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UK state pension deferral incentives and sustainability

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Pay-as-you-go state pension schemes such as that operated in the United Kingdom face growing pressures from the rising old age dependency ratio and improvements to life expectancies.

Alongside compulsory increases in the statutory retirement age, governments have used incentives to encourage workers to postpone voluntarily their exit from employment, deferring their Basic State Pension in exchange for the additional financial reward of an enhanced pension at a later point in time. The impact of pension deferral upon the sustainability of the state pension system is dependent on the interplay of short term savings from payment delay and increased subsequent longer-term payments to pension recipients. This article presents a model that simulates the financial effect of deferral uptake on the National Insurance Fund over a forty year projection under alternative scenarios, including current and revised post-2016 deferral incentives. The findings indicate that the recent change in enhancement rate from 10.4 percent to 5.8 percent will significantly impact on state pension sustainability while still providing an incentive to defer. We estimate that any reduction below 4 percent would result in zero uptake of the deferral option, based on a rational financial choice.

Keywords UK state pension, retirement, deferral, enhancement, incentive

JEL Classification H55; J18

UK state pension deferral incentives and sustainability

I. Introduction

Like other OECD countries, the UK is facing the challenges of ensuring that the first pillar state pension system is both financially sustainable and socially just into the longer term. There have been widespread legislative changes to the state pension system to address these challenges, such as equalising the state retirement age for men and women, followed up with increases to the retirement age for both genders. Furthermore, within the UK's state pension scheme there is the option to defer drawing the pension for a period of time in return for additional subsequent financial reward. From the government's perspective, state pension deferral delays payments to individuals making that choice but can entail the cost of higher subsequent payments. This paper seeks to assess the extent to which the UK state pension deferral provisions can address the financial sustainability of state pension provision. A comparison is presented of the cumulative impact of recent changes to the generosity of the deferral options on the National Insurance Fund from which UK state pension payments are made.

The paper is organised as follows. In the next section, the pressures faced by state pension schemes and the responses of governments are reviewed. An exposition of the more recent developments to the UK state pension scheme is then presented with particular attention paid to the mechanisms for incentivising state pension deferral. A simulation model of the UK state pension deferral mechanism, its policies and the possible future impacts on the financial position of the NIF is then presented. A range of assumptions about deferral uptake are modelled and the implications of the results are evaluated with respect to Fund sustainability.

UK state pension deferral incentives and sustainability

II. Literature

Reforming the state pension

Pension reform in the UK has manifested in a variety of ways, and has been driven by a range of economic and political considerations (Gilbert, 2004; Hills, 2004). Many governments are confronting pension sustainability issues arising from declining support ratios, and thus fewer tax-payers; and increased life-expectancy (Hock and Weil, 2012; Lee, 2014; Blake and Mayhew, 2006), which translates into more retirees dependent on social insurance benefits for longer periods (Poterba, 2014). The UK state pension system is financed on a ‘pay-as-you-go’ basis where today’s benefits are paid for entirely with current payroll taxes. Since there is little accumulation of tangible financial assets, only politically determined entitlements, the cash flow demand created by pension payments may not be matched by inflows from payroll taxes, with resulting surpluses or shortfalls where demographic changes are significant. The UK state pension scheme finances benefits with contributions paid into the National Insurance Fund (NIF). As noted above, this mode of financing makes it vulnerable to demographic ageing. Government legislation has equalised the State Pension age (SPA) for men and women and raised the SPA in a staged and progressive manner (see the *Pension Acts of 1995, 2007 and 2011*). Whilst the NIF has historically remained in surplus, the future demands placed on it will increase despite the raising of the SPA. A five-yearly review of the NIF (Llanwarne, 2014) has predicted that the Fund will be exhausted at some point during the next two decades.

State pension deferral incentives can encourage later retirement from the workforce, helping to offset the demands placed on pension systems. However, depending on the generosity of the incentive and its uptake, pressures on public finances may be alleviated only in the short term by state pension deferral (Farrar et al, 2012). The trade-off between short-term savings and longer-term payments is not necessarily an equal one.

UK state pension deferral incentives and sustainability

Incentivising state pension deferral

The National Insurance Scheme has allowed participants to defer drawing their state pension and draw an enhanced pension at a later point in time. The extent of deferral uptake will clearly have a bearing on the Fund balance. Key questions for policy makers are whether an overall benefit, in terms of pension sustainability, is likely to arise from pension deferral uptake; whether the magnitude of any such benefit is significant; and which party obtains the net benefit and which bears any corresponding costs. Where an enhanced pension cash flow stream over-compensates the deferrer for pension payments foregone, an intergenerational transfer arises in which a negative payoff is borne by the subsequent generation of pension claimants.

The specific deferral provisions have varied over time as government has sought to allow an appropriate degree of compensation to the deferrer for the pension payments foregone. Disney and Smith (2002) modelled state pension deferral decisions using a simple two-period model applying a general utility function. They concluded that accruing a 7.5 percent increment for each year of deferral would be actuarially fair for an average woman although not for a man, given their respective life expectancies. The *Pensions Act 2004* introduced the choice of either receiving a taxable lump sum payment following deferral or drawing an enhanced state pension, with retirement increments increased from 7.4 percent to 10.4 percent for each year deferred from 2010 onwards. Farrar et al (2012) modelled the financial benefits of the UK's state pension deferral options, evaluating the options of receiving an enhanced pension with 10.4 percent enhancement increments or a lump-sum payment under a range of conditions. Taking into account the combined effect of the deferred pension enhancement rate, forecasts of increasing life expectancy projections and the real terms pension increases, a strong financial incentive to defer was found for both sexes but particularly for women. Similar conclusions were drawn for the UK system by Kanabar and Simmons (2016) in a life cycle setting that incorporated possible labour force participation.

UK state pension deferral incentives and sustainability

Comparable studies in the US by Shoven and Slavov (2014), Rose (2015), and Glickman and Hermes (2015) also established that it was actuarially advantageous to defer receipt of benefits even for individuals with significantly higher mortality rates than the average.

In view of the UK findings, coupled with the continual upward revision of life expectancies over time, the 10.4 percent enhancement rate certainly appears generous. A report by The Government's actuaries Department - GAD (2014) provided a wide range of potential 'fair rates' between 5.7 percent to 8.5 percent based on assumptions concerning life expectancy, gender, length of deferral period, rate of uprating on benefits, year of reaching SPA, and SPA in that year. Following this report, the enhancement rate decreased to 5.8 percent from 2016-17 (Gadd, 2015) while the lump-sum option was withdrawn.¹

The eventual future pension payments to individuals who defer under the revised provisions are lower in comparison to the previous provisions, implying a positive effect on NIF sustainability. However, in the short term the reduced attractiveness of the deferral provisions may result in lower uptake of the deferral option, increasing the short-term demands on the NIF. The size of both benefits and costs to the NIF and their interplay over time depends on the degree of uptake of the pension deferral options and other relevant parameters.

In the following section, we use a systems dynamics simulation model to assess the impact of recent changes in pension deferral incentives on the NIF under a range of alternative scenarios.

¹ One of the key reasons for the policy change to a less generous and more actuarially fair pension deferral incentive is the rise in life expectancy. To put the impact of rising life expectancy projections in context, the ONS estimated in their principal (main) projection that a man aged 65 in 2016 had a remaining life expectancy of 21.8 years and a woman aged 65 would survive for a further 24.4 years. For both genders, the projection indicated an increase in remaining life by 1.1-1.2 years to these figures for each decade beyond.

UK state pension deferral incentives and sustainability

III. Methodology: The state pension deferral system dynamics model

System dynamics is a quantified method first developed by Forrester (1958; 1961) that uses differential equations, to simulate the time-evolutionary behaviour of causally driven non-linear complex systems. Policy insights can be derived through testing scenario assumptions using a ‘what-if’ approach. Stock-flow diagrams are used to represent key accumulations or stocks and their inflows and outflows; stocks are dynamic in that their accumulations vary over time according to flow adjustments and may be decoupled by delays. Within the state pension deferral mechanism there are multiple accumulations and flows of people, and cash and information flows linking pension entitlements to people and payments. Non-linear relationships are associated with life expectancies and the time value of money, and there are inherent delays associated with deferral of pension drawings.

The system dynamics simulation model was constructed and parameterised using Ithink™ software to express the UK state pension deferral mechanism as a system of difference equations. The structure and equations within the model are informed by data drawn from five government sources, namely: legislative changes to the state pension age (SPA); policy incentive parameters for deferral choice; deferral uptake statistics; population dynamics; and life expectancy projections.

The assumptions parameterised within the model reflect recent data on deferral uptake (DWP, 2015a), which differ for men and women. The model simulates a forty-year period from 2016 to 2056 to test possible impacts on the National Insurance Fund (NIF) given a range of aggregate deferral decisions. It should be noted that the model aims to measure the effect of deferral on the NIF payment burden rather than its overall balance, which will also depend on the flow of contributions into the Fund; effectively these are assumed to be invariant to the changes made in deferral incentives.

UK state pension deferral incentives and sustainability

A stock-flow diagram representing the state pension deferral mechanism is outlined in Figure 1.

INSERT FIGURE 1 ABOUT HERE

Stocks within the model represent accumulations time of funds or persons, as determined by relevant dynamic flows over time. At any point in time, a stock has a value determined by its initial value plus the sum of the net flows in each time period to date:

$$Stock(t) = \int_0^t [inflow(t) - outflow(t)]dt + stock(0)$$

Stocks that represent time spent in a particular state such as the periods of pension deferral and pension claiming are characterised by a delay D between inflow and outflow. During this period, mortality at a rate m will reduce the outflow such that:

$$Outflow(t) = inflow(t-D)e^{-mD}$$

The mortality rates parameterised within the model are time-specific and gender-specific.

The stock representing the cumulative impact on the NIF is the sum of the series of payment flows over the simulation period:

$$Cumulative\ impact\ on\ NIF(t) = \int_0^t [state\ pension\ payment(t)]dt$$

As shown in Figure 1, the stock-flow ageing chain is structured and parameterised to reflect the retirement population changes, impact of increases to the SPA, uprating of state pension payments and differing levels of deferral incentive 40 years into the future from the starting point of April 2016. The choice either to draw the state pension immediately at SPA, or to defer drawing the pension results in two distinct stocks or accumulations beyond SPA. Dynamic representations

UK state pension deferral incentives and sustainability

of mortality are built into each stock as a drain on the numbers of people accumulated there using Office for National Statistics (ONS) cohort mortality projection data². State pension payments are determined by the accumulations of people drawing the Basic State Pension (BSP) and enhanced pensions.

Moving from left to right through Figure 1, the detailed structure represents the flow of male retirees into SPA and beyond (the stock-flow structure is identical for men and women but with differing assumptions about the age starting point). The flow of individuals into the ‘pre-retirement age’ stock is parameterised with time series data derived from ONS UK population projections to cover the simulation duration period³.

At the starting point in 2016, men reach SPA at age 65 and women at age 63. The SPA for both sexes will be equalised by 2018 under the *Pensions Act 2011*, with further phased future increases to 66 years from 2020, rising to 67 between 2026 and 2028, and 68 between 2044 and 2046. Measures for the further phased SPA increase for both sexes are parameterised as incremental dwell time in the pre-retirement stock in steps of one, two and three years at appropriate points. The proportion of those at pre-retirement age who will not survive to SPA is reflected in the pre-pension mortality flow. Those surviving will then move to either the ‘deferring pension’ stock or the ‘drawing pension’ stock, determined by the proportion deferring the pension.

Assumptions are necessary at this point concerning the degree of uptake of the deferral option. The rational choice to defer is parameterised in the model using a time series of binary values, derived exogenously from a comparison of the breakeven post-deferral survival period at which deferral is worthwhile and differing life expectancy projections over time. We assume that individuals are rational and their choice to defer will reflect the financial attractiveness, or

² Historic and Projected Mortality Rates (qx) from the 2010-based UK Life Tables: 1951-2060 (see <http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcn%3A77-257453>), Published 2012.

³ 2012-based National Population Projections, Published 2014 (see <http://www.ons.gov.uk/ons/taxonomy/index.html?nscl=Population+Projections>).

UK state pension deferral incentives and sustainability

otherwise, of the strategy: if the enhanced pension value created by deferral does not compensate the individual for the loss of the payments that could have been claimed over the deferral period, no-one will choose to defer. Following the approach of Farrar et al (2012), the values of the deferred and enhanced pension streams can be derived, with the weekly pension receipt stream being approximated as a continuous flow. Pension receipts are assumed to grow at a rate g over the deferral period and the post-deferral pension claiming period. The amount of a deferred pension receipt arising at time t , P_t , will be $P_t = P_0 e^{gt}$ where P_0 is the value of a before-tax pension receipt at the start of deferral. The foregone amounts during the deferral period, D , have an associated opportunity cost i , assumed to be a representative savings investment rate with no associated personal tax liability on the interest earned. The pension receipts are assumed to be taxable at the individual's marginal tax rate T , assumed constant over time. Thus at the end of a period of deferral, the after-tax value of the deferred pension receipt will be $P_t e^{i(D-t)}(1-T)$ where D is the deferral period. Since $P_t e^{i(D-t)} = P_0 e^{iD} e^{(g-i)t}$, the value V_F of the foregone pension receipt stream at the end of deferral is $P_0 e^{iD} (1-T) \int_0^D e^{(g-i)t} dt$.

At the end of the deferral period, the non-enhanced pension receipt will be $P_0 e^{gD}$. Denoting the enhancement rate as r , the additional value resulting from deferral will be $rDP_0 e^{gD}$ and the present value of an enhanced receipt at time t will be $rDP_0 e^{gD} e^{(g-i)t}$. Thus, the value V_E of the total after-tax enhanced pension stream (assuming i and g are constant and $i \neq g$) is:

$$V_E = rn_d P_0 e^{gD} (1-T) \int_0^n e^{(g-i)t} dt$$

where n is the number of years of survival after the end of the deferral period.

UK state pension deferral incentives and sustainability

The deferral decision will be rational if $V_E > V_F$, with the breakeven survival period being the value of n at which $V_E = V_F$.

Assuming a personal savings rate of 1.4 percent⁴, a personal marginal tax rate of 20 percent⁵ and a rate of pension growth of 3.3 percent⁶, breakeven survival periods are calculated for different assumed enhancement rates and deferral periods and compared with future year-specific cohort life expectancies. Under these assumptions we find that where the enhancement rate is 10.4 percent or 5.8 percent, there is a rational case for individuals of both sexes to defer under all life expectancy projections and all deferral periods modelled (two, four or six years); at a rate of 5.0 percent, the same is true for almost all combinations of these parameters. In contrast, if the enhancement rate is 3.0 percent or below, the analysis indicates no rational case for deferral for any combination of gender, deferral period or life expectancy projection throughout the simulation time period. At an enhancement rate of 4.0 percent deferral is found to be worthwhile for some cohorts but not others, depending on the specific combination of parameters (state pension age, gender, deferral period and life expectancy) modelled, and therefore this enhancement rate may be regarded as approximating a minimum feasible policy value to incentivise deferral. Hence, to gain insights into the impact of rational deferral choices on the NIF, we examine scenarios with as assumed enhancement rate of 4.0 percent in addition to the 10.4 percent and 5.8 percent rates that have been applied in practice.

Deferral uptake is assumed to be zero in scenarios where the breakeven survival period exceeds life expectancy. Where deferral is financially worthwhile in a given year (life expectancy exceeds the breakeven survival period) a proportion of individuals will choose to do so, but not all.

⁴ Derived from the *Average annual yield from British Government Securities, 10 year Nominal Par Yield* (from <http://www.bankofengland.co.uk/boeapps/iadb/index.asp?Travel=NIXIRx&levels=1&XNotes=Y&C=DUS&G0Xtop.x=51&G0Xtop.y=7&XNotes2=Y&Nodes=X41514X41515X41516X41517X55047X76909X4051X4052X4128X33880X4053X4058&SectionRequired=I&HideNums=-1&ExtraInfo=true#BM>)

⁵ This is the marginal tax rate faced by the majority of UK taxpayers (*Number of individual income taxpayers by marginal rate, gender and age, 1990-91 to 2016-17*, from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/616435/Table_2.1.pdf)

⁶ Derived from *estimated earnings growth forecasts*, *Office for Budget Responsibility: Economic and fiscal outlook, Cm9212, 2016* (<http://cdn.budgetresponsibility.org.uk/March2016EFO.pdf>).

UK state pension deferral incentives and sustainability

This proportion is set at 2.83 percent for men and 5.70 percent for women, based on recent estimations of deferrers selecting an enhanced pension at the time when the enhancement rate of 10.4 percent applied (see DWP, 2015a) which provided a clear financial incentive to defer; the low uptake even with this incentive is assumed to be determined by individuals' consumption preference and other unknown aspects of utility which are assumed to remain invariant for differing financial incentives.

The dwell time in the 'drawing pension' stock represents the non-deferrers' remaining lifespan, parameterised using ONS cohort life expectancy projections⁷. For those 'deferring pension', dwell time is governed by the pension deferral period which not all will survive. Those surviving the deferral period then move to the 'ex pension deferrers drawing enhanced pension' stock with the dwell time there being determined again by ONS projections.

Turning to the state pension payments, the total payment flow is categorised into two streams: payments to recipients who did not defer before drawing the state pension ('drawing pension' stock) and enhanced payments to recipients who deferred then drew the enhanced pension ('ex pension deferrers drawing enhanced pension'). The total 'state pension payments' flow incorporates the non-enhanced and enhanced pension payment streams as determined by the number of recipients of each type of payment and the assumed enhancement multiplier value and deferral period.

The parameterisation of the state pension payment stream in terms of the initial amount, indexation over time, and appropriate discount rate follows the approach of GAD's Quinquennial Review (Llanwarne, 2014). The initial (non-indexed) annual state pension payment is set at

⁷ The projections are derived from the 2012-based Historic and projected expectations of life (ex) from the 2012-based life tables: Principal projection (ONS, 2014), available at <http://ons.gov.uk/ons/taxonomy/index.html?nscl=Life+Expectancies>.

UK state pension deferral incentives and sustainability

£7,670⁸ with subsequent increases determined by an indexing factor based on upratings in line with the triple lock policy each year, assuming projected annual earnings growth figures taken from Economic and Fiscal Outlook data (EFO2015)⁹. Following the assumption of Llanwarne (2014), the discount rate is set at 3.15 percent in nominal terms, representing a proxy for the long-term index-linked investment return needed to make projections of the balance of the National Insurance Fund. The enhancement multiplier, reflecting the rate of increase in the state pension for deferrers, was parameterised for comparison purposes with rates of 10.4 percent, 5.8 percent or 4 percent, as described above.

The impact of state pension deferral decisions on the NIF is simulated under three scenarios reflecting principal, low and high life expectancy, using data from the respective ONS (2014) projections. Each scenario encompasses deferral periods of two, four and six years for both men and women, reflecting a reasonable range of assumptions¹⁰. The cumulative difference in the total present value of payments to both male and female recipients under each scenario, compared with the corresponding no-deferral case, is derived by comparison of the outputs from the system dynamics model and represented graphically.

⁸ This figure is derived from Llanwarne's assumptions that the new State Pension will be set at £155.25 per week in 2016 in nominal terms and that the long-run average level of entitlement to this amount will be 95%. Complexities in the estimation of average entitlement arise from, for example, adjustments relating to participation in contracted-out occupational pension schemes. The extent to which these adjustments may impact on the post-2016 average state pension payment is not quantifiable at present based on any publicly available information.

⁹ <http://budgetresponsibility.org.uk/economic-fiscal-outlook-july-2015/>.

¹⁰ The range of assumed deferral periods chosen for this analysis is informed by data reported in the Freedom of Information Request – 2773/2011 which indicates that for both men and women an average deferral period is between three and four years.

UK state pension deferral incentives and sustainability

IV. Results

Scenario 1: Principal life expectancy based projections

The first scenario simulated is informed by the most likely of the ONS life expectancy projections – the principal (main) projection, where modest improvements to life expectancy are assumed.

Graphical presentation of the outputs for each scenario is presented in Figures 2a-3c. Similarities can be seen in the trajectories across gender, deferral period and uptake and the higher enhancement rate assumptions but not for the lower rates.

INSERT FIGURES 2a-3c ABOUT HERE

As the deferral period increases, the cumulative saving curve at the 5.8 percent and 10.4 percent pushes upwards over time with the cumulative saving being much greater for women than men, reflecting the higher female deferral uptake and longer female life expectancy. It can be seen that where the pre-2016 provision of 10.4 percent enhancement rate is assumed, the cumulative savings curve eventually becomes negative in each of Figures 2a-3c. The interpretation here is that the total present value of the future pension payment stream will be greater than it would have been if no deferral had occurred, and this is so for both men and women. The observation is clearly consistent with the perception that the previous policy of using a 10.4 percent enhancement rate was generous to the deferrer. From a government perspective, the initial savings to the NIF from reduced pension payments made as a consequence of deferral are more than offset by the impact of consequently higher pension payments.

Where a 5.8 percent enhancement rate is assumed as per the revised post 2016 provision, the cumulative savings curve closely follows the corresponding curve for the 10.4 percent rate assumption over the early years of the simulation until around the mid-2020s. This similarity arises partly as a result of zero pension payments being made to deferrers over the actual deferral period,

UK state pension deferral incentives and sustainability

regardless of the eventual amount they will be paid following deferral, and partly because the curves represent cumulative amounts that do not differ significantly between simulations until a longer term horizon is reached. From the mid-2020s onwards it can be seen that the trajectories for the 5.8 percent and 10.8 percent enhancement rates diverge radically, indicating substantially higher savings to the NIF under the revised provision.

An interesting difference in the shape of the curves can be seen when comparing the trajectories for men (Figures 2a-2c) with the corresponding ones for women (Figures 3a-3c). In each of the assumed deferral periods, the female trajectories suggest that cumulative savings from deferral will still eventually become negative even at the reduced 5.8 percent enhancement rate, with turning points in the trajectories event from the mid-simulation period. In the two year deferral case this does in fact occur at the end point of the simulation. In contrast, for men, the cumulative savings curves remain clearly positive throughout the simulation period. This suggests that for women, but not for men, the revised 5.8 percent rate may still represent a generous compensation for the pension payments foregone during deferral.

Where a lower enhancement rate of 4.0 percent is assumed some interesting dynamics are displayed. Taking the case of men deferring for two years (Figure 2a) the cumulative savings to the NIF are positive and grow throughout the simulation period, whereas, for four and six year deferral (Figures 2b and 2c) take up is zero reflecting the rational choice not to defer. For women, we see a similar pattern for two year deferral (Figure 3a). In contrast, where women choose to defer for four years (Figure 3b) the Fund runs a small consistent saving up to around 2036 followed by a strong increase. This pattern reflects increasing attractiveness and uptake of deferral, as the increase in women's life expectancy more than offsets the planned step increases in SRA in the first two decades of the simulation run. Deferring for six years (Figure 3c) is worthwhile for women towards the end of the simulation period in the 2050s but deferral uptake is very low up to that point.

UK state pension deferral incentives and sustainability

In summary, it can be seen that across Figures 2a-3c the cumulative savings are variable with trajectories sensitive to both enhancement rate modifications and deferral period assumptions. Unsurprisingly, the degree of uptake of deferral is a principal determinant of the impact of the deferral provisions on the NIF.

Scenario 2: Low life expectancy variant projections

The second scenario is informed by the ONS's low life expectancy projections, where slight improvements to life expectancy over time are assumed.

Broadly, the same features can be observed that were described for the principal projection where the enhancement rate is applied at 5.8 and 10.4 percent. From Figures 4a to 5c it is evident that the cumulative savings to the NIF for women are greater than those for men, consistent with Figures 2a-3c. In addition, the trajectories for these enhancement rates are similar to those of the principal projections over approximately the first twenty years of the simulation period. This reflects the choice of starting point in the simulation model where individuals are at SPA in 2016 and therefore the impact of mortality is very low over this initial period. Over the latter half of the simulation period, the aging of the cohorts that previously entered SPA becomes more significant, with the consequence that mortality rates are higher and the impact of life expectancy assumptions becomes more important. The curves in each of the graphs for 5.8 and 10.4 percent shift slightly upwards compared to the corresponding principal projections, with the divergence slightly increasing as the deferral period becomes longer. This difference in savings is determined mainly by the lower cost of servicing the enhanced pension payment commitment and also by the greater number of deferrers not surviving the deferral period.

UK state pension deferral incentives and sustainability

Where a 4.0 percent enhancement rate is considered, as with Figures 2a. to 3c, the trajectories are very different. For men (Figures 4a. to 4c.) the impact on the NIF is zero as there is no rational case for deferral across all deferral periods. With regard to women (Figures 5a. to 5c.), since deferral is worthwhile only in the early part of the time period modelled and then only for two or four years, the impact of these choices on the Fund is very minimal. Throughout most of the simulation period the rational choice is not to defer as the phased increases in SPA grow at a faster rate than life expectancy.

INSERT FIGURES 4a-5c ABOUT HERE

Scenario 3: High life expectancy variant projections

The third scenario simulated is informed by the ONS's high life expectancy projections, where more significant improvements to life expectancy are assumed.

Again, the high life expectancy scenarios shown in Figures 6a to 7c follow a broadly consistent pattern to those of the principal and low life expectancy projections where the 5.8 and 10.4 percent enhancement rates are assumed, particularly in the first half of the simulation period. Turning points later in the simulation trajectories are observed for both men and women. However, it is noticeable that the trajectories for men show a downward movement in savings on the curves in the later part of the simulation runs. This indicates that the cost of servicing the enhanced pension payments is more significant, relative to the initial deferral savings achieved, in comparison to the other life expectancy scenarios.

Where the 4.0% enhancement rate is assumed, two year deferral is rational for men throughout the course of the simulation. At later points in the simulation deferral for longer periods

UK state pension deferral incentives and sustainability

is also rational as a result of increasing life expectancy: for example, by 2038 deferral is worthwhile even for six years. For the case of women, deferral is appropriate under all conditions throughout the simulation time.

INSERT FIGURES 6a-7c ABOUT HERE

Summary of simulation results

Across the scenarios modelled, some interesting patterns appear. Under all assumptions made, the 10.4 percent enhancement rate is associated with a long-term cumulative cost to the NIF. When comparing the impact of differing deferral incentives it can be seen that the policy change from an enhancement rate of 10.4 percent to one of 5.8 percent will strongly affect the long term cumulative saving, or cost, to the NIF as a result of deferral, assuming uptake of the option remains unchanged at current levels. In the shorter term, by contrast, the difference will be relatively small. The impact of changing life expectancy assumptions becomes significant over the later part of the time period simulated, in particular in the case of men where low life expectancy is combined with a long deferral period, as would be expected.

A clear difference is shown between the male and corresponding female trajectories. For both sexes a 10.4 percent enhancement rate leads eventually to a net cost to the NIF, although this cost is much more significant for women. Under the 5.8 percent enhancement rate, for men, the cumulative savings curve approximates to a steady state after about 30 years except in the case of six year deferral combined with low life expectancy, where the cumulative savings continue to rise over the simulation period. By contrast for women, in all simulation runs the cumulative savings curves eventually peak and then start to fall, including all cases with a 5.8 percent enhancement rate assumption.

UK state pension deferral incentives and sustainability

Where a 4.0 percent hypothetical enhancement rate is applied, a wider range of trajectories is illustrated reflecting the variability in rational deferral choice across the scenarios modelled. For women, the rational choice to defer is present throughout most of the simulation runs, whereas with men deferral is a rational choice only where higher life expectancy and shorter deferral periods are assumed.

Figure 8a illustrates the magnitude of the difference in the total present value of cumulative savings to the NIF, arising as a result of the revised enhancement incentive, up to the simulation horizon in 2056. Figure 8b shows the corresponding impact that would have resulted from a change to a 4.0 percent enhancement rate.

INSERT FIGURES 8a-8b ABOUT HERE

The final values of the scenario simulation runs are dependent on the simulation endpoint of 2056 which is chosen somewhat arbitrarily, but they are indicative of the direction of the long-term impact of pension deferral in relation to specific factors.

It can be seen from Figure 8a that in all cases there is a significant financial benefit to the NIF arising from the switch to a lower enhancement rate. The saving is more substantial in simulations where the assumed pension deferral period is longer (and enhanced pension payments are therefore greater); where assumed life expectancy is longer (reflecting the longer series of expected pension payments in each case). The savings relating to women are greater in comparison to men, due to higher pension deferral uptake among women and longer female life expectancy in each of the ONS projections.

By contrast, if the enhancement rate were to have been reduced to 4.0 percent (Figure 8b) it can be observed that the savings would be much lower where the low life expectancy scenario is assumed, particularly with respect to men, and much greater with high life expectancy, especially in

UK state pension deferral incentives and sustainability

relation to women. In the high life expectancy scenario, as in Figure 8a, a clear relationship can be seen between the length of deferral period and the saving to the NIF. For the other scenarios the pattern is less clear, reflecting the variable uptake of the deferral option over time.

The case that corresponds most closely to real world data assumes the ONS principal life expectancy projection and a deferral period of four years on reaching SPA. Figure 8a shows that the combined total cumulative saving for both men and women up to the 2056 simulation horizon is approximately £25.0bn, assuming that deferral uptake remains unchanged at its 2016 level. The comparable result in Figure 8b is not significantly different at approximately £25.7bn, although there is much greater variability across the life expectancy projections. To contextualise these figures, spending on the Basic State Pension in 2014-15 was £67 billion representing 3.7 percent of GDP (DWP, 2015b). Hence, although the impact of state pension deferral on the National Insurance Fund is relatively small in absolute terms, the cumulative savings are significant over the 40 year simulation period.

V. Conclusion

Incentivising the deferral of retirement can be viewed both as a government response to the sustainability of state pension provision and as a measure that enables people to exercise a level of control over their retirement planning. This paper has assessed the impact of the uptake of UK state pension deferral options on the burden of state pension provision, as represented by its impact on the National Insurance Fund using a system dynamics simulation model of the UK Basic State Pension deferral system that models the current provisions, the revised incentive that applies from April 2016 and an alternative value that approximates the minimum feasible incentive.

UK state pension deferral incentives and sustainability

With respect to the role of pension deferral in helping to achieve state pension sustainability, it is evident that under the existing deferral enhancement provisions where a 10.4 percent annual enhancement rate is available for each year of deferral, the financial impact on the NIF is negative in the longer term in all cases simulated in our analysis, reflecting the generosity of this recently discontinued enhancement rate. Short term savings to the government (reflecting the pension payments foregone by deferrers) are followed by generous enhanced payments that benefit deferrers but represent greater longer term costs to the government (and hence to later generations of pension claimants, assuming the source fund is not unlimited). This implies a rolling intergenerational transfer of pension obligations with the burden always falling on future generations.

Our analysis shows that, under the assumptions made, the impact of this on the NIF will clearly be mitigated by modifying the enhancement rate to one which does not over-compensate the deferrer. Under all simulations modelled, we find an incentive to defer in all time periods where the enhancement rate is 10.4 percent or 5.8 percent. Reduction to 4.0 percent results in a variable picture where specific life expectancy scenarios lead to very different financial outcomes. Our analysis indicates that substantial savings will be made to the Fund, at least in the short to medium term, where the enhancement rate offered is sufficient to provide a financial incentive to defer. Under differing life expectancy projections, it is clear that longer life expectancy is associated with greater savings as a result of the policy change from an enhancement rate of 10.4 percent to one of 5.8 percent, and additional savings would result at a rate of 4.0 percent. This is particularly true in relation to women. From a policy perspective, our analysis suggests that a slightly lower incentive than the recently revised 5.8 percent would still be acceptable to many individuals approaching retirement while still aiding the long-term viability of the NIF. Within our analysis we have not attempted to model behavioural changes in response to differing deferral incentives, other than the rational financial choice, and any associated incremental changes in the total contributions to the National Insurance Fund. These may be significant, depending on the numbers of older workers

UK state pension deferral incentives and sustainability

remaining longer in the workforce¹¹. Further investigation could be conducted into this aspect when empirical data on the uptake response to the recent changes becomes available.

From the individual perspective, pension deferral can be a rational choice in that the financial benefits may exceed the costs, depending on factors such as remaining life expectancy, the existence and extent of any substitute sources of income, the individual's marginal tax rates in work and in retirement and their personal consumption preference. The relaxation of restrictions on the use of personal or occupational pension funds and the enforcement of anti-age discrimination in employment opportunities facilitate the uptake of alternative sources of income in later life. In this context, state pension deferral can help enable individuals to create their optimal overall retirement income strategy without contributing to an excessive financial burden to future generations.

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¹¹ Employers of individuals past state pension age, but not the individuals themselves, are still required to make contributions.

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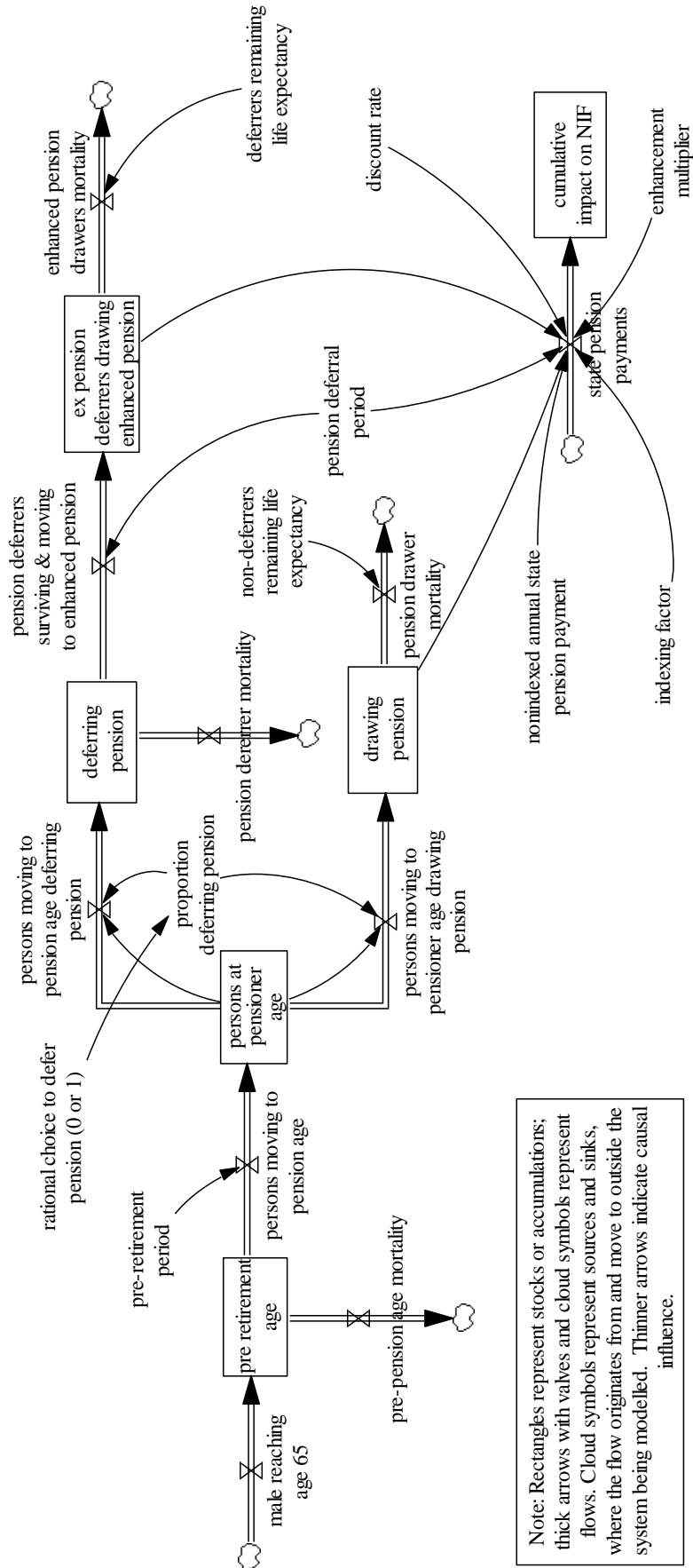


Fig. 1. Stock-flow diagram of the state pension deferral mechanism

UK state pension deferral incentives and sustainability

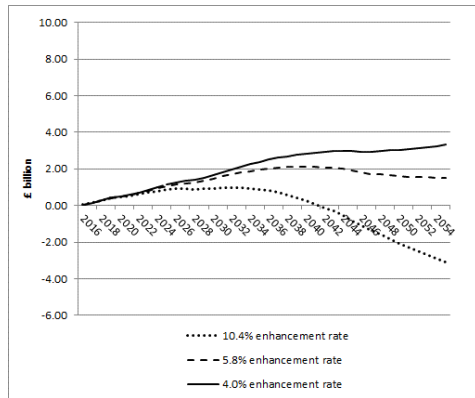


Figure 2a: Two Year Deferral

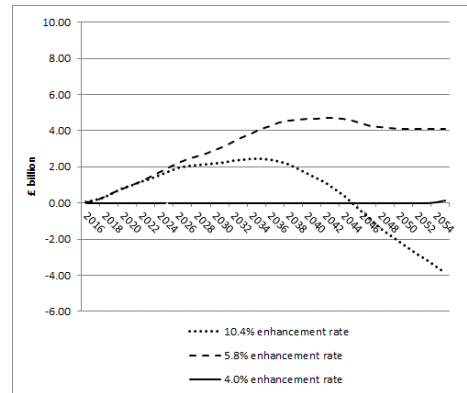


Figure 2b: Four Year Deferral

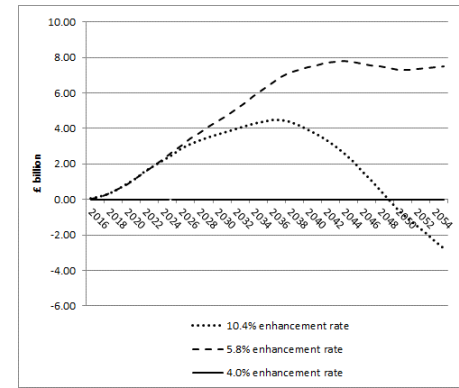


Figure 2c: Six Year Deferral

Figure 2a-2c. Male principal life expectancy projection vs cumulative savings to the NIF

UK state pension deferral incentives and sustainability

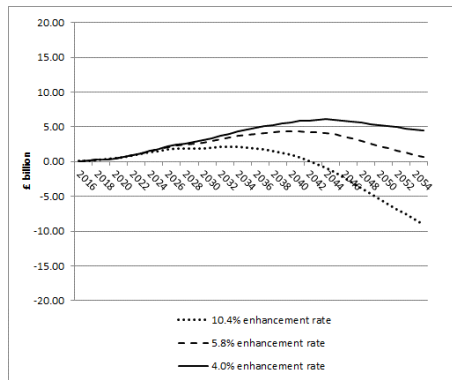


Figure 3a: Two Year Deferral

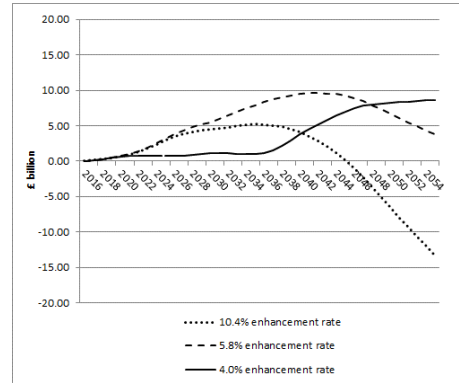


Figure 3b: Four Year Deferral

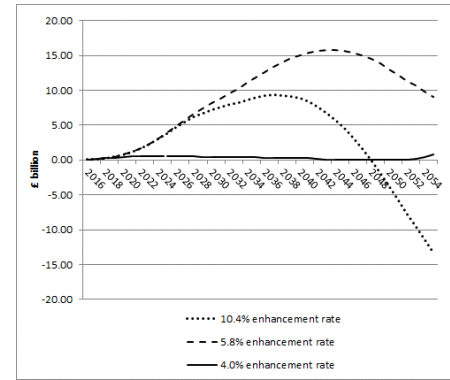


Figure 3c: Six Year Deferral

Figure 3a-3c. Female principal life expectancy projection vs cumulative savings to the NIF

UK state pension deferral incentives and sustainability

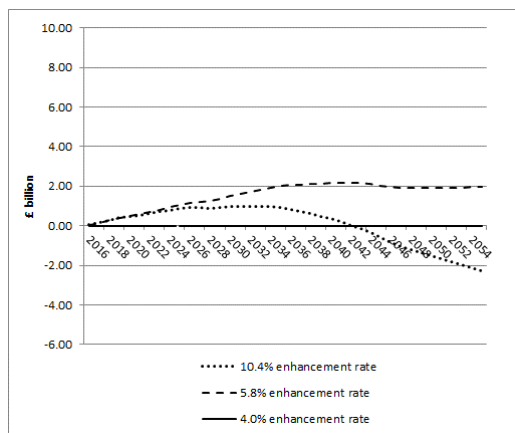


Figure 4a: Two Year Deferral

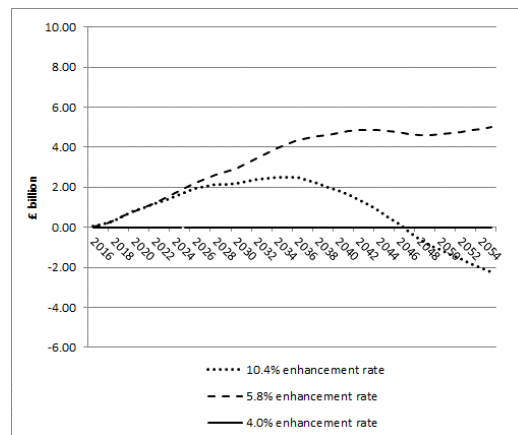


Figure 4b: Four Year Deferral

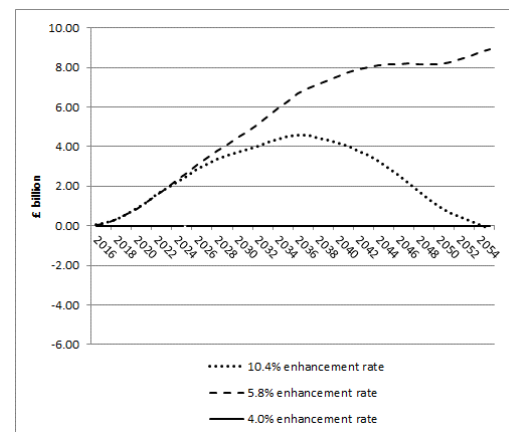


Figure 4c: Six Year Deferral

Figure 4a-4c. Male low life expectancy projection vs cumulative savings to the NIF

UK state pension deferral incentives and sustainability

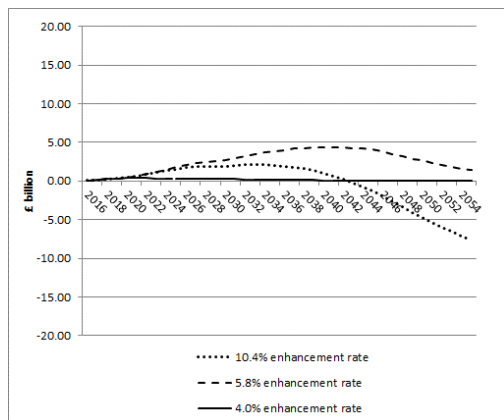


Figure 5a: Two Year Deferral

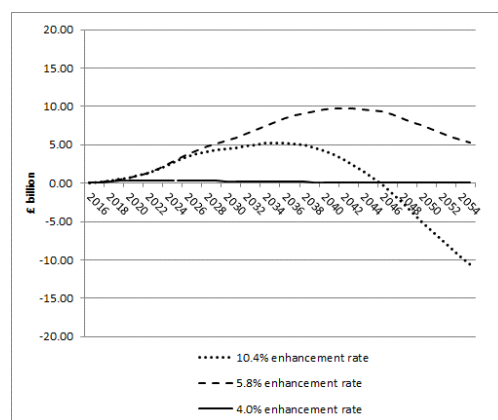


Figure 5b: Four Year Deferral

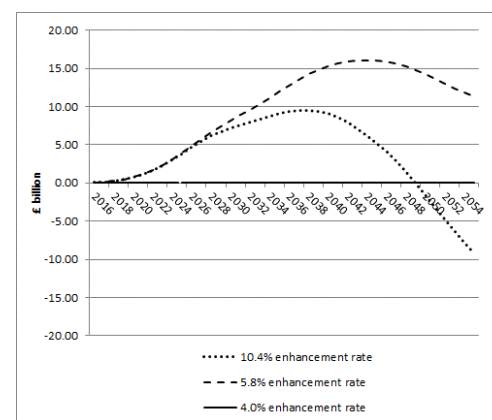


Figure 5c: Six Year Deferral

Figure 5a-5c. Female low life expectancy projection vs cumulative savings to the NIF

UK state pension deferral incentives and sustainability

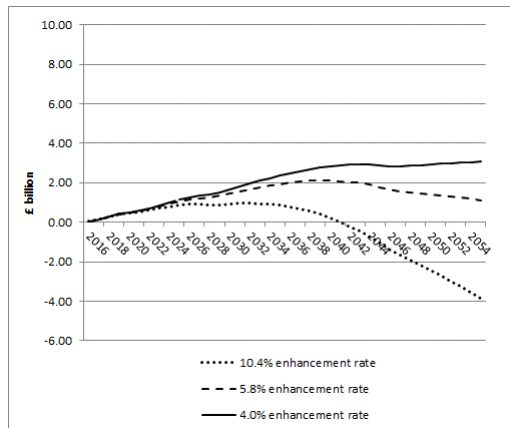


Figure 6a: Two Year Deferral

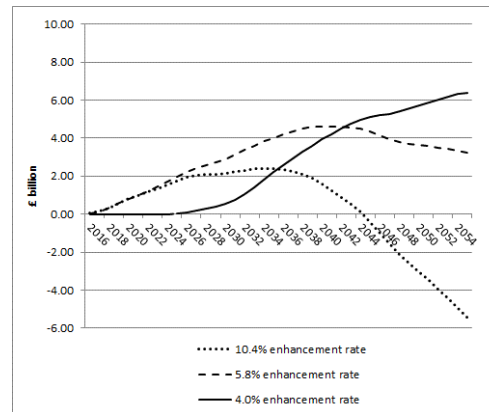


Figure 6b: Four Year Deferral

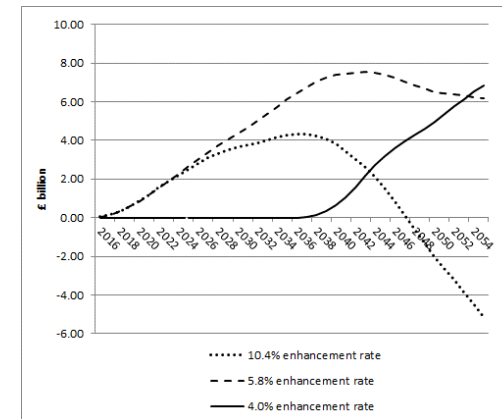


Figure 6c: Six Year Deferral

Figure 6a-6c. Male high life expectancy projection vs cumulative savings to the NIF

UK state pension deferral incentives and sustainability

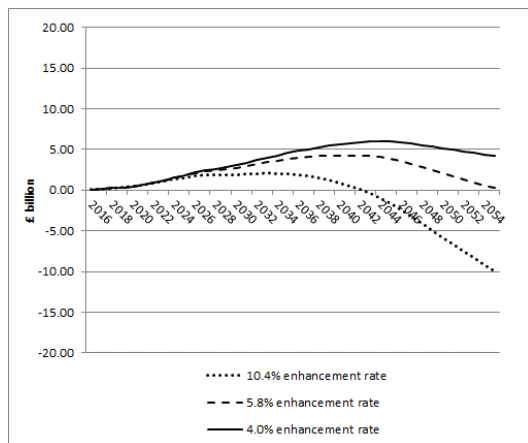


Figure 7a: Two Year Deferral

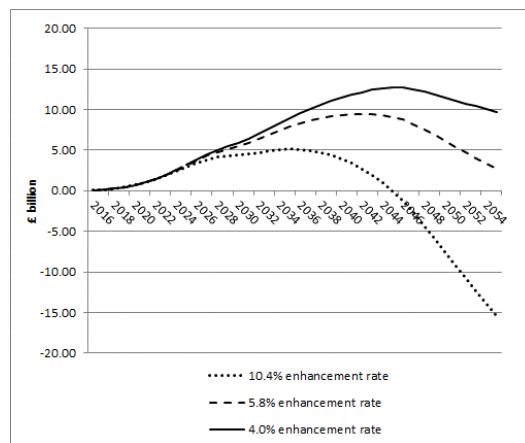


Figure 7b: Four Year Deferral

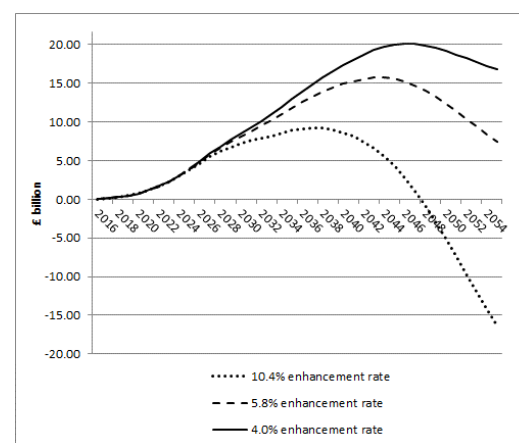


Figure 7c: Six Year Deferral

Figure 7a-7c. Female high life expectancy projection vs cumulative savings to the NIF

UK state pension deferral incentives and sustainability

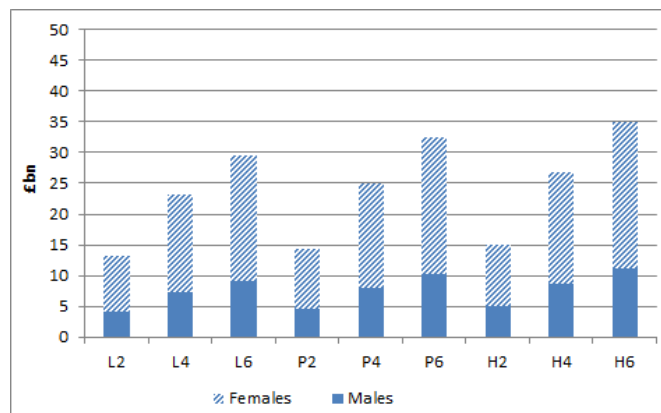


Figure 8a. Total cumulative savings up to 2056 arising from reducing the enhancement rate from 10.4 to 5.8 percent (L, P and H represent the low, principal and high life expectancy variant and 2, 4 and 6 are the respective lengths of deferral in years.)

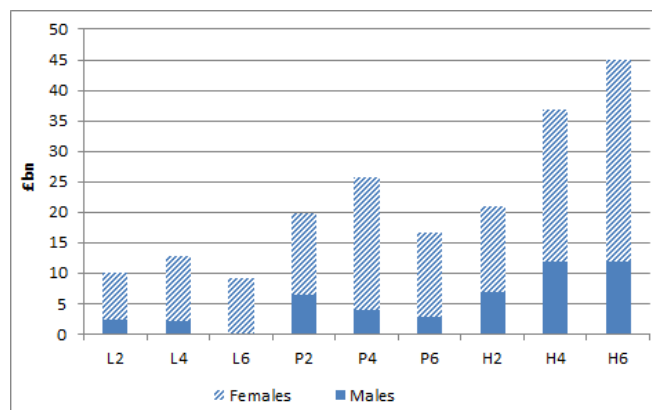


Figure 8b. Total cumulative savings up to 2056 that would arise from reducing the enhancement rate from 10.4 to 4.0 percent