Collective DC - Stability and Fairness

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Executive Summary

We are delighted to present our second paper analysing the potential for Collective Defined Contribution ('CDC ') benefit plans to better member outcomes for retirement savings in the UK. Our first paper is available from https://aon.com/collectivedcukuk and analysed the basic feasibility of potential CDC plans running in a steady state, that is, with a steady population of members. In this paper, we expand significantly on that analysis to ask whether it is possible to design a CDC pension plan that can be grown from zero assets, survive membership shocks in the context of a bulk transfer into the plan, and close back down to zero assets. This is akin to the key questions to ask when buying something like a car: 'Does it start, go and stop?'

The answer is an emphatic 'yes', provided that the investment policy and control processes are chosen carefully. More specifically, we have refined our rather simplistic investment model from the first paper now to reflect the age characteristics of each individual plan member, with younger members having a higher weighting to equity assets and older members a higher weighting to bond assets. In conjunction with this, we have adjusted the effect of any one-off adjustment to benefits (positive or negative) so that they are based on a scale of adjustments that reduces with age, thereby exposing older members to less risk of changes (up or down) to their benefit level. Together, these amendments significantly add to the stability of the CDC plan design under very varied membership conditions.

In fact, we show in our back-testing that had such a CDC plan existed over the period since 1930, it would have out-performed a traditional Individual Defined Contribution ('IDC') plan design with annuitisation over almost all time periods and regardless of the state of the plan membership. It is natural, then, to ask the question: 'Isn't this too good to be true? 'To explain why it isn't, it is important to understand what is driving the relative performances of CDC and IDC outcomes.

The most significant factor in this is the difference in investment policy over time between CDC and IDC. In order to provide a meaningful comparison between the two designs, each is established to provide a regular income to the member in retirement. This happens naturally in the CDC design, which pays a regular pension from the assets of the plan. In contrast, the IDC plan member is assumed to purchase an annuity at retirement age in order to purchase an income. The effect of this is that the CDC plan can remain invested in equity assets for longer and the outcome is that over sufficiently long time periods, this leads to an enhanced return. This is a well-established feature of past equity performance (see, for example, the Barclays Equity Gilt Study 2015).

The other feature that CDC plans possess is the pooling of longevity risk, whereby the assets of members dying earlier than expected are redistributed to pay the benefits of those members living longer than expected. Of course, an annuity provider will also do the same thing amongst its book of annuity business, but there will also tend to be a loading for profit and the not inconsiderable cost of capital that moves the price of the annuity away from the best estimate value. Our analysis in this paper does not take credit for this effect, even though we would expect it to manifest in practice.

But if the reason for the CDC design's superior performance is the asset strategy, is it not possible to replicate this in the IDC world, especially now that the Chancellor's Pensions Freedoms mean that options beyond annuity purchase are open to IDC savers? The answer is a qualified ‘yes ‘. The same type of investment strategy that we are advocating for the CDC design could, in principle, be adopted under an IDC plan both during the accumulation phase and the decumulation phase using a version of income drawdown.

However, two drawbacks face anyone attempting to do this:

1. Such an investment policy (even in the simple version we have modelled here) is significantly more sophisticated than a typical IDC investment policy. Consequently, adopting this type of investment policy would mean committing to a relatively time-consuming process of monitoring and managing asset allocations. A CDC plan design of the type we have modelled provides this efficiently to individuals and requires no input on their part.

2. Individual longevity risk remains in IDC plans. In very simple terms, with the current range of products available, an IDC saver can either choose to invest in return-seeking assets beyond retirement age (via income drawdown) or to hedge their post-retirement longevity risk (via annuity purchase) but it is extremely difficult to do both simultaneously. In contrast, a CDC plan design can deliver both to members.

Taking these points into account, we remain persuaded that a carefully constructed CDC plan can deliver distinctive and valuable benefits to members. Further, such a CDC plan can be started from scratch, run in a financially equitable and robust way and run off should that prove necessary. Consequently, we believe that CDC benefits need to be included for consideration alongside more familiar designs when pension plan benefits are being re-designed.

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September 2015 (updated April 2020)

Stability and Fairness

Introduction

In November 2013 we published a White Paper setting out detailed consideration of the pros and cons of Collective DC (CDC) plans in the UK[1].

The paper outlined our modelling of an example CDC plan design, and concluded that there was potential to achieve higher, more stable pension outcomes for members than in a conventional Individual DC (IDC) pension arrangement. The modelling was based on a plan with a mature membership and a steady distribution of new entrants, retirements and deaths maintaining the population profile.

This paper extends our earlier analysis by considering alternative membership scenarios, and shows that it is possible to design a CDC plan for which:

- pension outcomes are stable under (quite extreme) changes to the plan membership, and
- pension outcomes are 'fair' across different members and different generations in the plan.

An objection

An oft-cited objection to CDC plans is that they require a continuing stream of new entrants to ensure sustainability, as risk is passed from older generations to newer generations and/or that there is a cross-subsidy from younger to older generations. If the stream of new joiners dries up, the sustainability of the plan is threatened.

In their December 2009 review[2], the Department for Work and Pensions put it like this:

'… The results [of modelling performed by the Government Actuary's Department] do suggest that CDC plans appear to require a continuing stream of member contributions to ensure 100% sustainability over time and to allow risk sharing to operate between members… '

'… It would be very difficult to contain risk levels for schemes that had very small numbers of new entrants. When there are few or no new members there is a higher probability of a scheme failing and leaving some members without any pension or facing significant cuts being made to younger members' pensions… '

A serious charge!

If this is true, then in order to remain sustainable a CDC approach may require (in the words of another critic)

'… the system to work indefinitely and for compulsory (non-opt out) contributions. '[3]

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[1] Aon; November 2013, *The Case for Collective DC: A new opportunity for UK pensions*

[2] Department for Work and Pensions; December 2009, *Modelling Collective Defined Contribution Schemes: A summary of The Government Actuary's Department modelling of collective defined contribution schemes*

[3] Morgan, L.; July 2013, *Collective DC – digging a deeper hole*, Schroder Investment Management

The problem

It is of course perfectly possible to design a CDC plan (poorly) so that it exhibits this kind of instability under a maturing population.

The GAD modelling cited above looked at an example plan with a *fixed* investment strategy (including 50% investment in equities) as the population matured with no new entrants. Under typical CDC risk sharing designs, this investment approach can indeed generate unacceptable risk levels for the final cohorts of members as the plan runs off.

To illustrate this, consider a (highly simplified) 'straw man' design in which:

- the plan awards a lump sum benefit payable at age 65, equal to 1% of pay for each year of service, revalued between the year of accrual and age 65 in line with rises in the Consumer Prices Index (CPI);
- the plan's funding position is maintained each year by adjusting the target rate for *future* benefit revaluations up or down by a fixed margin (e.g. CPI + 1% p.a. instead of CPI) such that the assets held are sufficient to cover the value placed on those target benefits;
- the plan's assets are invested 50% in equities and 50% in liability-matching assets (such as index-linked gilts of appropriate duration[4]);
- the accrued benefit liabilities of the plan are currently distributed evenly between members aged 35 to 64 years old.

Although the form of benefit here is quite simple, the adjustable revaluation aspect is representative of typical CDC risk sharing mechanisms (including those set out in our White Paper, and in Appendix B of this report).

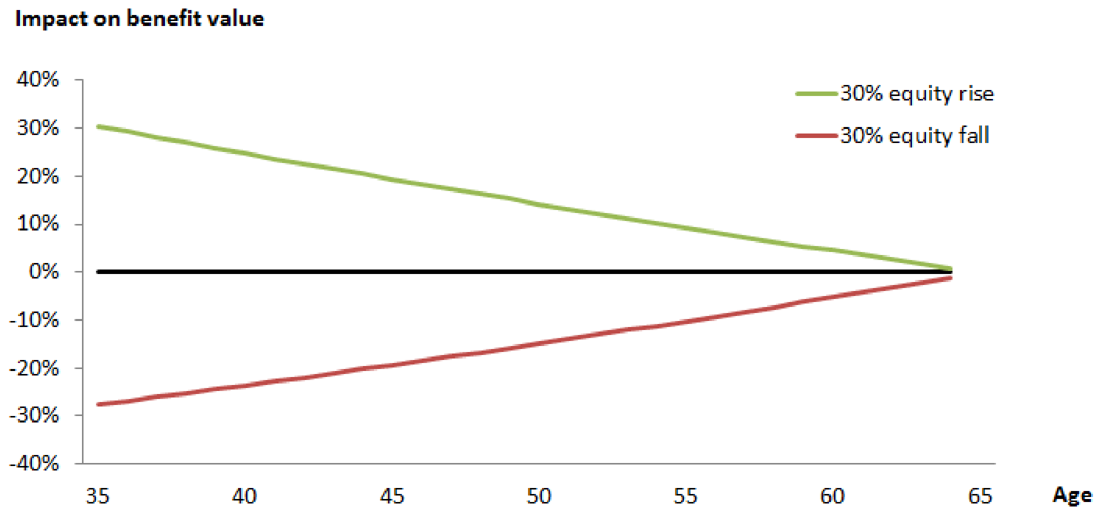
Chart 1 shows how the value of members' benefits would be affected by a 30% rise (or fall) in equity markets over the coming year.

In this example, a 30% fall in equity markets relative to the matching assets would require the revaluation target in the plan to reduce by around 1% p.a. in order to bring the plan's finances back into balance. This would reduce the value of accrued benefits by 30% for a member aged 35, but by only 1% for a member aged 64 (since they have only one future revaluation left to be awarded before their benefit is paid at age 65).

This demonstrates how the design shares risk between members. The exposure to asset underperformance (and outperformance) decreases as members approach their benefit payment age of 65, so that they gain increasing certainty over the level of benefit which they will receive.

[4] In practice, index-linked gilts can of course only provide an *approximate* match to the liabilities – for example, the market is currently limited to gilts tracking the RPI (rather than CPI) measure of inflation. It may be possible to match liabilities more closely in other ways, such as purchasing hedging products from an insurer or synthesising a tailored hedge using derivatives. It is beyond the scope (and purpose) of this paper to consider how best to construct a liability-matching asset portfolio in practice – we simply posit that this can be (approximately) achieved using gilt-like investments, and focus instead on the mix between matching assets and return-seeking assets in our analysis of plan behaviour.

Chart 1 – Impact of 30% equity rise / fall

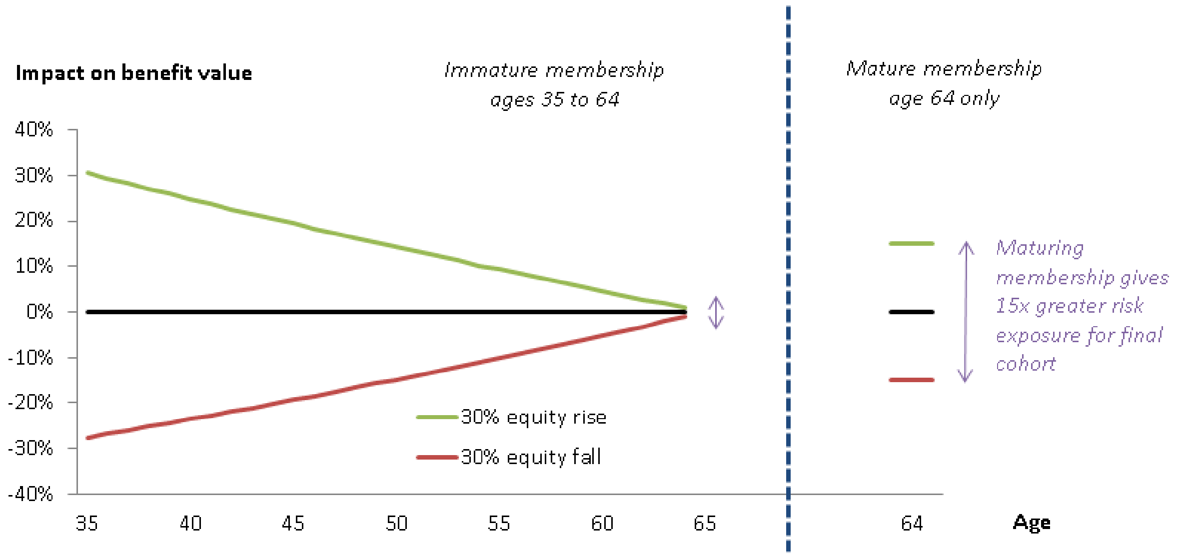


The problem comes if we now allow the plan to mature with no new entrants, without changing the investment strategy – see Chart 2.

In 29 years' time, there will only be one cohort of members left in the plan, aged 64. If equity markets were to fall by 30% at this point (reducing the overall assets by 15%) then the whole impact would be borne by the remaining cohort, with their benefits reducing in value by 15% in the year prior to benefit payment. This is 15 times as high as the risk exposure of the 64-year olds in the original (immature) population profile, where younger cohorts of members shared the overall risk.

Of course, our cohort is now also more exposed to the 'upside' risk of an equity market rise, but the point is that the plan has failed to taper down the volatility of these members' benefits as they approach age 65.

Chart 2 – Impact of 30% equity rise / fall (maturing membership)



What can be done?

One answer is to focus on the maturing membership profile – after all, it is the lack of risk sharing with younger members that has increased the risk exposure, right? If we can ensure a continuing stream of new joiners then the problem goes away. This leads on to considerations of scale and compulsory membership of the sort commonly discussed (and criticised) by the detractors of CDC.

But there is another way…

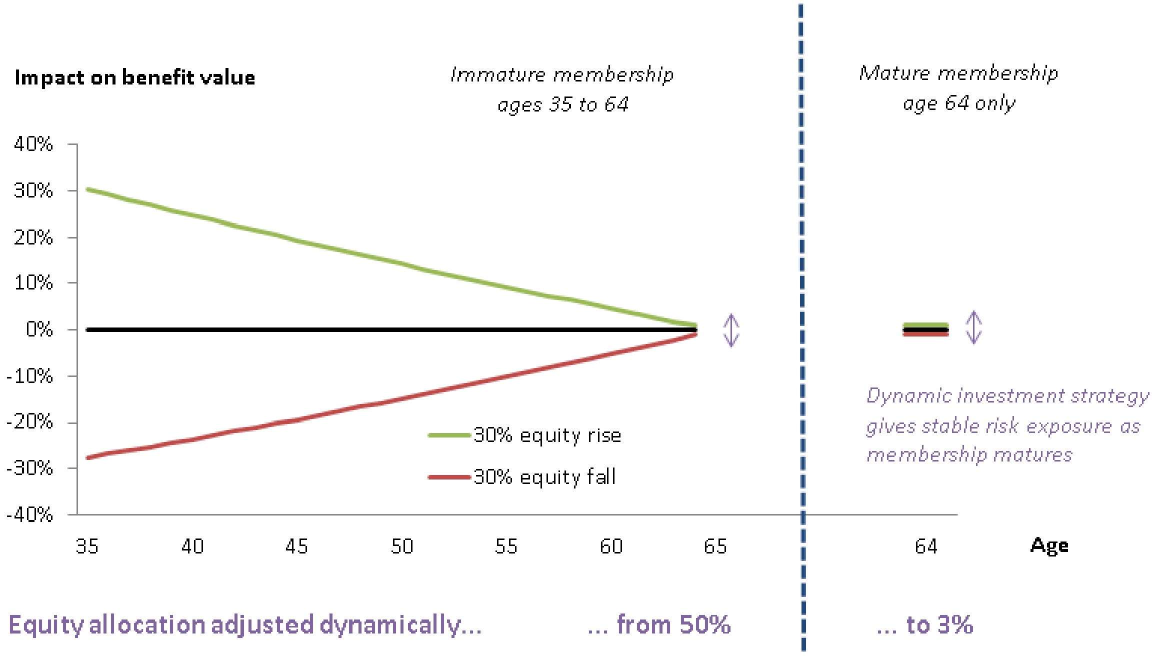
A solution

Our approach would be to allow the CDC plan to de-risk its investment strategy progressively into matching assets as the population runs off, so as to maintain a healthy level of risk exposure for each cohort of members.

In our example, we can achieve this by moving away from a fixed 50% investment in equities, and instead adjusting the equity allocation to reflect the membership profile of the plan each year. If we taper the equity allocation from 50% down to 3% as the membership runs down to its final cohort, then the risk exposure at each age *will remain constant even as the membership matures*.

Chart 3 shows how this plays out for our final cohort of 64-year olds. The volatility of benefits for these members is the *same* as for the original cohort of 64-year olds when the plan had a full distribution of younger members sharing the risk. This gives a more palatable risk exposure as the plan matures (in return for which members are of course foregoing some of the expected asset outperformance typically associated with equity investments).

Chart 3 – Impact of 30% equity rise / fall (dynamic investment strategy)



Modelling the solution

We have tested this approach on a more realistic CDC plan design, similar to that described in our White Paper.

The design we have tested targets a pension benefit based on career average revalued earnings (CARE), payable from age 65 with attaching spouses' benefits.

Each year the plan's funding level (value of the assets divided by value of the liabilities) is measured, based on the CARE-style benefits which have accrued up to that point in time. Benefits are then adjusted to maintain a funding level of 100%, by (in order):

i. adjusting the target rate for *future* benefit revaluations (up to and after retirement) by a fixed margin, within the range CPI ± 5% (with revaluations subject to an overall annual minimum of 0%);

ii. applying a one-off percentage adjustment (positive or negative) to accrued benefits (both those in payment and those not yet in payment), based on a scale of adjustments that reduces with age. This scale is illustrated in Appendix B.

As in the White Paper, we have compared the benefit outcomes for members in this plan with those that they would have been expected to receive under a conventional IDC pension arrangement, based on actual financial market conditions over the period from 1930 to 2012.

Design refinements

In addition to the use of a dynamic investment strategy, our design incorporates some further refinements compared with the illustrations in our earlier White Paper which reflect our latest thinking:

- We have replaced the gilt portfolio with a notional real asset that exactly matches the liabilities. This is a simplification designed to draw out more clearly some conceptual features of the modelling. We have made a corresponding change to the IDC investment strategy for consistency.

- Under the White Paper design, contributions were fixed at 10% of pay and annual accrual was fixed at 1% of pay. Any difference between the contribution rate and the cost of accrual was absorbed through the benefit levers at the end of the year. We have kept the contributions fixed at 10% of pay, but now accrual varies so as to be cost-neutral under the (best estimate) funding basis – this avoids direct cross-subsidies between generations.

- We have removed the funding gate between 90% and 110% (the funding level is now required to be 100% at each annual funding assessment). Somewhat counterintuitively, our research suggests that this delivers more responsive benefit levers leading to marginally smoother benefit outcomes overall.

- We have reduced the range in which the revaluation lever can move from CPI ± 20% p.a. to CPI ± 5% p.a. This prevents the lever structure (and accrual rate) from drifting too far over the long term.

- When the revaluation lever is not sufficient to return the funding level to 100%, benefits are now adjusted at each age in proportion to the sensitivity of liabilities to movements in the revaluation lever, rather than a uniform adjustment (see Appendix B for more detail). This reduces the exposure of older members to benefit cuts (and uplifts) and makes the two levers in our design consistent in value terms.

We note in passing that, whilst the high-level CDC plan behaviour remains similar to that modelled in our White Paper, some features of the benefit outcomes differ as a result of the refinements above. In particular, the move to cost-neutral accrual has removed an element of cross-subsidy between cohorts which was previously implicit in the design (with the equity outperformance of the 1990s partly subsidising the rising cost of new accrual under falling real yields). Having removed this cross-subsidy, the benefit outcomes shown in Chart 5a on the next page are:

- less smooth over the last two decades, and

- higher on average (since more of the equity outperformance is emerging in benefits for members retiring *within* the window analysed, rather than supporting benefit accrual for later retirees),

compared with those illustrated in our White Paper.

Appendices A and B gives full details, respectively, of the IDC and CDC designs modelled in this paper.

Closed plan

Charts 5a and 5b on the next page show the income replacement ratio (average real pension during retirement divided by final pay) that would have been achieved by a member after contributing 10% of pay each year for 25 years to either an IDC scheme or our selected CDC plan. Three types of IDC investment are illustrated: equities (black), gilts (orange) and lifestyle (red) – compared with the CDC plan outcome (green).

Chart 5a shows outcomes for a CDC plan with a stable membership profile where new entrants, retirements and deaths are in balance.

Chart 5b shows outcomes for a CDC plan with a closed membership and no new joiners after 1930.

In both cases, the plan operates a dynamic investment strategy, varying the equity allocation at the start of each year to preserve the risk exposure of members at each age (as discussed in more detail in the later section 'Setting the investment strategy').

- For the stable membership profile, this strategy is broadly equivalent to holding 60% equities (40% matching assets) over the period.

- For the closed membership scenario, this strategy means tapering the equity allocation down to zero[5] as the plan matures (see Chart 4).

[5] Although the age distribution progresses smoothly, the proportion of equities – here and in later charts – varies due to changes in the discount rate from year to year, which changes the proportion of the value of benefits represented by younger and older members around the expected generally reducing trend line.

Chart 4 – Membership profile and proportion of assets invested in equities (closed plan)

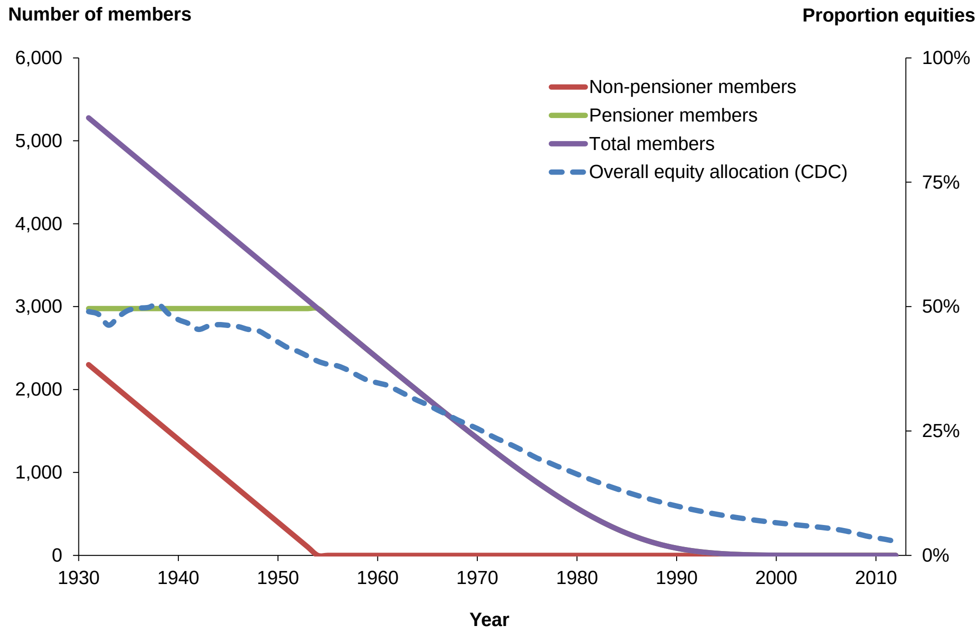


Chart 5a – Historic CDC and IDC outcomes (stable membership)

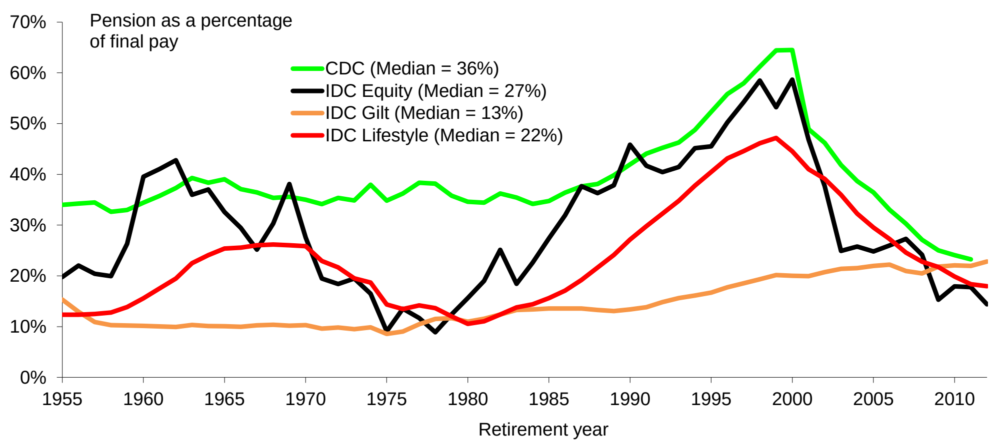
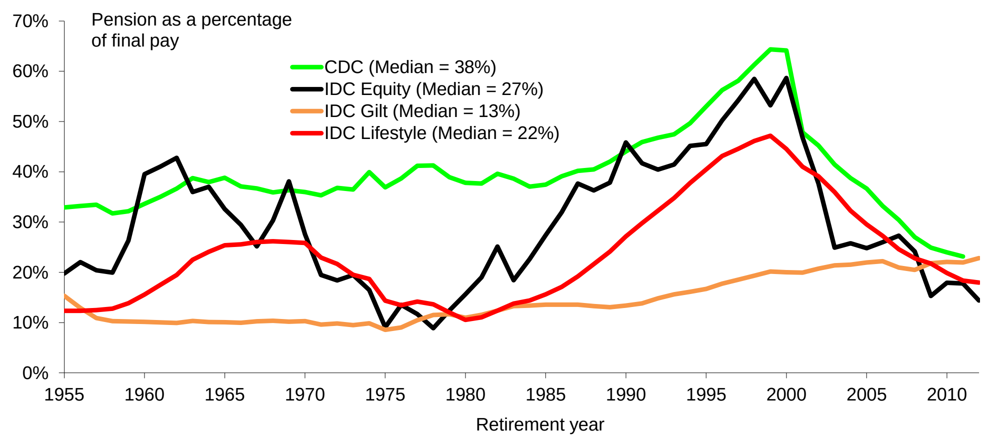


Chart 5b – Historic CDC and IDC outcomes (closed plan)



Closed plan – observations

As in our White Paper, the charts show that benefit outcomes from the sample CDC plan are:

- higher on average, and
- more stable over time

than the outcomes from a typical IDC lifestyle arrangement.

But what's particularly striking here is the consistency of outcomes between Charts 5a and 5b. In spite of the very significant changes in membership profile, the benefits received by each cohort of retirees in the closed plan is almost identical to what they would have received in a plan with stable continuing membership.

Closed plan – adjustment to benefits

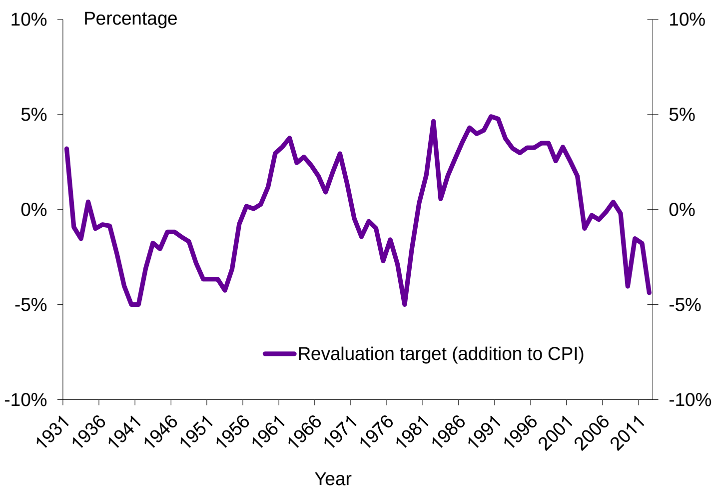
We can delve into this a little further by examining the CDC benefit adjustments needed to keep the plan in balance under each scenario. The charts below show, for each year during the period:

- the addition to/deduction from CPI in the plan's future revaluation target each year and, separately,
- the extent of any one-off benefit cut/uplift applied each year (the benefit adjustment shown is for a member at the average in-payment age of 76 – the adjustments are larger for younger members and smaller for older members, in line with the design set out in Appendix B).

Chart 6a shows outcomes for a CDC plan with a stable membership profile where new entrants, retirements and deaths are in balance.

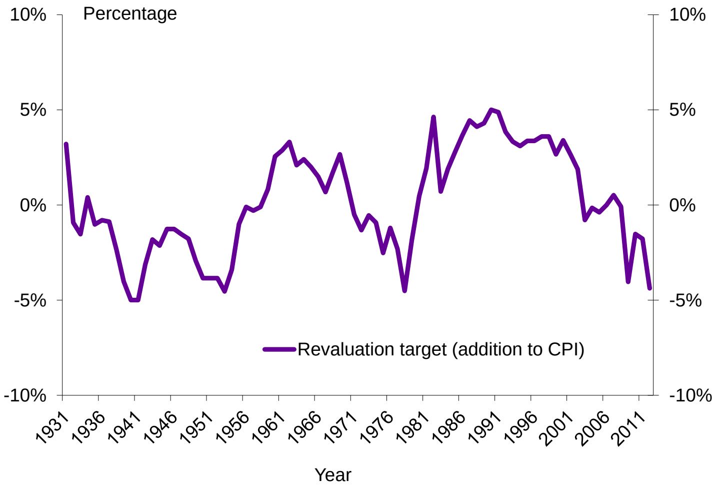
Chart 6b shows outcomes for a CDC plan with a closed membership and no new joiners after 1930.

Chart 6a – Historic adjustment to benefits over time (stable membership)



Year	Benefit adjustment (at age 76)
1932	-9.9%
1933	-3.2%
1940	-2.5%
1941	-10.2%
1978	-2.2%
2009	-4.7%
2012	-6.1%

Chart 6b – Historic adjustment to benefits over time (closed plan)

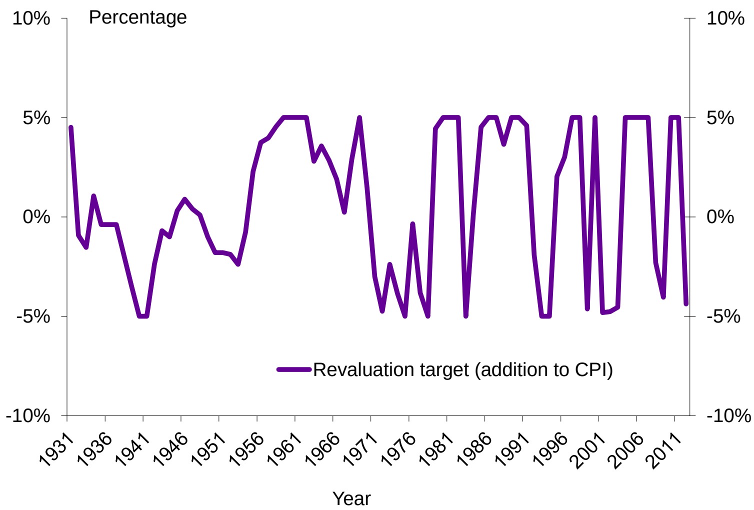


Year	Benefit adjustment (at age 76)
1932	-9.9%
1933	-3.2%
1940	-2.5%
1941	-10.2%
2009	-3.8%
2012	-6.1%

Again, the consistency between the charts is striking. By dynamically adjusting the investment strategy over time, we are able to maintain a stable risk exposure which effectively immunises members to changes in the overall plan profile.

Contrast this with Chart 6c below which shows how the plan's benefit levers would have behaved if we had run the closed plan off with a *fixed* investment strategy of 60% equities / 40% matching assets. In this case, as the population matures, the effective risk exposure of each cohort of members increases significantly and the levers become very unstable over time. This volatility is reminiscent of the straw man design behaviour illustrated in Chart 2 and demonstrates the value of a carefully managed investment strategy in a maturing CDC plan.

Chart 6c – Historic adjustment to benefits over time (closed plan, fixed investment strategy)



Year	Benefit adjustment (at age 76*)
1932	-8.4%
1933	-2.1%
1940	-1.6%
1941	-11.9%
1959	+8.4%
1960	30.1%
1961	+6.9%
1962	+9.0%
1969	+3.2%
1975	-28.8%
1978	-36.6%
1980	+111.5%
1981	+60.2%
1982	+138.5%
1983	-43.5%
1986	+41.3%
1987	+44.5%
1990	+51.7%
etc …	etc …

*While benefit adjustments are specified for a member aged 76 for ease of comparison, from 1966 onwards all remaining members are older than 76. The adjustments actual members receive after 1966 will therefore be smaller than those quoted.

Alternative scenarios

As well as testing the dynamic investment approach on a stable population and a closed population in run-off, we have modelled the evolution of the CDC plan under two alternative scenarios:

- A new plan opening in 1930 (with no accrued liabilities or assets);
- A large bulk transfer of active members, liabilities and assets in 1950.

Further details of these scenarios and the results of our modelling are set out in Appendix D. The key observation is that, again, the CDC lever behaviour (and hence benefit outcomes for members) is almost identical to those for a plan with stable continuing membership. Using an appropriate dynamic investment strategy has effectively immunised members against changes in the overall plan profile.

Furthermore, we have tested all four membership scenarios on alternative future financial projections, as well as the actual historic data between 1930 and 2012. In each case the conclusions are the same – plan performance is independent of changes in the membership profile. In Appendices E, F and G we have included a few examples from the set of future financial simulations to illustrate this:

- Each appendix covers an illustrative simulation of future financial market performance over the period 2013 – 2062, taken from the full distribution of projections generated by the Aon Asset Model.
- We have deliberately (and artificially) chosen simulations with widely disparate growth asset performance, to show how the behaviour might vary under quite different future paths. These simulations are not intended to give a view of what is actually likely in the future.

Setting the investment strategy

Taking a step back, it is worth considering *how* a dynamic investment strategy is able to immunise members against changes in the plan profile.

The rationale underlying this approach is that, for each individual, we can:

- determine the *effective* investment exposure of that individual by virtue of the plan benefit levers that apply to them;
- attribute a notional asset allocation to the individual that delivers that exposure;
- set the plan's overall asset allocation by adding up these notional pots across the membership.

For example, we may wish to design a strategy which ensures that a 10% equity market rise/fall will always correspond to a 0.2% p.a. increase/decrease to the revaluation target, regardless of the age profile of the plan at a given point in time. This would mean attributing a notional asset allocation to each member in line with their exposure to the revaluation/pension increase lever:

- A 65-year old may have accrued pension benefits with an average time to payment of 15 years (so, on average, exposure to 15 future increases). So a notional pot of 30% equities / 70% matching assets would match the sensitivity of their benefit value to a 0.2% p.a. change in the revaluation/increase target.

- On the other hand, a 45-year old may have accrued pension benefits with an average time to payment of 35 years (so, on average, exposure to 35 future revaluations). So a notional pot of 70% equities / 30% matching assets would match the sensitivity of their benefit value to a 0.2% p.a. change in the revaluation/increase target.

By re-assessing the age profile of accrued benefits in the plan each year and re-aggregating these notional pots, we can ensure the overall proportion of equities vs matching assets in the plan is always set so as to preserve the desired revaluation/increase lever sensitivity to equity outperformance.

As an aside, a consistent approach is required when setting the discount rate used to value liabilities. For each member, we know in advance that the notional equity allocation will need to be reduced each year into the future in order to preserve their revaluation/increase lever sensitivity. In the example above, we know that the appropriate equity allocation for a 45-year old is currently 70% but will need to reduce to around 30% by the time they have reached age 65.

This tapering risk exposure should be recognised up front in the form of a declining equity risk premium allowance in the discount rate (and the modelling outcomes illustrated in this paper make just such an allowance). Otherwise the discount rate might need to be reduced as the investment strategy changes are actually made, introducing a strain and potential reductions to members' benefits at that time.

Although we have kept the modelling and discussion simple by restricting ourselves to investment in matching assets and UK equities, the approach can be generalised in the obvious way to investment in matching assets and a diversified portfolio of growth assets.

Implications for fairness

In the design we have analysed, it is possible to attribute a notional investment allocation to each member's risk exposure within the plan.

A corollary of this is that the investment risk profile borne by each member must be balanced by expected returns in line with pricing in the financial markets.

For example, our 45-year old described on the previous page will be exposed to asset risk (and reward) consistent with an individual fund invested 70% in equities and 30% in matching assets. This gives them a greater exposure to equity risk than the 65-year old (30% equities / 70% matching) but

- the risk exposure is two-sided (i.e. they stand to gain more if equity markets rise, not just to lose more if equity markets fall), and

- the average return they can expect to achieve will be higher to compensate them for the additional overall uncertainty in outcomes (according to the additional risk premium priced into the equity markets by investors at large).

One way of interpreting this is that the CDC design is distributing risk (and reward) 'fairly' at each point in time. Members exposed to greater risk can also expect greater rewards, and to an extent consistent with the expected risk vs expected reward balance demanded by investors in the wider market.

A further benefit of this approach is that it gives a natural means of determining transfer values for those members wishing to transfer into (or out of) the plan. By taking the member's notional asset pot as the transfer value, one would ensure that:

- the value transferred in or out is market-consistent and hence 'fair' to the member (in the sense described above); and
- transfers do not alter the risk or return profile of benefits for any of the other members in the plan.

Implications for risk sharing

The astute reader may be tempted to ask whether we have now strayed from collective DC into conventional (individual) DC. If we can attribute 'notional' pots to members behind the scenes when managing the CDC investment strategy, what is to stop us from simply setting up *actual* pots on an individual basis and managing these in an identical way? Surely the benefit outcomes would be the same?

This is a reasonable (and timely) question, noting that the new pension flexibilities introduced from April 2015 give much greater freedom over the investment strategy and drawdown options available to individuals accessing their IDC pension savings. Prior to these changes, it was not possible (or at least tax efficient) to keep an IDC pot invested in return-seeking assets such as equities after retirement. And the pattern of pension instalments during retirement was constrained to a limited range of annuity products from insurers.

Under the new regime, both of these aspects have changed – individuals are free to manage the drawdown of their funds under whatever investment strategy they prefer, and they can choose how much income to draw from these funds year by year rather than following a fixed schedule throughout retirement.

In principle, this means that an IDC saver *could:*

- adopt a longer term dynamic equity investment strategy into retirement (which is the key driver of the higher average returns for CDC exhibited in our modelling); and
- draw down their pension annually in a way which mimics the sort of CDC revaluation and benefit adjustment levers we have modelled.

So where does this leave Collective DC?

The benefits of Collective DC

From one perspective, the message above may be comforting – under a sensibly designed asset strategy the investment risk in a CDC plan is fundamentally no greater or worse than in a collection of IDC pots. There is no iniquity of risk transfer, no requirement for continuing new joiners and no catastrophe if the plan is allowed to run down.

But this does not mean that the plan simply *is* a collection of IDC pots. We believe that CDC holds many attractions compared with IDC, even in the world of post April 2015 pension freedoms.

Longevity risk

The first point is that a CDC plan of the kind set out in this paper does deliver genuine risk sharing between members, of a kind that cannot be replicated by IDC drawdown. This is not so much in the pooling of investment risk – it is in the pooling of longevity risk.

An individual wishing to operate a drawdown fund into retirement runs the significant risk that they will simply outlive their savings. This is not a trivial matter – under typical UK pension scheme projections, a man aged 65 today might have a life *expectancy* of around 22-23 years… but there is a 1 in 8 chance that they will live a full 10 years longer than this. If they choose to draw down their pot based on their life expectancy, there is a material chance of exhausting all the funds well within their lifetime. And of course the risk is exacerbated if individuals underestimate their life expectancy in the first place.

By participating in a CDC plan, individuals can pool this risk with others and reduce their exposure to the statistical randomness of individual lifetimes. This is fundamental to the original concept of a 'pension', as opposed to a mere investment fund.

No member decisions

Investment policy for a CDC plan could – and, in our view, should – be carried out by trustees acting on behalf of members. There would be no need for individual member involvement in investment decisions.

Evidence[6] suggests that members have been unwilling or unable to take the investment decisions required in an IDC scheme, even under the pre-April 2015 regime of relatively simple strategies leading up to annuitisation at retirement. In order to deliver performance akin to the CDC plan illustrated in this paper, the strategy would need to encompass dynamic portfolio rebalancing and a managed drawdown approach after retirement based on regular monitoring of financial conditions. This sophistication is simply out of reach of the typical IDC saver, and would in any case be inefficient if operated on an individual basis.

[6] For example:

- Byrne, A.; 2007, *Employee Saving and Investment Decisions in Defined Contribution Pension Plans: Survey Evidence from the UK,* Financial Services Review, Vol. 16, No. 1.
- Choi, J. Laibson, D. Madrian, B.; 2011. *$100 bills on the sidewalk: Suboptimal investment in 401 (k) plans.* Review of Economics and Statistics 93, 748-763.
- Lusardi, A. Mitchelli, O. 2007; *Financial literacy and retirement preparedness: Evidence and implications for financial education.* Business Economics 42, 35-44.

A CDC plan gives an ideal framework for setting and managing the investment strategy more effectively, by placing the responsibility on trustees, who would be professionally advised, and not directly involving members in investment decisions.

Superior investment choices

The collective approach to investment decisions can deliver access to the best expertise available in the marketplace, and a wider range of investment classes than IDC arrangements.

There are many areas in current IDC schemes where investment options are sub optimal. For example, one of the major drawbacks of contract-based group personal pensions is that member consent is required to effect investment switches, which hinders innovation and nimble management even when an investment governance committee is in place to oversee the strategy.

In a CDC plan, these barriers could be removed. Furthermore, the plan may be able to negotiate lower charges than a number of IDC schemes, and to access asset classes of a form not readily available in an individual arrangement. For example:

- interest rate and inflation hedging derivatives could be used to improve the effectiveness of a 'liability matching' asset portfolio (just as they are currently used by many UK defined benefit plans);
- longevity swaps could be secured to protect against *systemic* rises in life expectancy, as well as the randomness of individuals' lifetimes;
- CDC plans may also be able to take a longer term view and invest more of their assets in illiquid investment categories such as infrastructure, mortgages and other investments, an excellent diversifier of investment returns which can be difficult to incorporate into conventional IDC plans.

Account blindness

A CDC plan offers a natural framework for expressing members' benefits in pension income terms, rather than account value terms, which can be far superior as a means of communication.

Repeated evidence suggests that account blindness leads members to underestimate the amount they need to save for an adequate retirement. In part this is because members underestimate their own life expectancy.

An IFS report[7] suggests that men (women) aged 50-60 underestimate their life expectancy on average by around 2 (4) years – leading to underestimates of how much they need to save for retirement (and contributing to the perception that annuities are poor value for money).

CDC plans express benefits in terms of income that can be related to the member's standard of living and should facilitate retirement planning, with an improved understanding of likely benefit outcomes.

What is more, despite the excitement being generated by the changes on 6 April 2015 to enable IDC savers to take their benefits flexibly, our research[8] shows that the great majority of IDC savers who have a preference would wish to receive an income from their savings, not a lump sum.

Other designs

The CDC plan modelled in this paper is just one example of a feasible design, intended to draw out some key features and demonstrate viable performance.

The accrual rate and control mechanisms it uses have the property that individual members' risk exposure (at any point in time) can be expressed in terms of notional individual pots of equities and matching assets. This allows the plan to immunise itself against membership movements using a dynamic investment strategy, and to distribute risk and reward 'fairly' between members at each point in time.

We are not suggesting that the design illustrated in this paper is optimal. It would be possible to consider alternative designs, both in the class of plans with the properties above and also in the wider class of CDC plans which are *not* instantaneously expressible in the form of notional individual pots. (The example design modelled in our White Paper strictly falls in this second category.)

Ultimately, the 'best' design in a given situation will depend on stakeholders' objectives (including the risk/reward preferences of the plan members) and the wider regime in which the plan is operated.

Conclusions

Our November 2013 White Paper showed that CDC plans had the potential to achieve higher, more stable pension outcomes for members than a conventional IDC pension arrangement.

Our latest modelling tackles head-on the contention that CDC plans require a continuing stream of new entrants to ensure sustainability.

This is simply not the case. It is feasible to design a CDC plan for which

- pension outcomes are stable under changes to the membership, and
- pension outcomes are 'fair' across different members and different generations in the plan,

whilst retaining the longevity risk sharing, governance, investment and communication advantages which CDC can offer.

In particular, this demonstrates that a CDC plan could provide a decumulation vehicle for pensioners, without the need to include any younger members.

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[7] Crawford, R. Tetlow, G.; November 2012, *Expectations and experience of retirement in Defined Contribution pensions: a study of older people in England*, The Institute of Fiscal Studies
[8] Aon and Cass Business School; December 2014, *In a brave new pensions world what will DC members really want? (Aon DC Member Survey)*

Appendix A – Illustrative IDC scheme design

IDC scheme design

We have calculated outcomes from a specimen IDC scheme, and in our modelling have compared this with outcomes from a CDC plan. The design of the baseline IDC scheme is set out below.

Basic design

- Contributions have been set at 10% of pay each year – the cost of any risk benefits and expenses of administration would be in addition and has been excluded from our modelling. The full 10% goes towards providing retirement benefits.
- Pay increases in line with the UK's National Average Earnings each year, overlaid with an allowance for additional promotional increases.
- Retirement occurs at age 65, at which point the member (assumed to be male) ceases contributions and starts to draw their pension.
- We have modelled 'Equity', 'Gilt' and 'Lifestyle' approaches to the investment of the IDC funds. These are simplified approaches – 'Equity' is UK equities, 'Gilt' is a notional portfolio of liability matching assets and 'Lifestyle' means a 10 year linear switch from equities to matching assets leading up to retirement at age 65.
- Contributions are assumed to be invested in the relevant asset class up to retirement and then disinvested to purchase an immediate annuity.

Annuity purchase

- There is an 80% chance of the member being married at age 65 (in which case the member's spouse is assumed to be female and 3 years younger and a 50% contingent spouse's pension is purchased).
- All members survive until age 65 (and continue contributing to the plan over that period).
- At age 65 the member purchases an inflation linked annuity, which increases in line with CPI each year. In practice CPI linked annuities have not existed throughout this period and so we have approximated their cost, using net interest rates and a suitable longevity assumption.
- Mortality rates are in line with the 'S1PxA' standard tables published by the Institute and Faculty of Actuaries' Continuous Mortality Investigation (CMI), with assumed improvements in mortality rates from 2002 in line with the CMI 2011 projections model using a long-term improvement rate of 1.25% p.a..

Appendix B – Illustrative CDC plan design

CDC plan design

The base design modelled here is simply an example to draw out the key features of CDC behaviour.

We are not suggesting that this design is optimal. Although it is a reasonable candidate for investigation, there are refinements which could be made to improve its performance (depending on the criteria which one uses to measure this).

Target benefits

- Company contributions 10% of pay (no member contributions).
- CARE accrual at a rate supported by the contributions paid in (accrual rate determined each year using the best estimate funding basis described below).
- Pension benefits payable from age 65, with attaching spouse's pension payable at a 50% rate if the member dies thereafter.
- Revaluations of 100% of CPI (zero floor, no cap) – both pre and post retirement.
- Cash commutation has been excluded from this modelling for simplicity.

Investment strategy

Dynamic investment strategy apportioned between UK equities and a notional portfolio of liability matching assets (consistent with the respective asset classes used for the IDC comparator).

The proportion of equities is varied each year based on the age profile of the plan, with the equity exposure at each age set to match the sensitivity of the liability at that age to changes in the revaluation lever. The idea is that this gives a portfolio which delivers a stable risk exposure for each member regardless of the other membership of the plan at a given point in time.

Control mechanism

Each year the plan's funding level (the value of the assets divided by the value of the liabilities) is measured based on the CARE-style benefits which have accrued up to that point in time.

- The funding assessment is performed using a market value of assets and a set of market-consistent best estimate assumptions for valuing the plan liabilities. The liabilities valued use the base pension to date, including any past increases awarded and any benefit cuts made. They allow for future revaluations and pension increases in line with those set after the latest annual funding review (rather than the 100% CPI target).

- Benefits are then adjusted to maintain a funding level of 100%, by (in order):

  i. adjusting the target rate for *future* benefit revaluations (up to and after retirement) by a fixed margin, within the range CPI ± 5% (with revaluations subject to an overall annual minimum of 0%);

     and then (if necessary)

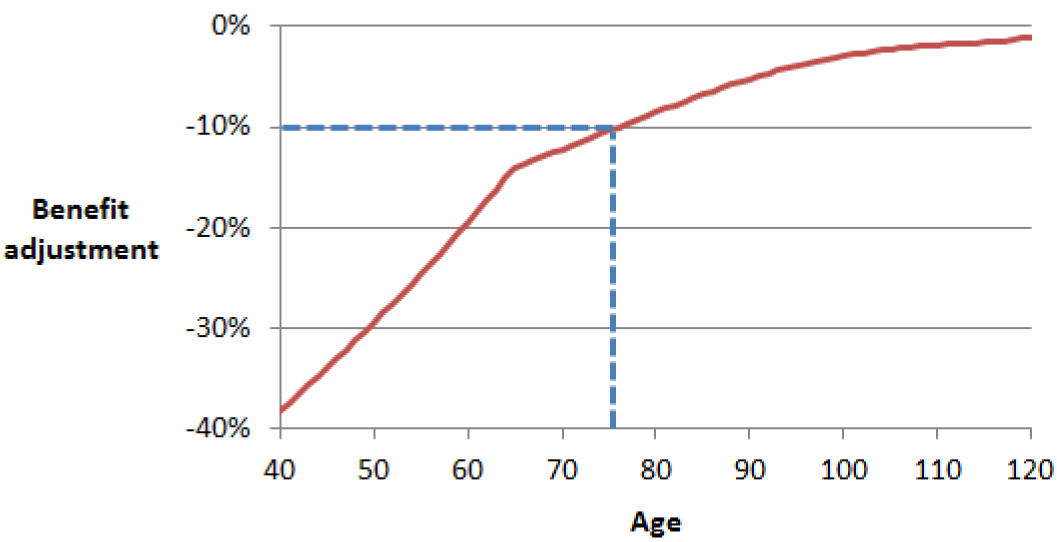
  ii. applying a one-off percentage adjustment to accrued benefits (both those in payment and those not yet in payment). This is based on a scale of adjustments that reduces with age in proportion to the sensitivity of liabilities to movements in the revaluation lever.

- Pensioner benefits are paid from the plan during retirement, rather than being bought out with an annuity provider (for example).

- Pensions in payment are exposed to both levers (i) and (ii) above.

An illustration of the scale used for lever (ii) is shown in Chart 7 below, which plots the one-off benefit adjustment which would apply at each age in a scenario in which the required adjustment to benefits at age 76 was determined to be -10%. (We have chosen age 76 as a reference point because it is the example used in the main body of the paper, reflecting the average in-payment age for benefits.)

Chart 7 – Example of benefit adjustment scale by age (corresponding to a -10% adjustment at age 76)



Using this tapered scale reduces the exposure of older members to benefit cuts and makes our two levers consistent in value terms.

Appendix C – Methodology and assumptions

Nature of calculations

The historic calculations covered in this paper are approximate estimates of the member outcomes which might have arisen in practice (under the plan designs considered).

The stochastic future projections cover a range of possible scenarios consistent with the modelling behind Aon's Global Capital Market Assumptions as at 30 September 2012.

Where we refer to a 'best estimate' assumption in this paper we mean one which is expected to have an equal probability of understating or overstating the true future value.

Scenarios modelled

For the 'stable membership' scenario in this paper, we have modelled past performance assuming:

- the CDC plan starts with a mature 'steady state' membership profile in 1930, and is fully funded at that point;
- between 1930 and 2012 the plan develops within its design rules, with a steady flow of new entrants, retirements and deaths, and an allowance for broad historic asset returns and other changes in financial conditions.

The future performance analysis of our 'stable membership' scenario is independent of this and assumes instead that:

- the CDC plan starts with a mature 'steady state' membership profile in 2013, and is fully funded at that point;
- between 2013 and 2062 the plan develops along an illustrative simulated future. In each case, it develops within its design rules, with a steady flow of new entrants, retirements and deaths, and an allowance for the asset returns and other changes in financial conditions associated with that simulation.

For the past history and each of the future simulations, corresponding IDC outcomes are constructed based on identical financial conditions to the CDC scenario.

For simplicity we have assumed that for each member in the CDC (or IDC) plan:

- service commences at age 40;
- contributions are paid to the scheme at a rate of 10% of pay between ages 40 and 65;
- pay rises in line with the UK's National Average Earnings each year, overlaid with an allowance for additional promotional increases.

- retirement occurs at age 65, at which point the member ceases contributions and starts to draw their pension;
- thereafter mortality rates are in line with the assumptions adopted in the liability assessment (below).

For the 'closed plan', 'new plan' and 'bulk transfer' scenarios we have modelled alternative CDC membership profiles as set out in Appendix D (past performance) and Appendices E, F and G (future performance). In particular, the 'bulk transfer' scenario considers a group of new members transferring in to the plan with *existing* accrued pensions at the age of 40.

Asset roll-forward

The assets in the CDC (or IDC) plans are projected in an approximate manner year-by-year with allowance for:

- new contributions paid in;
- (for CDC) benefits paid out to pensioners;
- UK equity returns in line with a proxy total return index;
- liability-matching asset returns in line with the change in members' liability values. In practice, assets that perfectly match the liabilities are unlikely to be available for investment, though these could be approximated to some extent through appropriate combinations of long-dated fixed interest and index-linked bonds and risk-hedging derivatives.

In all of the modelling assets are assessed at (approximate) market value.

Liability assessment – financial assumptions

The assessment of liabilities for calculating the CDC plan funding level each year is based on market-consistent best estimate assumptions.

- For the purpose of the modelling best estimate assumptions are derived from the assumed market yield data at the point of assessment, with:
  - a CPI inflation assumption based on the difference between nominal and real (RPI) UK government bond yields of appropriate duration, adjusted downwards by 0.8% p.a. to make broad allowance for an assumed future gap between RPI and CPI inflation; and
  - a forward-looking inflation volatility assumption of 2.3% p.a. for much of the historic period, reducing to 1.7% p.a. for more recent assessment dates and dates in the future.

- The discount rate used in the CDC plan assessment of liabilities for each member is taken as:
  - the yield on long-dated fixed interest government bonds, plus
  - an equity risk premium in respect of that portion of the liabilities expected to be backed by UK equity holdings at each age into the future, consistent with the plan's dynamic investment strategy (to make some allowance for expected outperformance of equities over government bonds).
    - In practice the equity risk premium would be re-calibrated to a suitable best estimate each year by the plan's actuary based on current market conditions.
    - Our modelling uses a simplistic formula to attempt to capture the first order impact of this re-calibration, with a cap of 5% p.a. and a floor of 0% p.a. applied to the resulting equity risk premium before use in the discount rate.
- Given the purpose of the modelling (to illuminate broad features of CDC and IDC plan behaviour) we are not attempting to use a full yield curve discount rate or inflation assumption for the funding assessment basis.

Liability assessment – demographic assumptions

The demographic assumptions used for valuing the liabilities in our modelling are held fixed throughout the projections (for example, we have not modelled an increasing expectation of longevity throughout the historic period).

The reason for doing this is simply to isolate the behaviour of CDC and IDC plan designs under changes in financial conditions. Mixing this with variations in the demographic assumptions would have made the analysis less transparent (though of course we would expect changes to the demographic assumptions from time to time if managing a CDC plan in practice).

The key assumptions used are:

- Male gender for the plan member;
- 80% chance of being married at age 65 (in which case the member's spouse is assumed to be female and 3 years younger than them) and a 50% contingent spouse's pension is provided;
- All members survive until age 65 (and continue contributing to the plan over that period);

- From age 65, mortality rates are:
  - in line with the 'S1PxA' standard tables published by the Institute and Faculty of Actuaries' Continuous Mortality Investigation (CMI), with
  - assumed improvements in mortality rates from 2002 in line with the CMI 2011 projections model using a long-term improvement rate of 1.25% p.a..

Historic data

The historic total return indices, real and nominal government bond yields, annual inflation and National Average Earnings growth figures assumed for the period 1930 to 2012 are based on:

- Financial data from Barclays' published 2012 'Equity Gilt Study'…
- … with suitable extrapolations where series are not available; for example:
  - Real government bond yields did not exist prior to 1983, so before that point we have assumed 'notional' real yields consistent with a 10-year central moving average of realised inflation;
  - Similarly, for the period prior to publication of the National Average Earnings index we have assumed earnings inflation in line with RPI growth + 0.7% p.a.

Stochastic simulation data

The distributions of future total return indices, real and nominal government bond yields, annual inflation and National Average Earnings growth figures assumed for the period 2013 to 2062 are based on independent simulations from the proprietary Aon Asset Model, calibrated to market conditions at 30 September 2012.

This is an econometric model designed to generate plausible (and plausibly volatile) future scenarios in the financial markets. It has the following key features:

- Arbitrage free
- Market consistent
- Full yield curve
- Fat tails to reflect observed market characteristics

Limitations and scope

The figures and charts in this paper are intended as an illustration of the research that we are conducting at Aon, and as a starting point for further discussion.

They do not constitute formal advice and should not be relied upon in themselves to make policy decisions.

In particular, this paper is not subject to 'Technical Actuarial Standard R: Reporting Actuarial Information' (or to the other Technical Actuarial Standards in force at the time of writing).

Appendix D – Membership profile sensitivities

Membership scenarios

In the main body of this paper we provided a brief illustration of benefit outcomes (Charts 5) and lever behaviour (Charts 6) for our example CDC plan, under two alternative membership scenarios:

(a) a stable profile where new entrants, retirements and deaths are in balance between 1930 and 2012; and

(b) a closed membership profile with no new joiners[9] after 1930.

In this section we present the outcomes from those scenarios alongside two further membership profile sensitivities:

(c) a new plan opening in 1930 with no members, no liabilities and no assets. Members then join in the same way as in scenario (a), as set out in Appendix C;

(d) a plan receiving a large (fully funded) bulk transfer of active members in 1950, having developed with the same stable membership profile as scenario (a) up to that point. The bulk transfer broadly doubles the active population, comprising members aged 40 with individual accrued pensions approximately equal to the average pension across existing members of the plan at the point of transfer.

In each case, the plan operates a dynamic investment strategy, varying the equity allocation at the start of each year to preserve the risk exposure of members at each age.

For the stable membership profile, this strategy is broadly equivalent to holding 60% equities (40% matching assets) over the period.

For the other scenarios, this strategy means adjusting the equity allocation as the membership profile varies over time.

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[9] To illustrate the actual benefit outcomes in Charts 5 and 6 in the main body of this paper, and Charts 9 and 10 in this appendix, we do include a very small number of new members (so that it is possible to generate output for the same range of retirement years as are used for the other scenarios).

Asset allocation

Charts 8a to 8d show the developing membership profile of the plan under each scenario, splitting the overall number of members (purple) between

- non-pensioners (red) and
- pensioners in payment (green).

In addition, the blue dashed line shows the proportion of assets invested in equities under the plan's dynamic investment strategy and demonstrates how the asset allocation responds to changes in the membership profile over time.

Benefit outcomes

Charts 9a to 9d show the income replacement ratio (average real pension during retirement divided by final pay) that would have been achieved by a member after contributing 10% of pay each year for 25 years to either an IDC scheme or our selected CDC plan.

Three types of IDC investment are illustrated: equities (black), gilts (orange) and lifestyle (red) – compared with the CDC plan outcome (green).

Lever behaviour

Charts 10a to 10d show, for each year during the period:

- the addition to/deduction from CPI in the plan's future revaluation target each year and, separately,
- the extent of any one-off benefit cut/uplift applied each year (the benefit adjustment shown is for a 76-year-old – the adjustments are larger for younger members and smaller for older members, in line with the design set out in Appendix B).

Observations

The consistency between benefit outcomes in each scenario – charts 9(a) to 9(d) – and the underlying lever behaviour – charts 10(a) to 10(d) – is striking. By dynamically adjusting the investment strategy over time, we are able to maintain a stable risk exposure which effectively immunises members to (quite extreme) changes in the overall plan profile.

Chart 8 – Membership profile and proportion of assets invested in equities

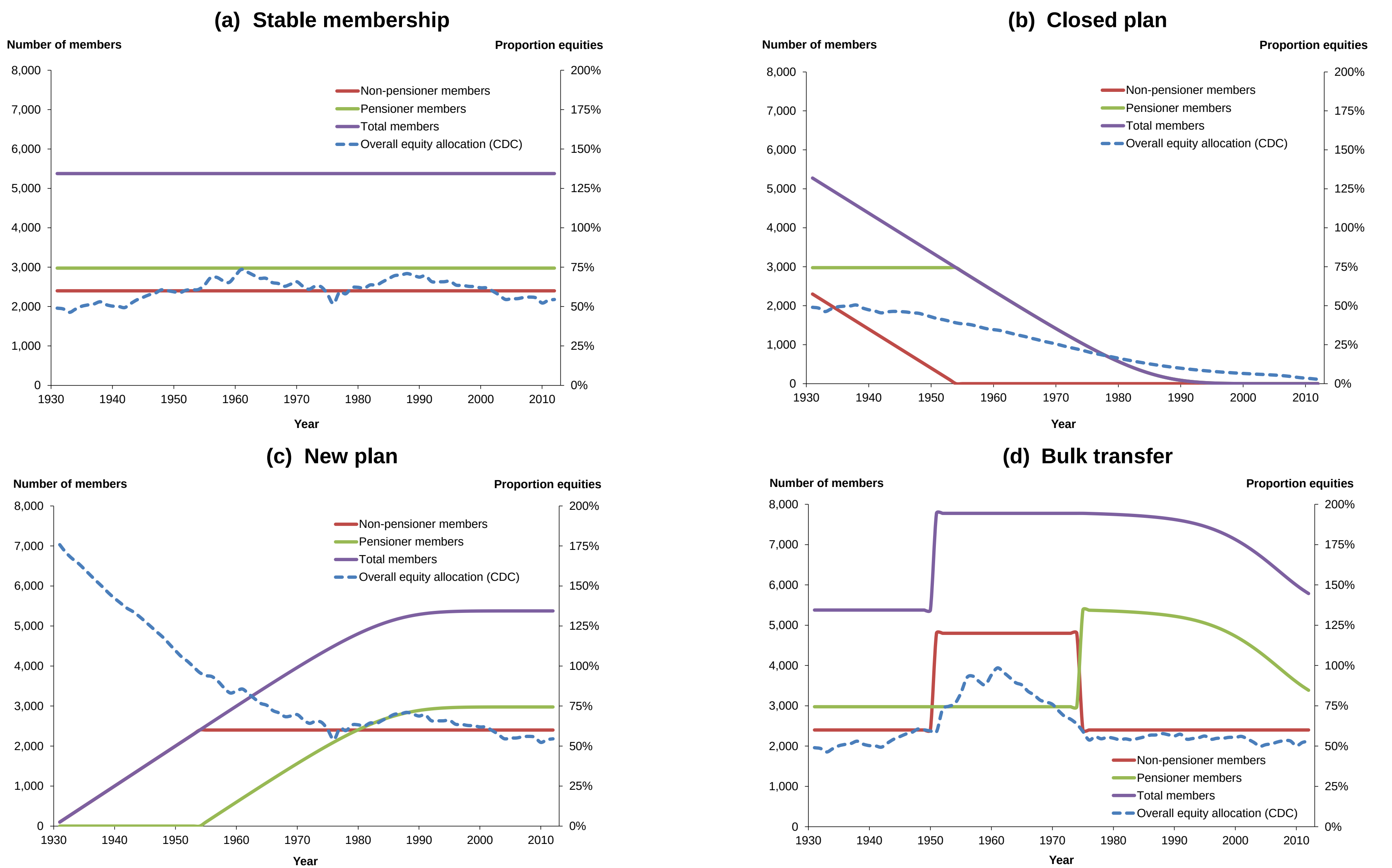
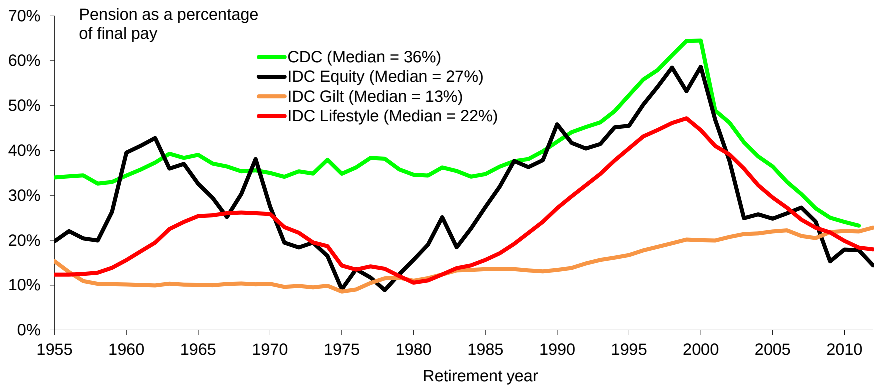
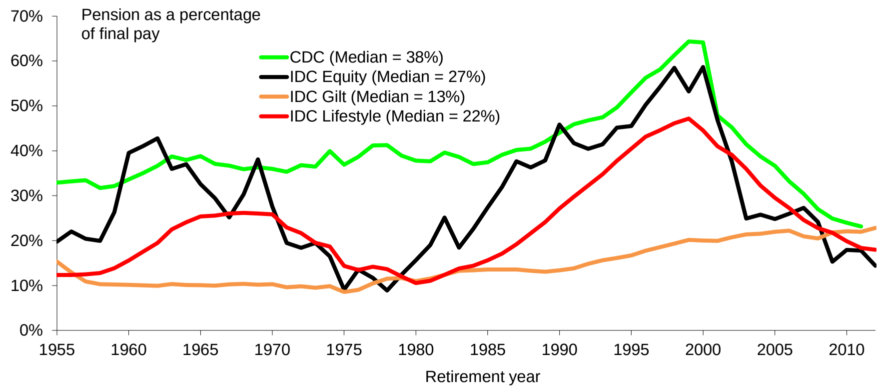


Chart 9 – Historic CDC and IDC outcomes

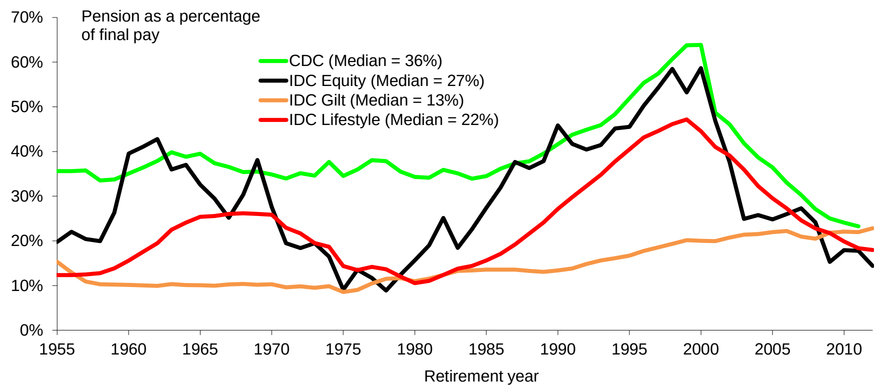
(a) Stable membership



(b) Closed plan



(c) New plan



(d) Bulk transfer

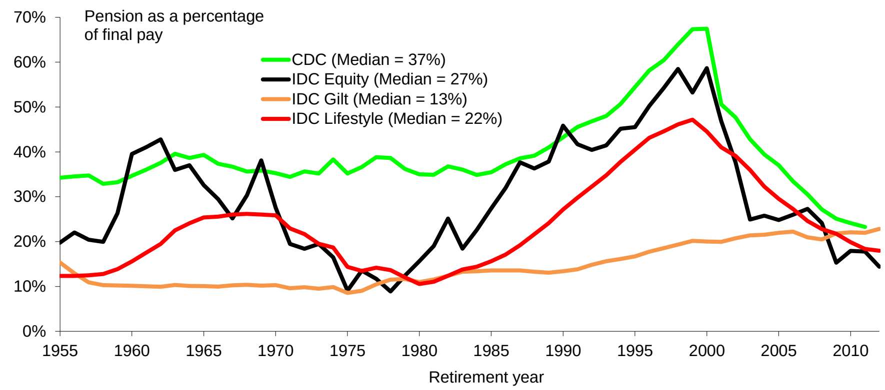
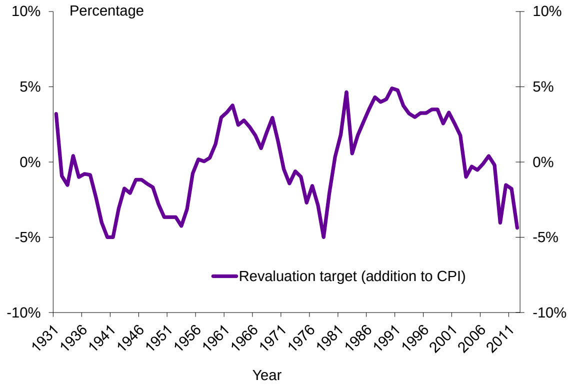


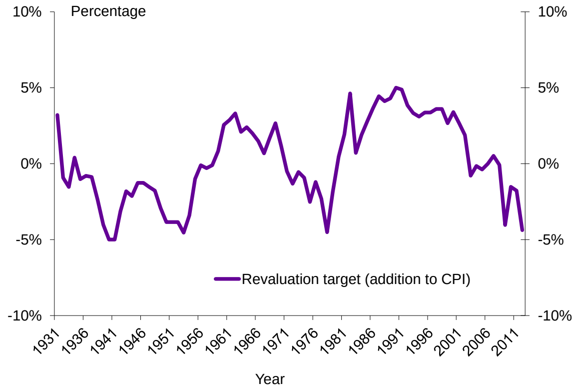
Chart 10 – Historic adjustment to benefits over time

(a) Stable membership



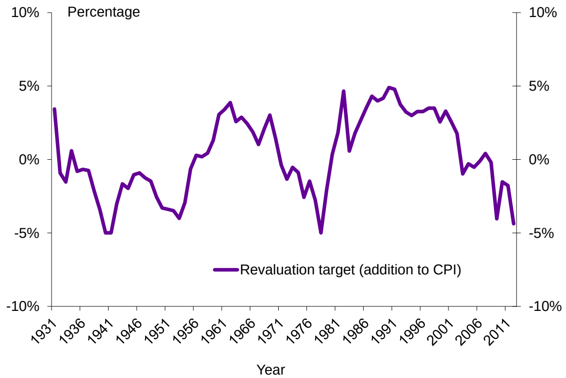
Year	Benefit adjustment (at age 76)
1932	-9.9%
1933	-3.2%
1940	-2.5%
1941	-10.2%
1978	-2.2%
2009	-4.7%
2012	-6.1%

(b) Closed plan



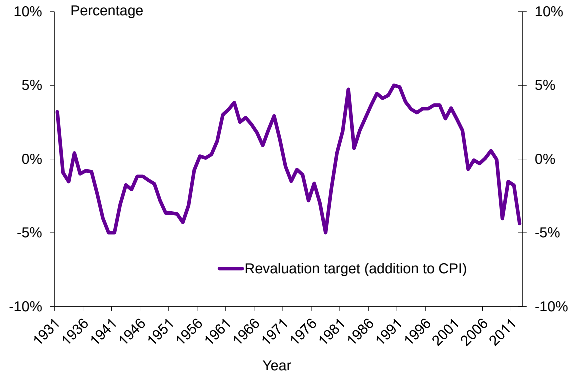
Year	Benefit adjustment (at age 76)
1932	-9.9%
1933	-3.2%
1940	-2.5%
1941	-10.2%
2009	-3.8%
2012	-6.1%

(c) New plan



Year	Benefit adjustment (at age 76)
1932	-8.0%
1933	-2.2%
1940	-0.8%
1941	-9.8%
1978	-1.6%
2009	-4.6%
2012	-6.1%

(d) Bulk transfer



Year	Benefit adjustment (at age 76)
1932	-9.9%
1933	-3.2%
1940	-2.5%
1941	-10.2%
1978	-3.0%
1990	+0.4%
2009	-3.4%
2012	-6.1%

Appendix E – Membership profile sensitivities (future scenario 1 – 'low growth')

Membership scenarios

In Appendix D we provided a comparison of membership profiles (Charts 8), benefit outcomes (Charts 9) and lever behaviour (Charts 10) for our example CDC plan, between four membership scenarios over the period 1930 – 2012.

In this appendix, we repeat the analysis for an illustrative simulation of future financial market performance over the period 2013 – 2062. The particular simulation shown here reflects a 'low growth' scenario for UK equities, drawn from the full range of stochastic projections generated by the Aon Asset Model. Our membership scenarios are:

(a) a stable profile where new entrants, retirements and deaths are in balance between 2013 and 2062;

(b) a closed membership profile with no new joiners[10] after 2013;

(c) a new plan opening in 2013 with no members, no liabilities and no assets. Members then join in the same way as in scenario (a), as set out in Appendix C;

(d) a plan receiving a large (fully funded) bulk transfer of active members in 2032, having developed with the same stable membership profile as scenario (a) up to that point. The bulk transfer broadly doubles the active population, comprising members aged 40 with individual accrued pensions approximately equal to the average pension across existing members of the plan at the point of transfer.

In each case, the plan operates a dynamic investment strategy, varying the equity allocation at the start of each year to preserve the risk exposure of members at each age.

The charts which follow demonstrate that the conclusions of Appendix D remain robust under this future simulation. Both the benefit outcomes – charts 12(a) to 12(d) – and the underlying lever behaviour – charts 13(a) to 13(d) – are strikingly consistent between the four membership profile scenarios considered.

[10] To illustrate the actual benefit outcomes in Charts 5 and 6 in the main body of this paper, and Charts 12 and 13 in this appendix, we do include a very small number of new members (so that it is possible to generate output for the same range of retirement years as are used for the other scenarios).

Chart 11 – Membership profile and proportion of assets invested in equities (future scenario 1 – 'low growth')

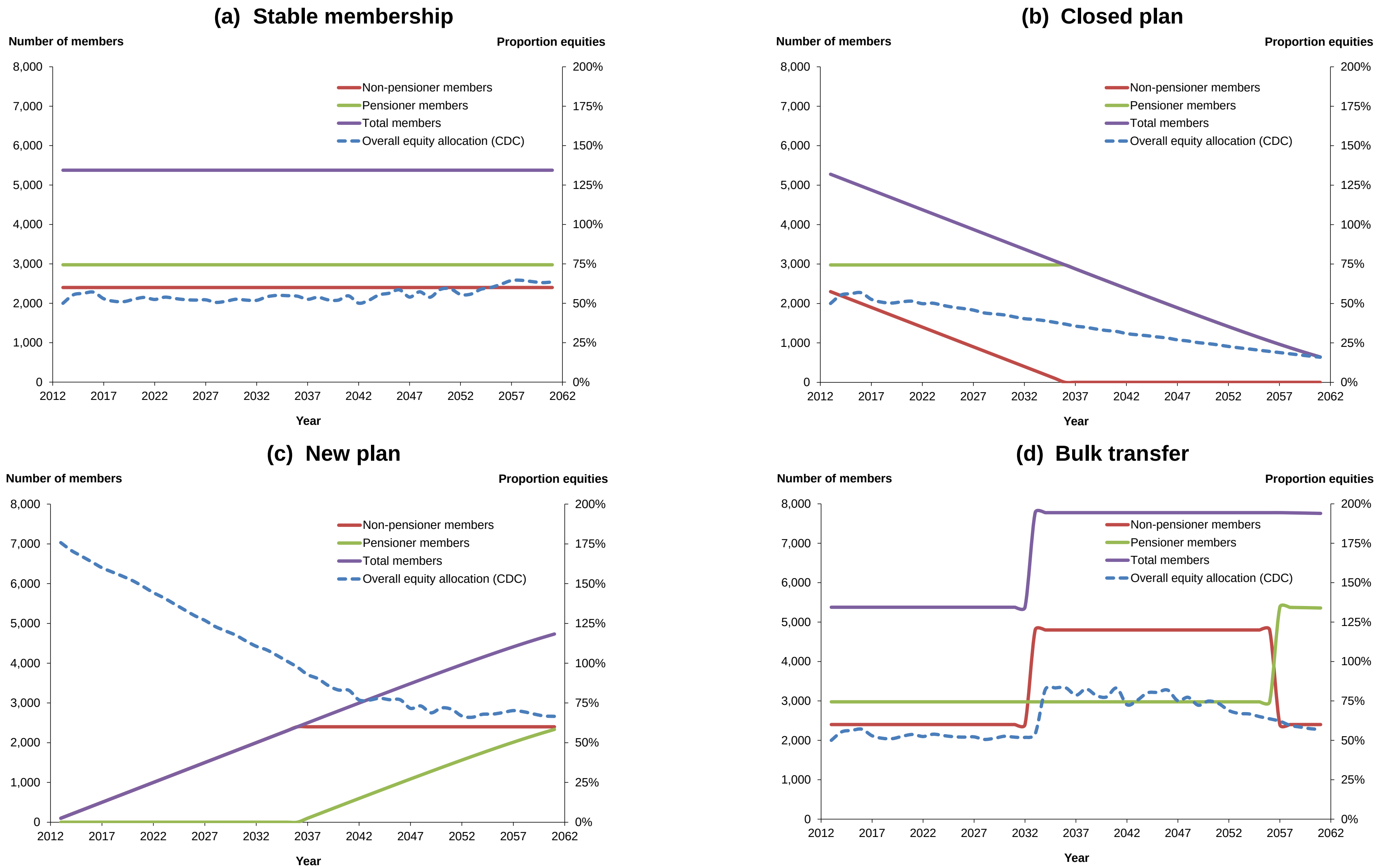
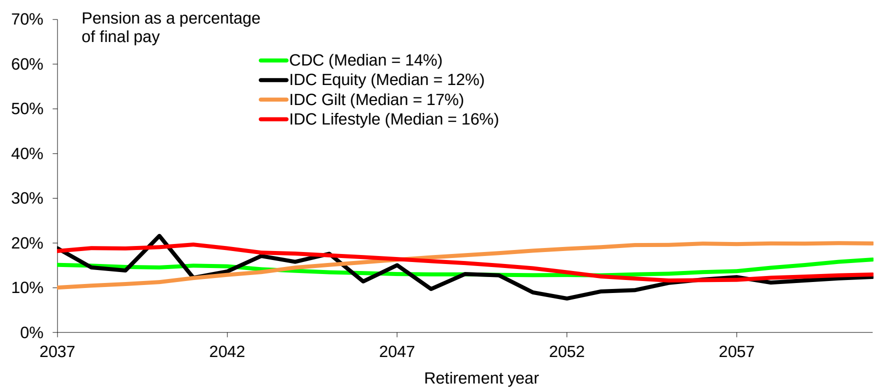
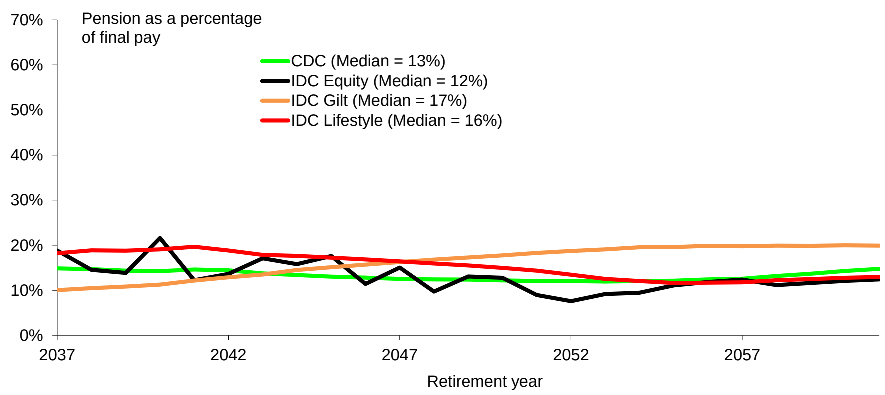


Chart 12 – Historic CDC and IDC outcomes (future scenario 1 – 'low growth')

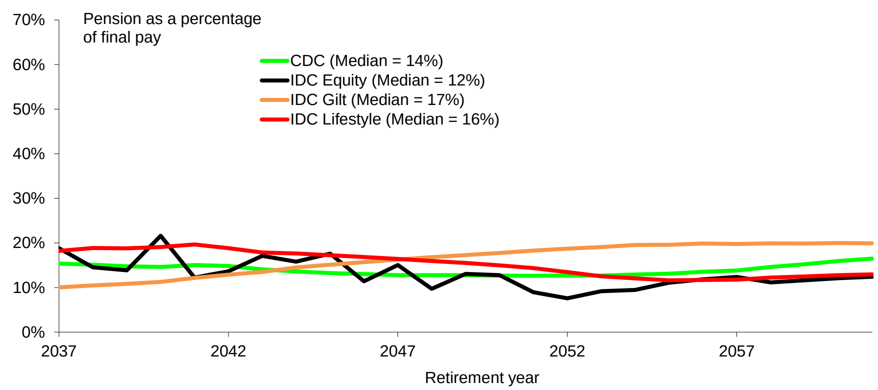
(a) Stable membership



(b) Closed plan



(c) New plan



(d) Bulk transfer

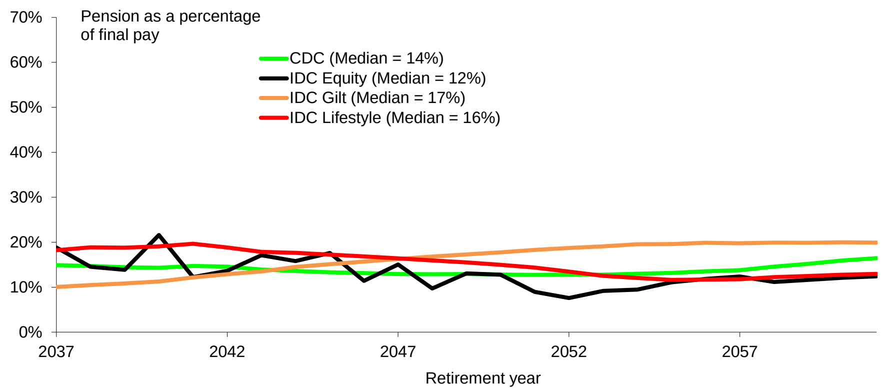
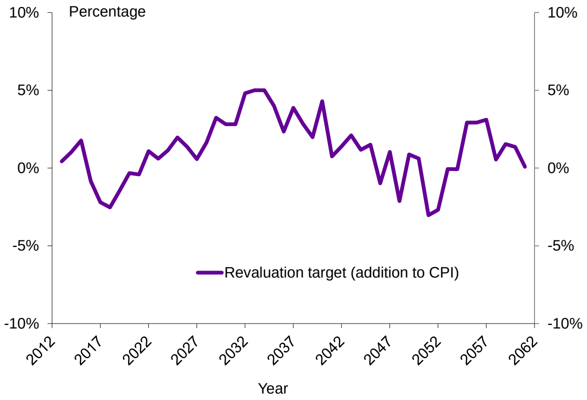


Chart 13 – Historic adjustment to benefits over time (future scenario 1 – 'low growth')

(a) Stable membership

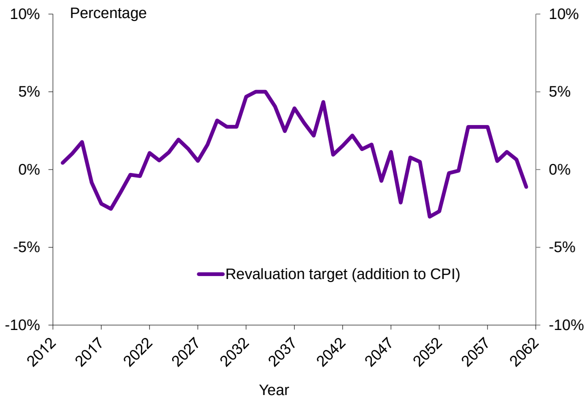
Year	Benefit adjustment (at age 76)
2033	+1.9%
2034	+0.8%
2048	-8.4%
2051	-2.5%
2052	-8.4%
2054	-0.5%
2058	-0.9%



Year	Benefit adjustment (at age 76)
2032	+3.4%
2033	+3.5%
2034	+0.8%
2048	-8.8%

(b) Closed plan

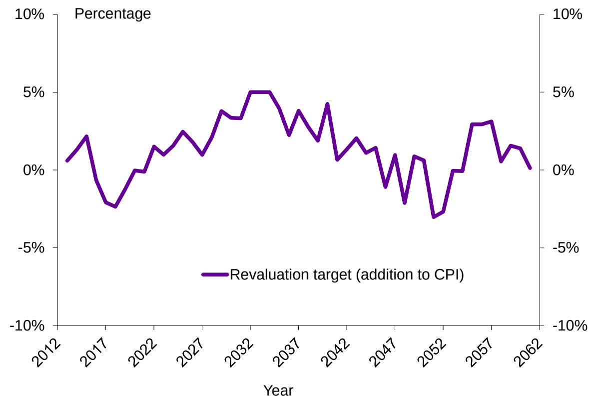
Year	Benefit adjustment (at age 76)
2033	+0.6%
2034	+0.8%
2048	-7.6%
2051	-3.3%
2052	-8.7%
2054	-1.6%
2058	-3.2%



Year	Benefit adjustment (at age 76)
2033	+1.9%
2034	+0.8%
2048	-9.8%
2051	-2.4%

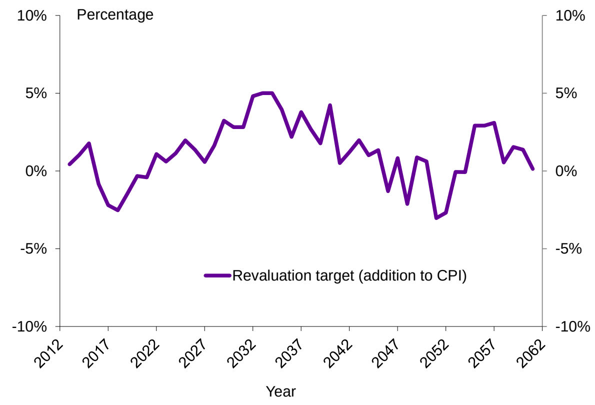
(c) New plan

2051	-2.4%
2052	-8.3%
2054	-0.4%
2058	-0.8%



(d) Bulk transfer

2052	-8.3%
2054	-0.5%
2058	-0.8%



Appendix F – Membership profile sensitivities (future scenario 2 – 'medium growth')

Membership scenarios

In Appendix D we provided a comparison of membership profiles (Charts 8), benefit outcomes (Charts 9) and lever behaviour (Charts 10) for our example CDC plan, between four membership scenarios over the period 1930 – 2012.

In this appendix, we repeat the analysis for an illustrative simulation of future financial market performance over the period 2013 – 2062. The particular simulation shown here reflects a 'medium growth' scenario for UK equities, drawn from the full range of stochastic projections generated by the Aon Asset Model. Our membership scenarios are:

(e) a stable profile where new entrants, retirements and deaths are in balance between 2013 and 2062;

(f) a closed membership profile with no new joiners[11] after 2013;

(g) a new plan opening in 2013 with no members, no liabilities and no assets. Members then join in the same way as in scenario (a), as set out in Appendix C;

(h) a plan receiving a large (fully funded) bulk transfer of active members in 2032, having developed with the same stable membership profile as scenario (a) up to that point. The bulk transfer broadly doubles the active population, comprising members aged 40 with individual accrued pensions approximately equal to the average pension across existing members of the plan at the point of transfer.

In each case, the plan operates a dynamic investment strategy, varying the equity allocation at the start of each year to preserve the risk exposure of members at each age.

The charts which follow demonstrate that the conclusions of Appendix D remain robust under this future simulation. Both the benefit outcomes – charts 15(a) to 15(d) – and the underlying lever behaviour – charts 16(a) to 16(d) – are strikingly consistent between the four membership profile scenarios considered.

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[11] To illustrate the actual benefit outcomes in Charts 5 and 6 in the main body of this paper, and Charts 15 and 16 in this appendix, we do include a very small number of new members (so that it is possible to generate output for the same range of retirement years as are used for the other scenarios).

Chart 14 – Membership profile and proportion of assets invested in equities (future scenario 2 – 'medium growth')

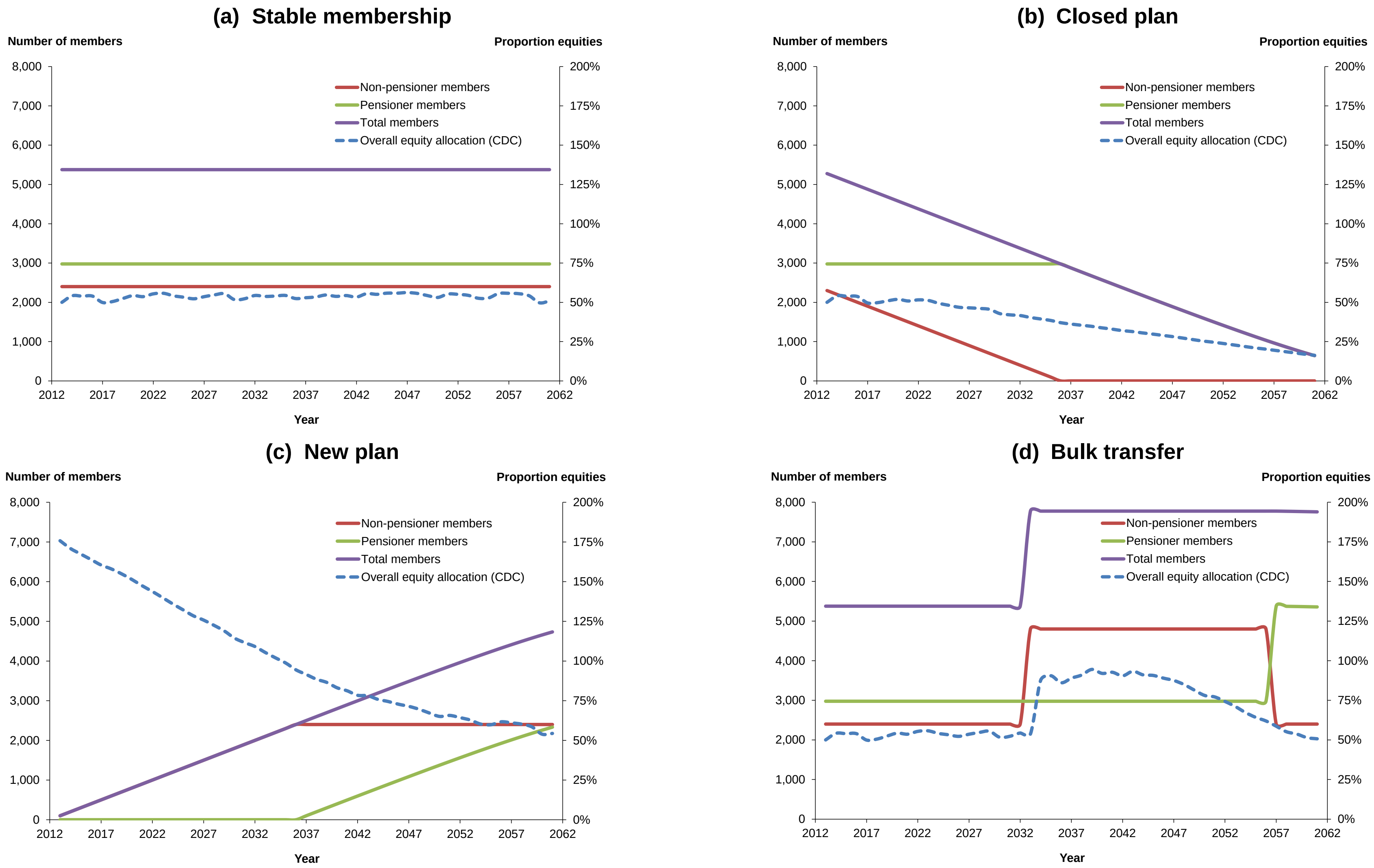
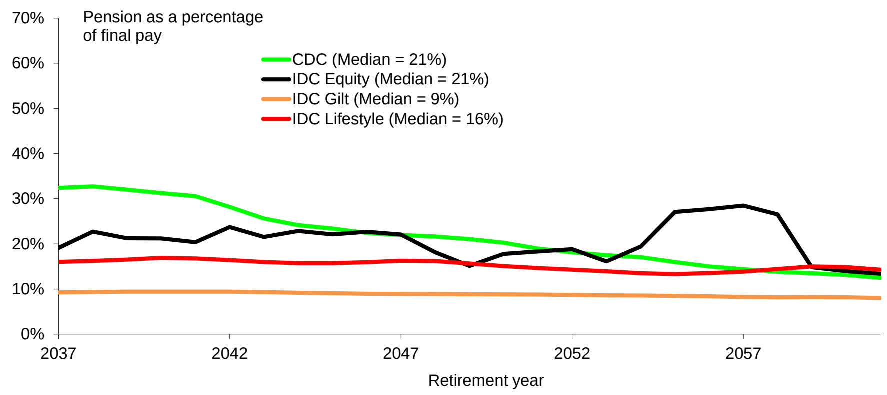
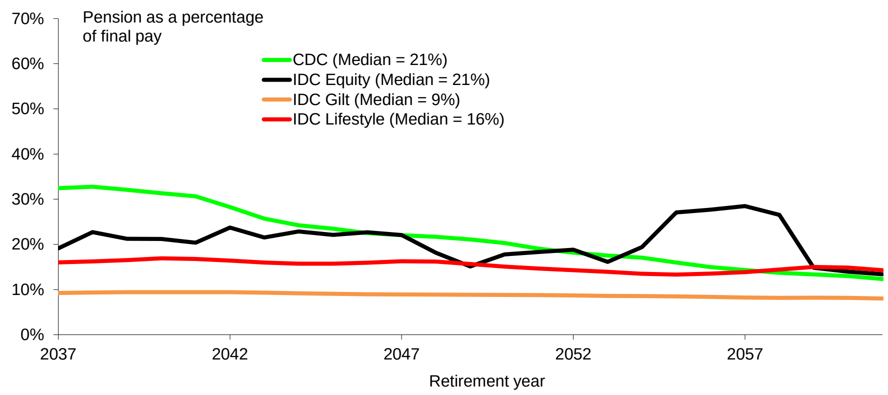


Chart 15 – Historic CDC and IDC outcomes (future scenario 2 – 'medium growth')

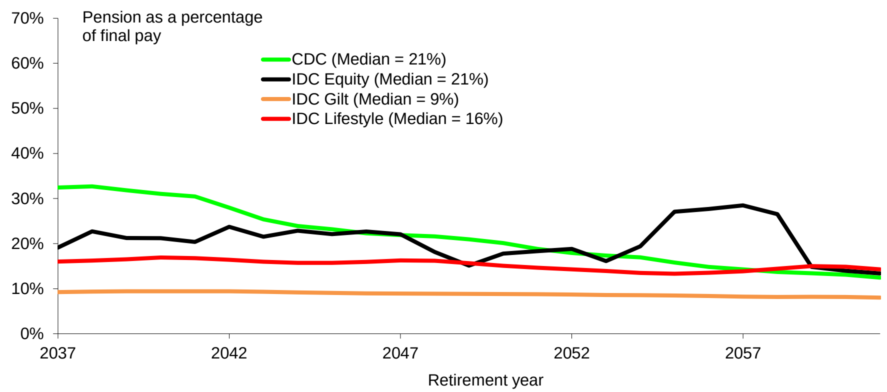
(a) Stable membership



(b) Closed plan



(c) New plan



(d) Bulk transfer

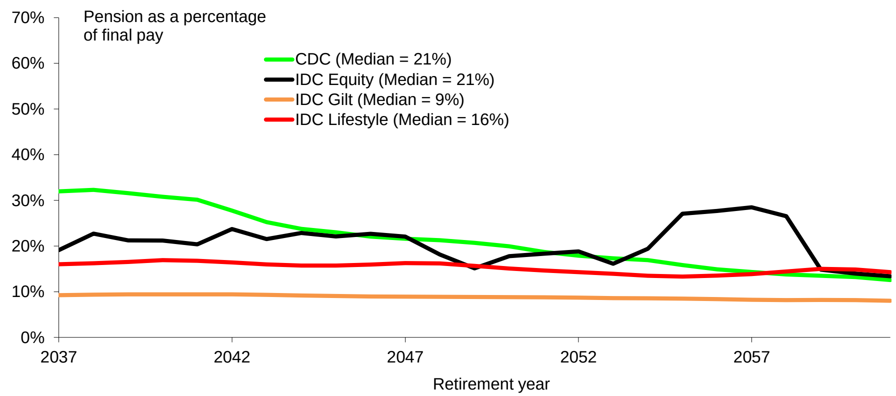
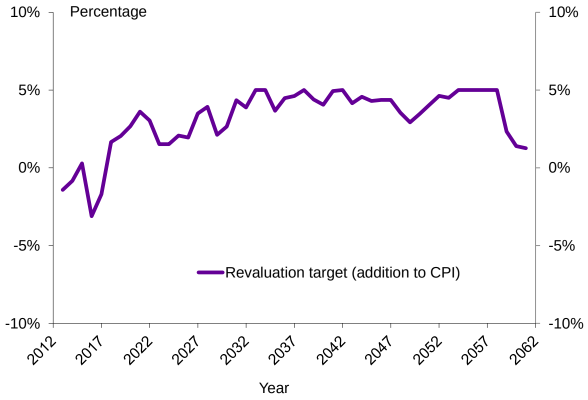


Chart 16 – Historic adjustment to benefits over time (future scenario 2 – 'medium growth')

(a) Stable membership

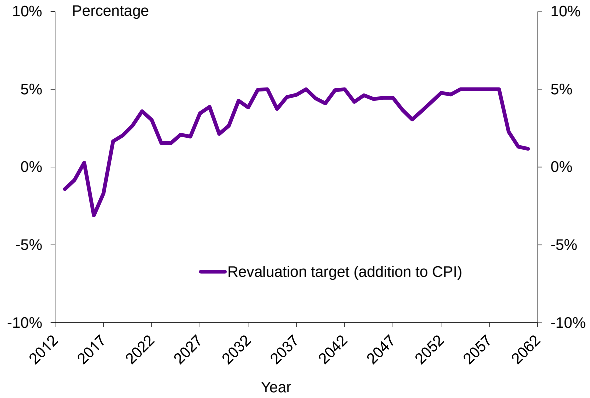
Year	Benefit adjustment (at age 76)
2016	-10.6%
2017	-1.0%
2033	+0.8%
2034	+1.4%
2038	+9.9%
2042	+9.3%
2054	+10.1%
2055	+21.6%
2056	+0.9%
2057	+2.7%
2058	+5.5%



Year	Benefit adjustment (at age 76)
2016	-9.0%
2017	-0.9%
2033	+2.2%

(b) Closed plan

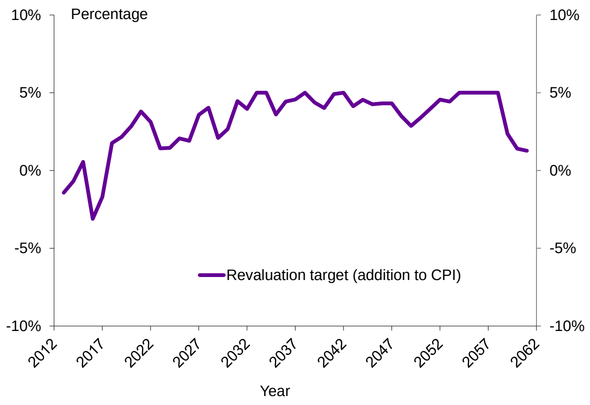
Year	Benefit adjustment (at age 76)
2016	-10.6%
2017	-1.0%
2034	+1.2%
2038	+10.0%
2042	+9.5%
2054	+11.6%
2055	+21.4%
2056	+1.0%
2057	+2.5%
2058	+4.6%



Year	Benefit adjustment (at age 76)
2016	-10.6%
2017	-1.0%
2033	+1.7%

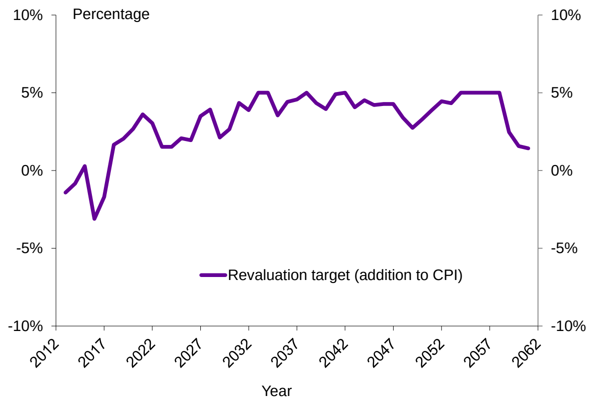
(c) New plan

2034	+1.3%
2038	+9.4%
2042	+9.0%
2054	+9.3%
2055	+21.5%
2056	+0.9%
2057	+2.7%
2058	+5.6%



(d) Bulk transfer

2034	+1.4%
2038	+9.7%
2042	+8.9%
2054	+7.8%
2055	+21.2%
2056	+0.7%
2057	+2.6%
2058	+5.6%



Appendix G – Membership profile sensitivities (future scenario 3 – 'high growth')

Membership scenarios

In Appendix D we provided a comparison of membership profiles (Charts 8), benefit outcomes (Charts 9) and lever behaviour (Charts 10) for our example CDC plan, between four membership scenarios over the period 1930 – 2012.

In this appendix, we repeat the analysis for an illustrative simulation of future financial market performance over the period 2013 – 2062. The particular simulation shown here reflects a 'high growth' scenario for UK equities, drawn from the full range of stochastic projections generated by the Aon Asset Model. Our membership scenarios are:

(i) a stable profile where new entrants, retirements and deaths are in balance between 2013 and 2062;

(j) a closed membership profile with no new joiners[12] after 2013;

(k) a new plan opening in 2013 with no members, no liabilities and no assets. Members then join in the same way as in scenario (a), as set out in Appendix C;

(l) a plan receiving a large (fully funded) bulk transfer of active members in 2032, having developed with the same stable membership profile as scenario (a) up to that point. The bulk transfer broadly doubles the active population, comprising members aged 40 with individual accrued pensions approximately equal to the average pension across existing members of the plan at the point of transfer.

In each case, the plan operates a dynamic investment strategy, varying the equity allocation at the start of each year to preserve the risk exposure of members at each age.

The charts which follow demonstrate that the conclusions of Appendix D remain robust under this future simulation. Both the benefit outcomes – charts 18(a) to 18(d) – and the underlying lever behaviour – charts 19(a) to 19(d) – are strikingly consistent between the four membership profile scenarios considered.

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[12] To illustrate the actual benefit outcomes in Charts 5 and 6 in the main body of this paper, and Charts 18 and 19 in this appendix, we do include a very small number of new members (so that it is possible to generate output for the same range of retirement years as are used for the other scenarios).

Chart 17 – Membership profile and proportion of assets invested in equities (future scenario 3 – 'high growth')

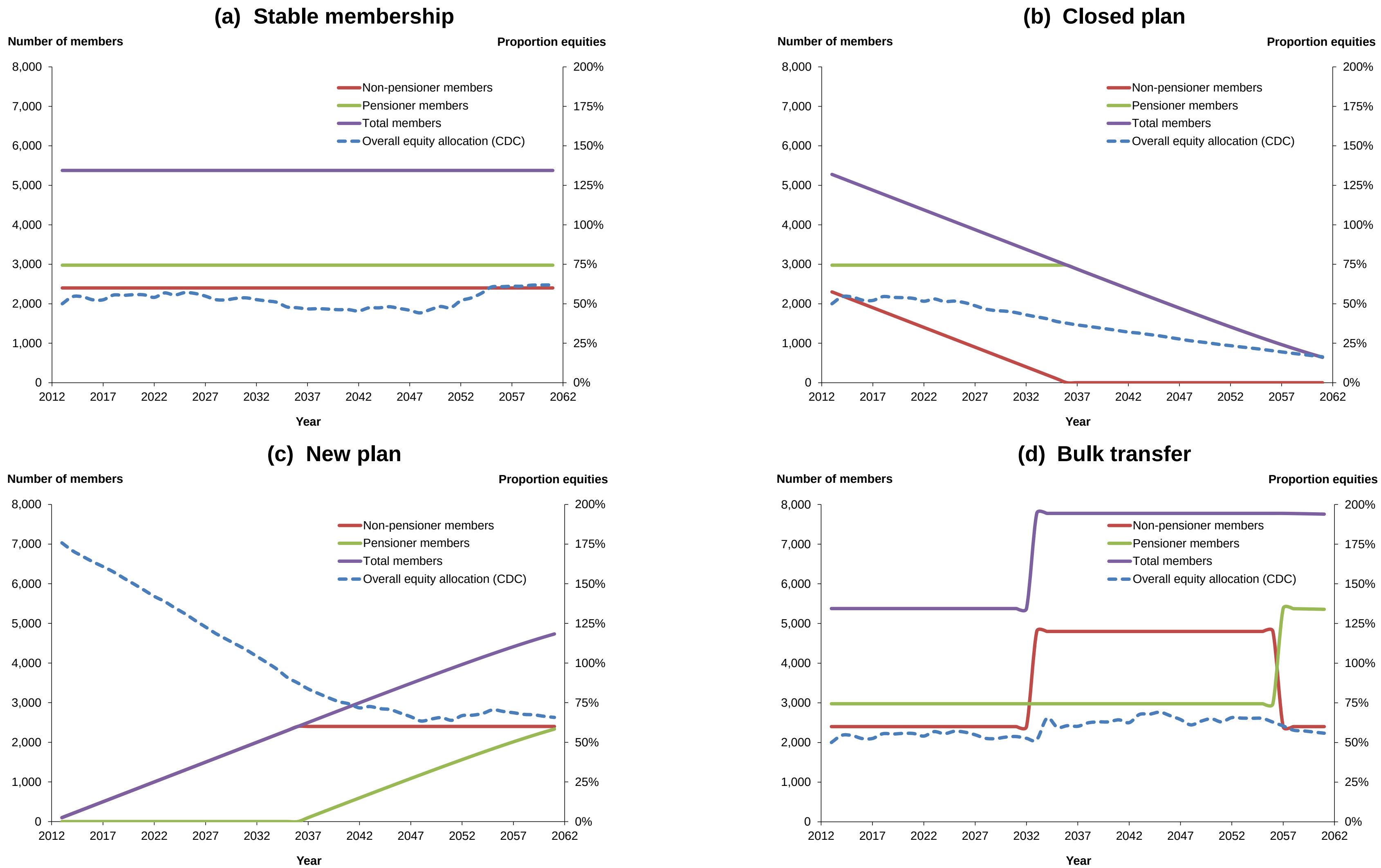
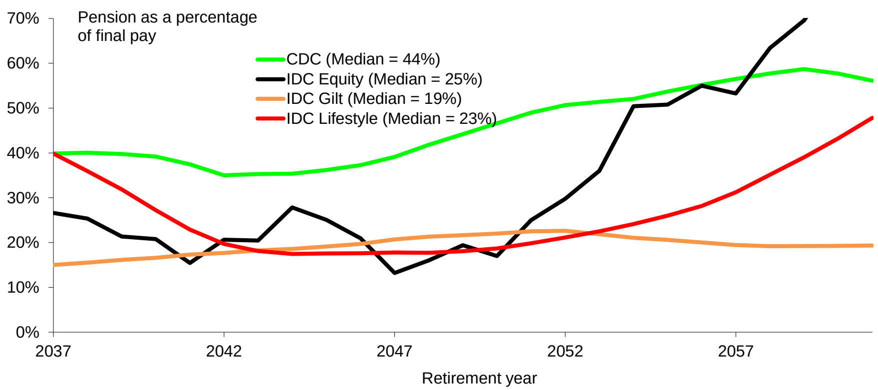
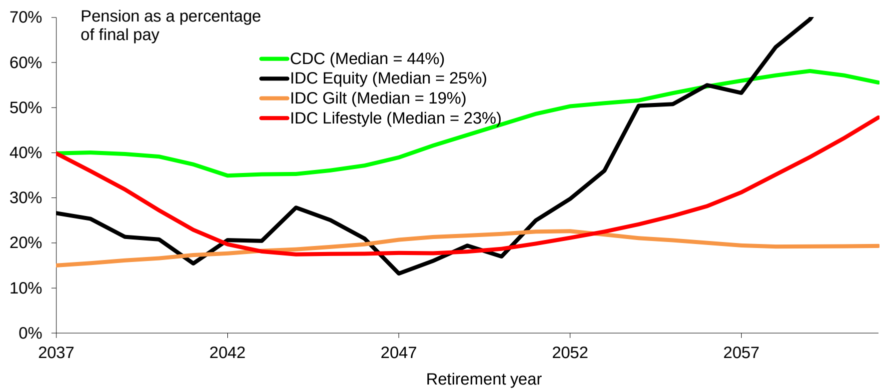


Chart 18 – Historic CDC and IDC outcomes (future scenario 3 – 'high growth')

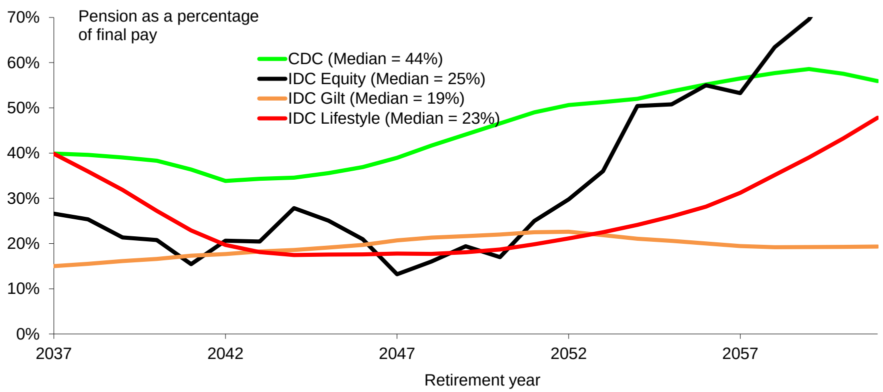
(a) Stable membership



(b) Closed plan



(c) New plan



(d) Bulk transfer

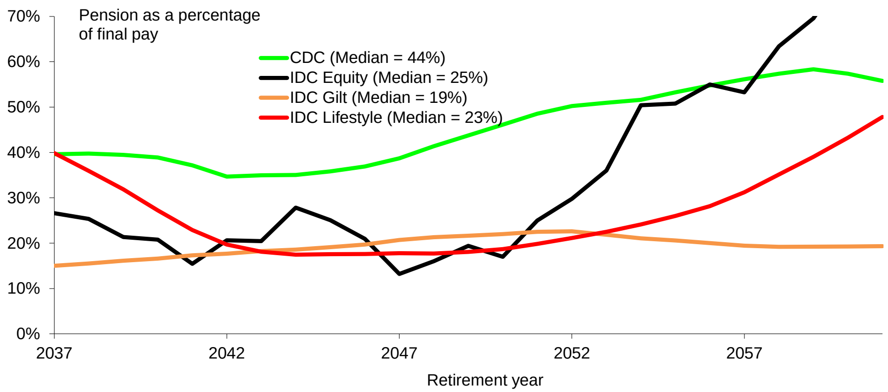
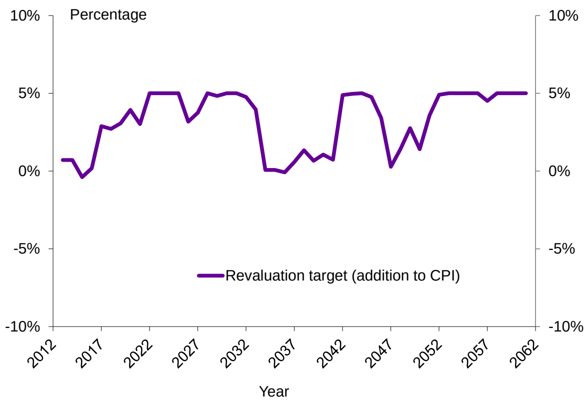


Chart 19 – Historic adjustment to benefits over time (future scenario 3 – 'high growth')

(a) Stable membership

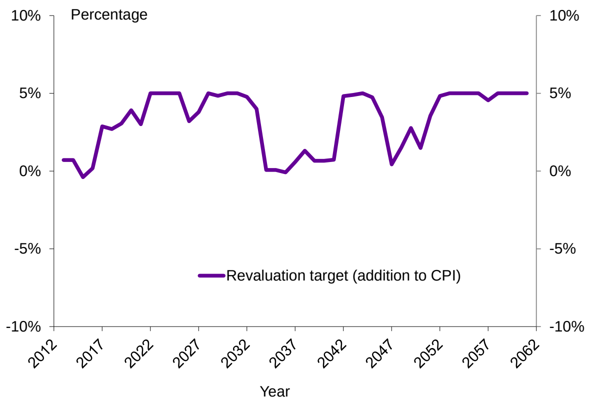
Year	Benefit adjustment (at age 76)
2022	+5.9%
2023	+0.4%
2024	+21.8%
2025	+13.1%
2028	+2.6%
2030	+11.3%
2034	-4.8%
2036	-9.1%
2037	-1.8%
2039	-5.7%
etc …	etc …



Year	Benefit adjustment (at age 76)
2022	+12.7%
2023	+0.5%
2024	+21.6%
2025	+12.9%
2028	+2.2%

(b) Closed plan

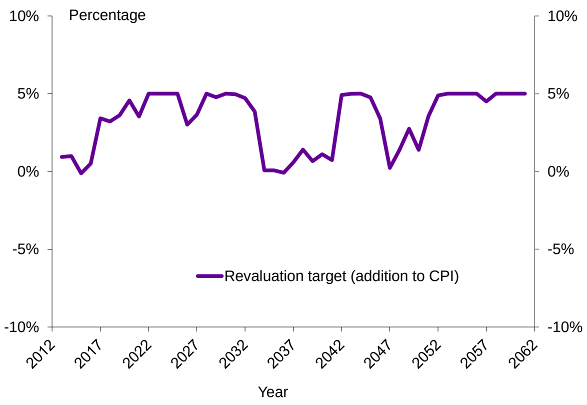
Year	Benefit adjustment (at age 76)
2022	+5.5%
2023	+0.4%
2024	+21.8%
2025	+13.1%
2028	+2.7%
2030	+11.4%
2034	-4.3%
2036	-9.2%
2037	-1.8%
2039	-5.8%
etc …	etc …



Year	Benefit adjustment (at age 76)
2022	+5.9%
2023	+0.4%
2024	+21.8%
2025	+13.1%
2028	+2.6%

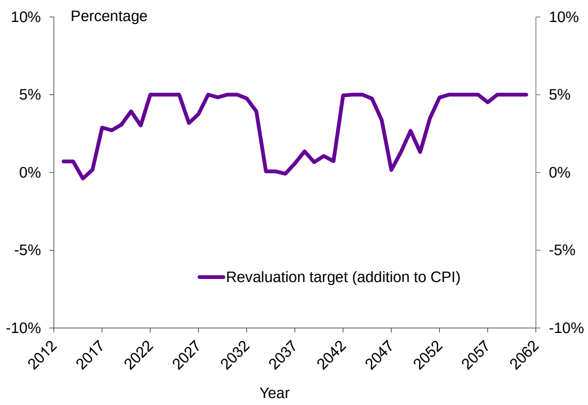
(c) New plan

2030	+10.7%
2034	-5.7%
2036	-9.1%
2037	-1.8%
2039	-5.5%
etc …	etc …



(d) Bulk transfer

2030	+11.3%
2034	-5.3%
2036	-9.2%
2037	-1.7%
2039	-5.7%
etc …	etc …



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Actions

Aon has carried out significant research into CDC plan designs and is actively consulting with the DWP on the implementation of CDC in the UK.

We are interested in hearing your thoughts on how pension provision should evolve in the UK. We would also relish the opportunity to talk to you about our work in the CDC arena, both to get your input into the subject and to continue to evolve our CDC template design.

If you would like to discuss any of the Government's proposals further, see further details of our research or would like more information, please speak to your usual consultant or one of the CDC team:

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