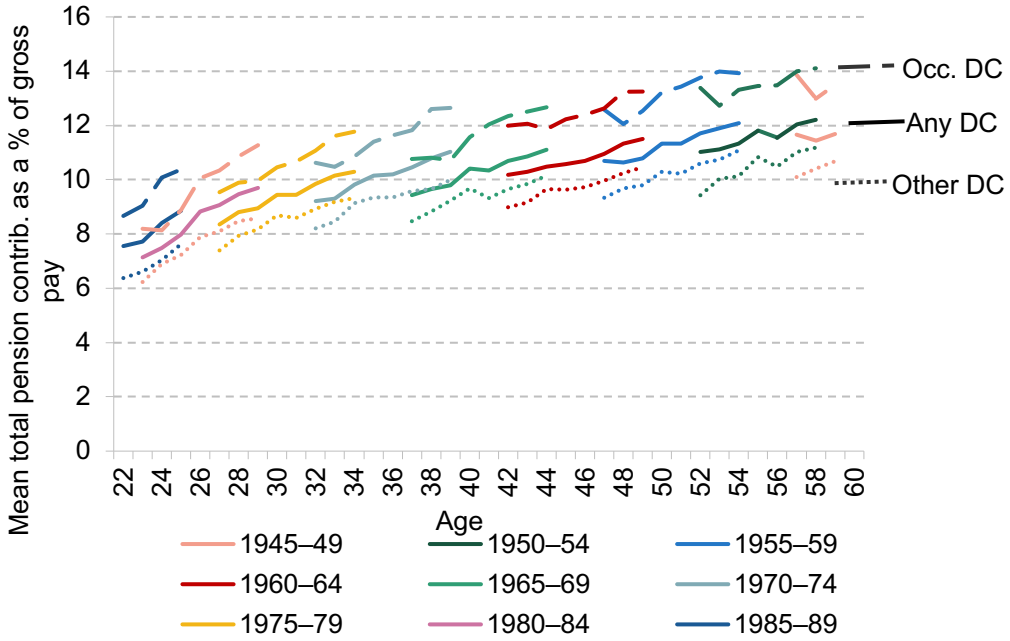


Figure C.5. Average employer pension contributions for private-sector employees with a workplace pension, by pension type

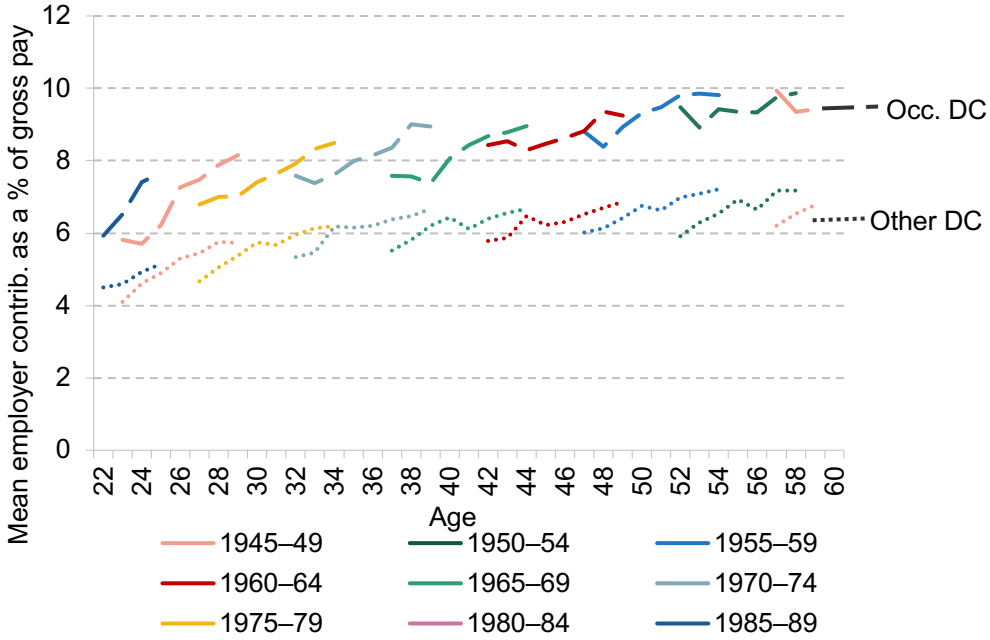


Figure C.6. Average employee pension contributions for private-sector employees with a workplace pension, by pension type

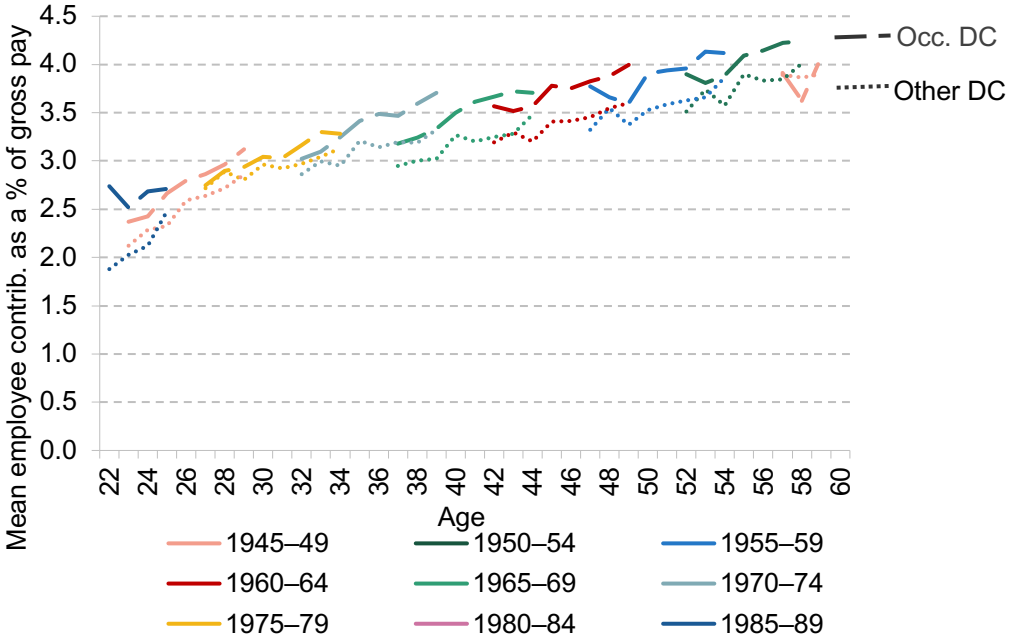


Figure C.7. Average employer pension contributions for private-sector employees in a balanced sample, by pension type

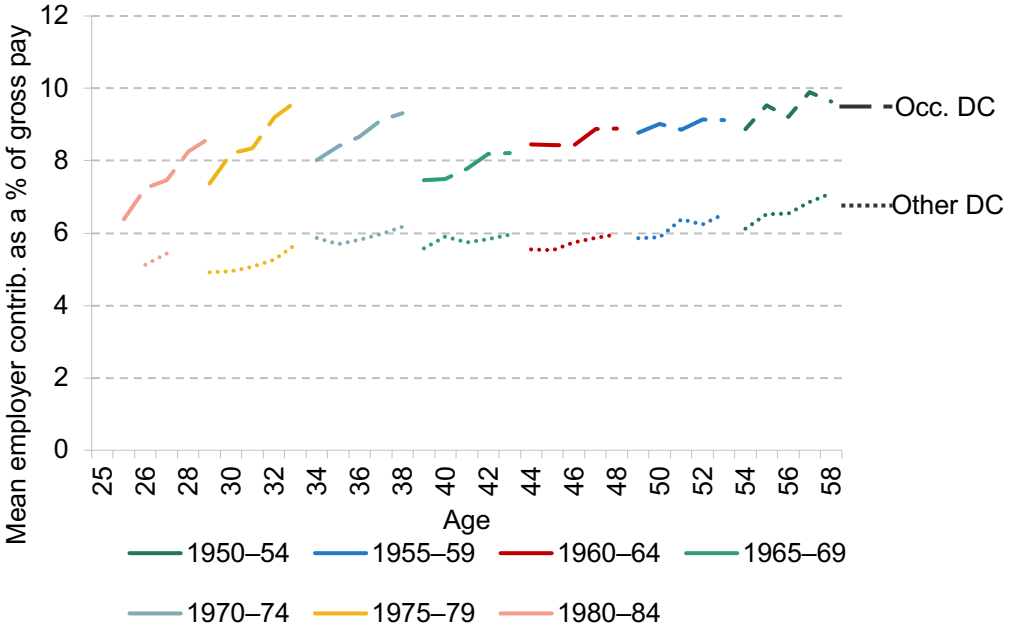


Figure C.8. Average employee pension contributions for private-sector employees in a balanced sample, by pension type

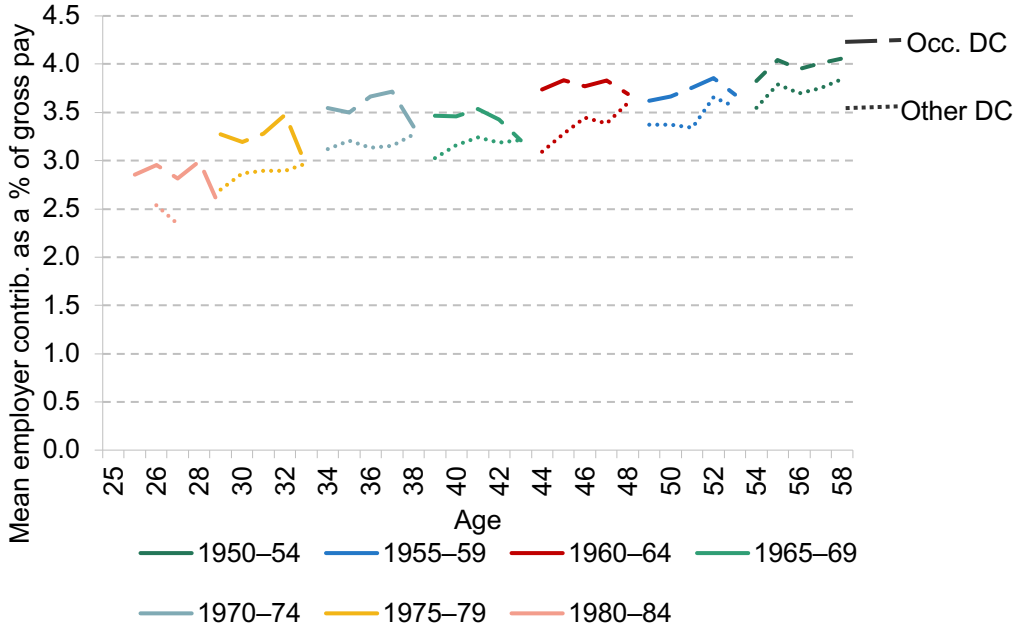


Figure C.9. Average total pension contributions for men and women

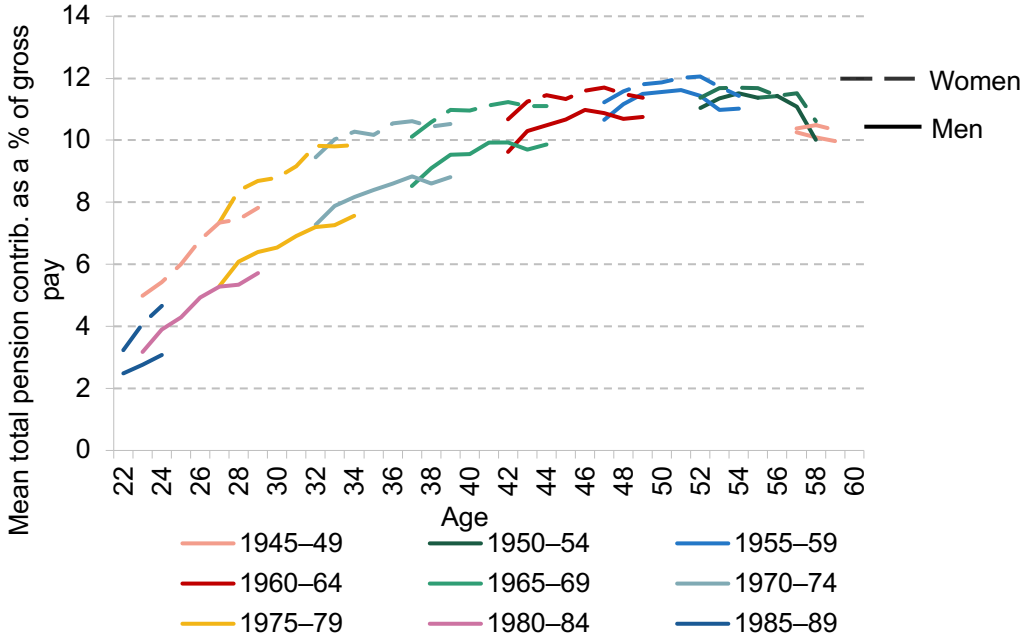


Figure C.10. Average total pension contributions for men and women in the private sector

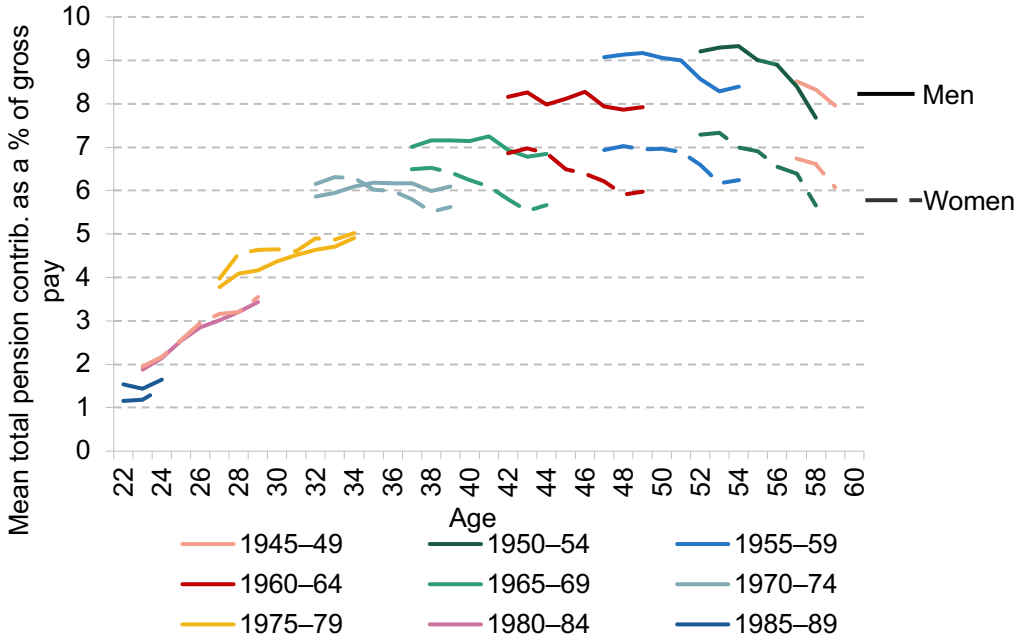


Figure C.11. Average total pension contributions for men and women in the public sector

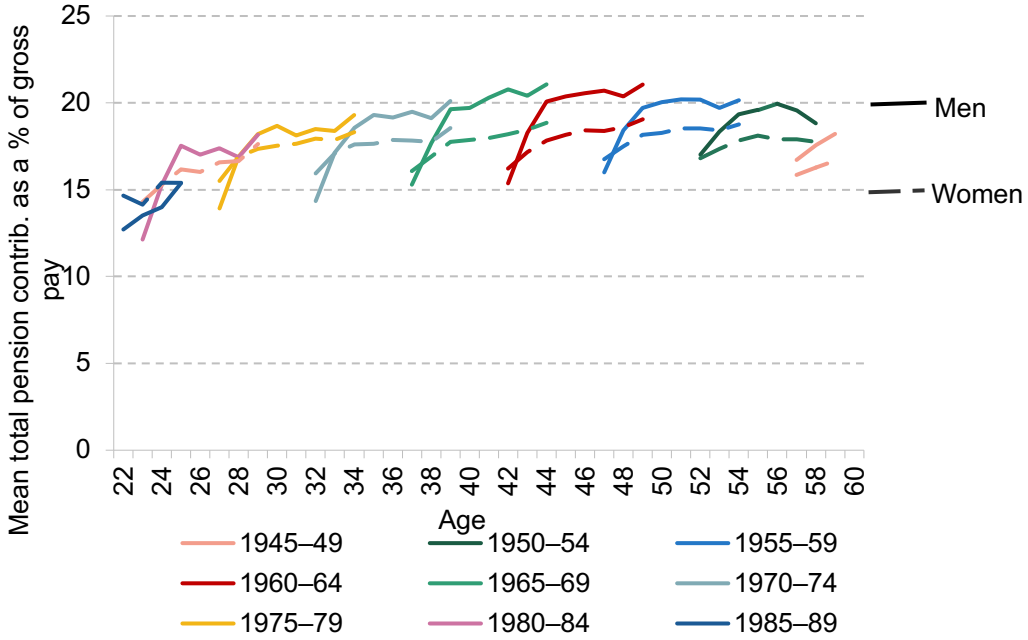


Figure C.12. Proportion of men and women in the private sector with a workplace pension

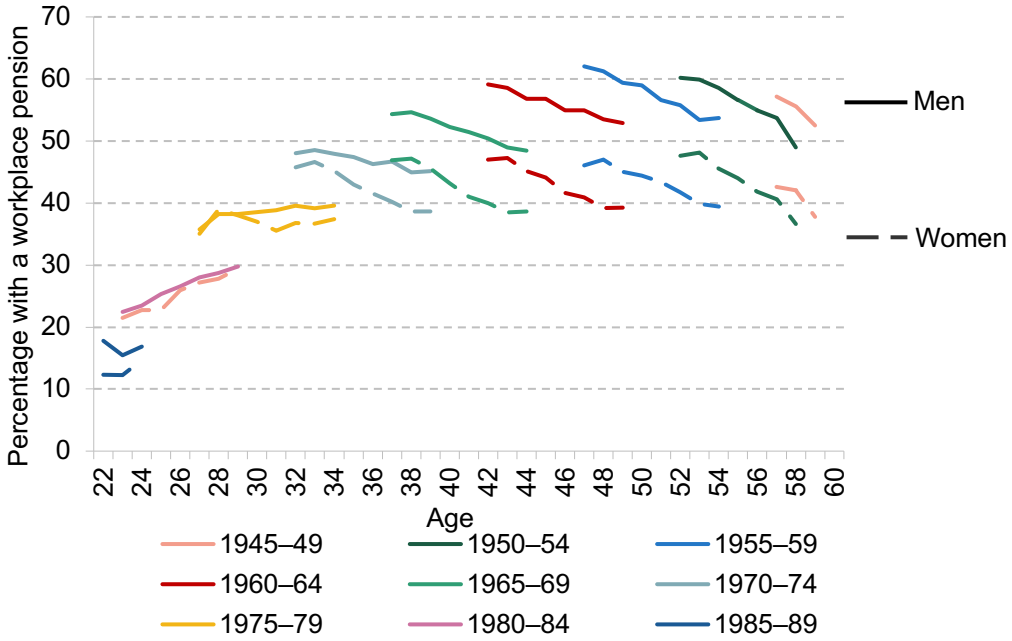


Figure C.13. Average total pension contributions for men and women in the private sector who were saving in a workplace pension

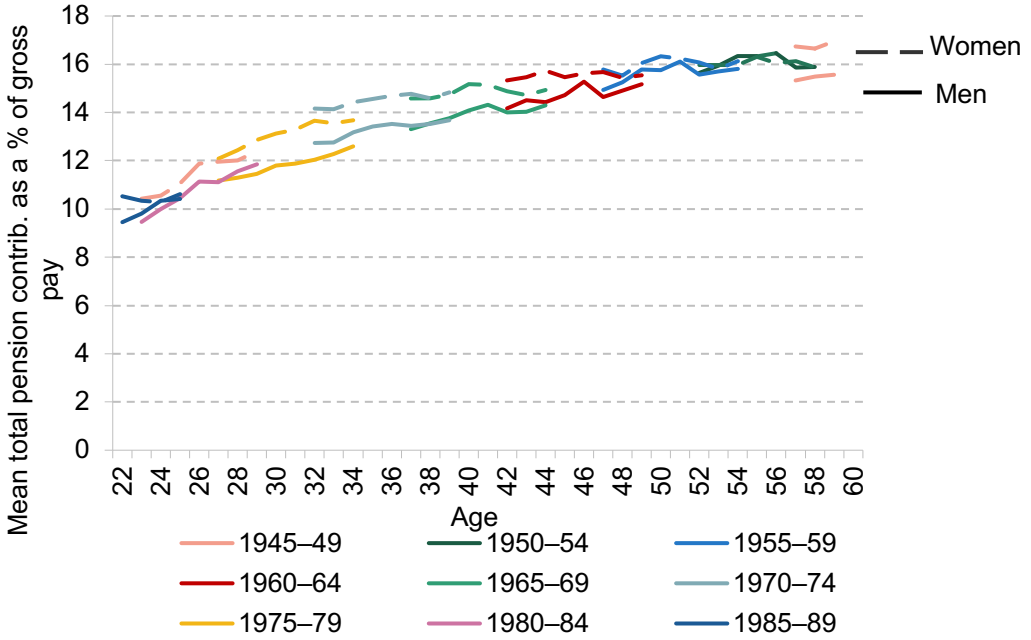
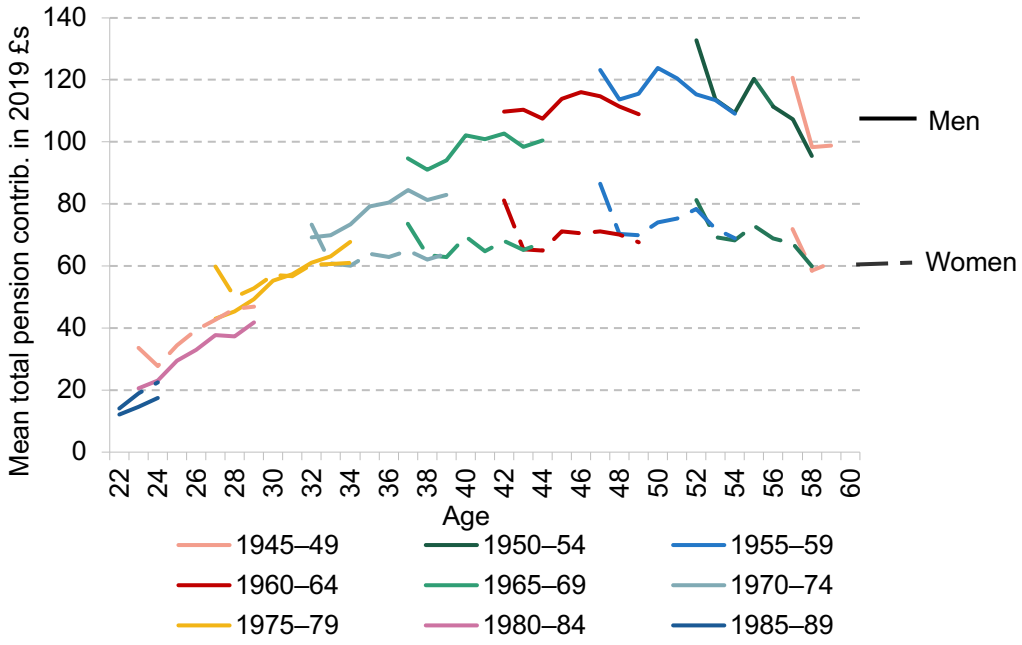


Figure C.14. Average total pension contributions for men and women in pounds

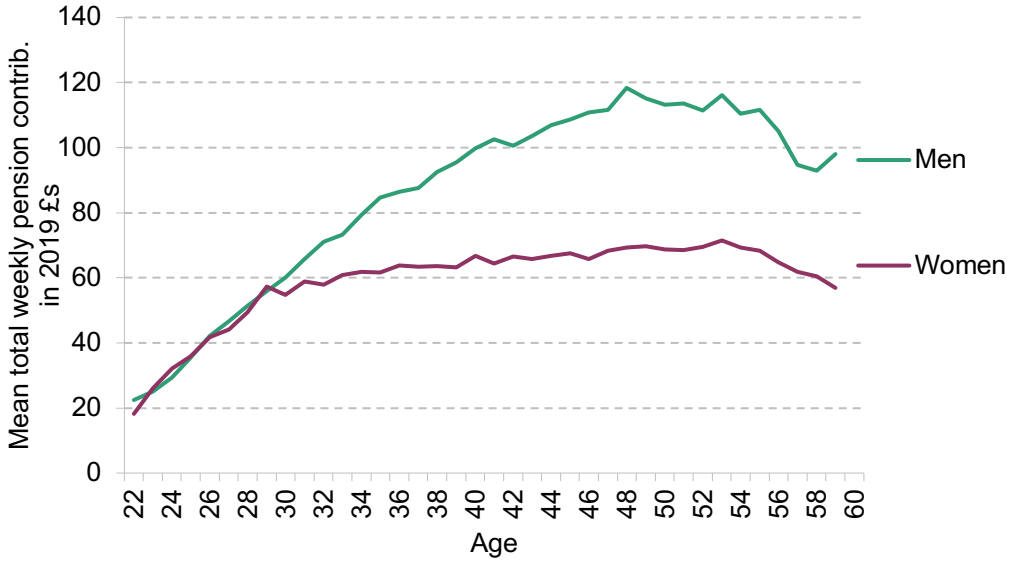


Appendix D

Gender differences in pension contributions, measured in pounds

In Section 4, we illustrate that female employees have higher average pension contributions, as a proportion of earnings, than male employees. In Figure D.1, we estimate analogous age profiles to those presented in Figure 4.1, but measuring pension contributions in pounds, rather than as a proportion of gross pay. When expressed in this way, average pension contributions are relatively similar for both male and female employees until age 30 or so. However, after this age, a gap opens up as contributions plateau for women and keep rising for men. The striking difference between Figures D.1 and 4.1 indicates that the gender pay gap is an important driver of differences in private pension wealth or income between men and women; see, for example, Costa Dias, Joyce and Parodi (2018) for more on the gender pay gap.

Figure D.1. Mean total pension contributions over the life cycle for men and women, measured in pounds



Note: Estimated age profiles including average estimated year effect and average estimated birth cohort effect. The 'raw' descriptions are provided in Figure C.14 in Appendix C.