

MPRA

Munich Personal RePEc Archive

Estimating economic and social welfare impacts of pension reform

van de Coevering, Clement; Foster, Daniel; Haunit, Paula;
Kennedy, Cathal; Meagher, Sarah and Van den Berg, Jennie
Department for Work and Pensions

29. November 2006

Online at <http://mpra.ub.uni-muenchen.de/1623/>

MPRA Paper No. 1623, posted 07. November 2007 / 01:53

Department for Work and Pensions

Pensions Technical Working Paper

Estimating economic and social welfare impacts of pension reform

Clement van de Coevering, Daniel Foster, Paula Haunit, Cathal Kennedy, Sarah Meagher and Jennie van den Berg

Corporate Document Services

© Crown Copyright 2006. Published for the Department for Work and Pensions under licence from the Controller of Her Majesty's Stationery Office by Corporate Document Services, Leeds.

Application for reproduction should be made in writing to The Copyright Unit, Her Majesty's Stationery Office, St Clements House, 2-16 Colegate, Norwich NR3 1BQ.

First Published 2006.

ISBN 1 84712 118 7

ISBN13 978 1 84712 118 9

Views expressed in this report are not necessarily those of the Department for Work and Pensions or any other Government Department.

Printed by Corporate Document Services.

Contents

Acknowledgements	vii
Foreword	1
Summary	3
1 Introduction	5
1.1 Background	5
1.2 Increasing State Pension age and extending working life	6
1.3 Personal accounts	9
1.4 Measuring impacts of policies	11
1.5 Economic impacts	11
1.6 Welfare impacts	11
1.7 What is not in the paper	13
1.8 Outline of the rest of the paper	14
2 Economic impact of working longer – a microeconomic approach	15
2.1 Introduction	15
2.2 Analytical framework	15
2.3 Methodology	18
2.4 Limitations and weaknesses in methodology	22
2.5 Results	23
2.6 Sensitivities	24
2.7 Conclusion	26
3 Macroeconomic modelling of personal accounts and working longer	27
3.1 Introduction	27
3.2 Analytical framework	27
3.3 Methodology	28
3.4 Limitations and weaknesses in methodology	28

3.5	Assumptions	29
3.6	Personal accounts – results	30
3.7	Personal accounts – sensitivities	33
3.8	Extending working life – results	34
3.9	Extending working life – sensitivities	38
3.10	Modelling the different parts together	40
3.11	Conclusion	42
4	Estimating the social welfare impact of consumption smoothing through personal accounts	43
4.1	Introduction	43
4.2	Analytical framework	44
4.3	Methodology	47
4.4	Limitations and weaknesses in methodology	53
4.5	Assumptions	55
4.6	Results	56
4.7	Sensitivities.....	57
4.8	Conclusion	58
5	Conclusion	59
Appendix	Savings and investment within NiGEM	61
References	63

List of tables

Table 2.1	Reasons for expecting to retire at State Pension age	17
Table 2.2	Current employment by five year age-bands; 55 and over age group	19
Table 2.3	Annual increases in GDP from employment effects of increasing State Pension age in steady state	23
Table 2.4	Annual increase in GDP from employment effects of increasing State Pension age in steady state (assuming no decline in earnings for groups affected)	24
Table 2.5	Annual increase in GDP from employment effects of increasing State Pension age in steady state (assuming average earnings of affected groups equal to the average earnings of 65-69 year olds)	25
Table 4.1	Weighting factors applied under the difference scenarios assuming annual earnings of £25,000	51
Table 4.2	Net present value of saving £1 for a man aged 30 in 2012 saving in 2012	52
Table 4.3	Estimated social welfare impact of personal accounts contributions from 2012 - 2050	56

Table 4.4	Sensitivity analysis of varying the discount rate and rate of return	57
Table 4.5	Sensitivity analysis of different benchmark replacement rates	57
Table 4.6	Sensitivity analysis of varying the annual management charge	58

List of figures

Figure 1.1	Trends in mean age of retirement in the UK	6
Figure 1.2	Average annual decline in activity rates of single-year cohorts	8
Figure 1.3	Economic activity, by age (men)	8
Figure 2.1	Projected employment rates 2050 – men	20
Figure 2.2	Projected employment rates 2050 – women	20
Figure 3.1	Impact of personal accounts on saving – central scenario	31
Figure 3.2	Impact of personal accounts on economic activity – central scenario	32
Figure 3.3	Impact of personal accounts on GDP – backward looking behaviour by economic agents	34
Figure 3.4	Individual underestimates of life expectancy, by age	35
Figure 3.5	Impact of longer working and life expectancy on employment	36
Figure 3.6	Impact of longer working and adjusted life expectancy on economic activity	37
Figure 3.7	Savings impacts of longer working and adjusted life expectancy	38
Figure 3.8	Impact of longer working and adjusted life expectancy on economic activity – backward looking behaviour by economic agents	39
Figure 3.9	Joint savings impact of personal accounts and longer working with adjusted life expectancy	41
Figure 3.10	Joint impact on economic activity of personal accounts and longer working with adjusted life expectancy	42
Figure 4.1	Benchmark replacement rates assumed for pensions commission modelling: percentage of gross earnings	50

Acknowledgements

We want to acknowledge our great thanks to Ray Barrell, Ian Hurst, Simon Kirby, Dawn Holland, Rebecca Riley and Justin van de Ven at NIESR, also to Nicholas Barr at the LSE, David Miles at Morgan Stanley, as well as Robert Laslett, Carole Willis, Chris Dobson and everyone else at the DWP for their comments and assistance during this project. Any errors or omissions are the fault of the authors.

Foreword

The Government has begun a major programme of pension reform. These reforms are based on an extensive, sound evidence base, contained, for example, in:

- The First Report of the Pensions Commission;
- The Second Report of the Pensions Commission;
- *Security in Retirement: towards a new pensions system* and its accompanying Regulatory Impact Assessment;
- The Pensions Bill and the accompanying documents published today.

Because of the scale and importance of these reforms, the Government is keen to continue to develop this evidence base. To contribute to this aim, the Government has undertaken, and continues to undertake, a range of innovative, exploratory analysis. This paper contains an exploration of method and early results from work which examines the macro-economic and social welfare impacts of elements of reform.

The analysis presented here is meant not as the conclusion of the work, but as an exposition of preliminary thinking. The Government would welcome the views of academics and other experts on the techniques used and preliminary findings presented. Comments should be directed to Clement van de Coevering (Clement.Van-de-Coevering@dwp.gsi.gov.uk).

Summary

This paper examines the impact of two effects of the pension reform package that was put forward in the May White Paper *Security in retirement: towards a new pensions system*: the likely increase in the number of older people working due to a higher State Pension age and the likely rise in saving due to more people putting away money for retirement.

State Pension age is currently 65 for men and 60 for women. There has been a long-planned increase in women's pension age to 65, due to take place between 2010 and 2020, which is not examined in this paper. However, the Government has announced that State Pension age for men and women will then rise from 65 to 66 by 2026, to 67 by 2036 and to 68 by 2046. Not everyone retires at State Pension age, but it is likely that this increase will lead to more people working. This will result in an increase in the size of the economy. There is considerable uncertainty about people's exact response to the reforms, so we present results as ranges. The paper explores different techniques to estimate the size of this impact. It finds that by 2050 the economy could be 1.4 – 1.7 per cent larger than it would be if reform had not taken place.

The introduction of personal accounts is thought likely to increase pension saving, although, again, individual responses are difficult to predict with certainty. Analysis suggests that the increase in saving for retirement could lead to a long-term growth in UK incomes of around 0.2 per cent. This would occur as UK residents increased their ownership of domestic and foreign companies and other assets that they invest in through their pension funds. The ownership of these assets would generate returns which would ultimately allow people in the UK to spend more.

The overall effect of changes to State Pension age and the introduction of personal accounts on UK incomes is likely to be in the range of 0.9 – 3.1 per cent. Although these numbers are relatively small proportions of the total economy, they represent significant sums. In terms of today's economy, they would be worth around £11 – 38 billion.

In addition to the economic impact of reform, the paper also explores its impact on people's wellbeing through improved consumption smoothing.

The Government provides a safety net to avoid pensioner poverty, and most people will achieve a basic level of pension through the State Pension system. However, it is in most people's interest to save on top of this for their retirement to avoid a big fall in their income when they stop working. This is because many people prefer to maintain a reasonably smooth pattern of consumption throughout life, than to have a relatively high level of consumption while they are working and then a much lower level once they retire.

Whilst many people would recognise the desirability of saving for retirement, analysis, for example presented by the Pensions Commission, suggests many are not saving enough to smooth their consumption effectively. According to the latest estimates at least seven million people are currently not saving enough to avoid a significant fall in their standard of living at retirement. The introduction of personal accounts is expected to lead to a large increase in the number of people saving for their retirement, leading them to be able to maintain a more consistent standard of living over their lives. This will improve the wellbeing of these individuals and, as social welfare is the total of the wellbeing of individuals, it will increase welfare across society.

This paper uses innovative economic analysis to examine the scale of this increase in people's wellbeing. It finds that if people save for retirement through personal accounts, then generally their wellbeing will be enhanced. As more people delay spending their income from when they are in work to when they are in retirement, we will feel better off as a society because of the increase in individual wellbeing.

1 Introduction

1.1 Background

The Government White Paper *Security in retirement: towards a new pensions system*¹, published in May 2006, contained a pension reform package that is designed to provide a long-lasting framework. It also announced the intention to produce this technical paper, to assess in more detail the economic and social welfare impacts of two particular aspects of the reforms, the introduction of personal accounts and measures to extend working life. This paper explores possible methodological approaches to how the economic and social welfare effects could be measured and using these methodologies provides quantitative estimates. This paper is not a definitive statement on the magnitude of outcomes from pension reform, about which there is substantial uncertainty, but suggests the direction and possible scale of the effects.

A number of challenges to the current pension system were identified in the White Paper. It concluded that pension reform is needed to address demographic and social change, the large number of people who are undersaving for retirement and the complexity of and the inequalities inherent in the State Pension system. To cope with these challenges, as well as improve outcomes for individuals and society as a whole, the White Paper announced the following policy measures:

- The uprating of the basic State Pension with earnings rather than prices and the reform of the State Second Pension into a flat rate pension;
- The improvement of coverage by the basic State Pension by reducing the number of years of contributions necessary to qualify and the introduction of new credits for carers;
- The gradual increase in the State Pension age and the consideration of other measures to extend working life, such as greater flexibility around State Pension deferral;

¹ Department for Work and Pensions (DWP), 2006. Hereafter referred to as the White Paper.

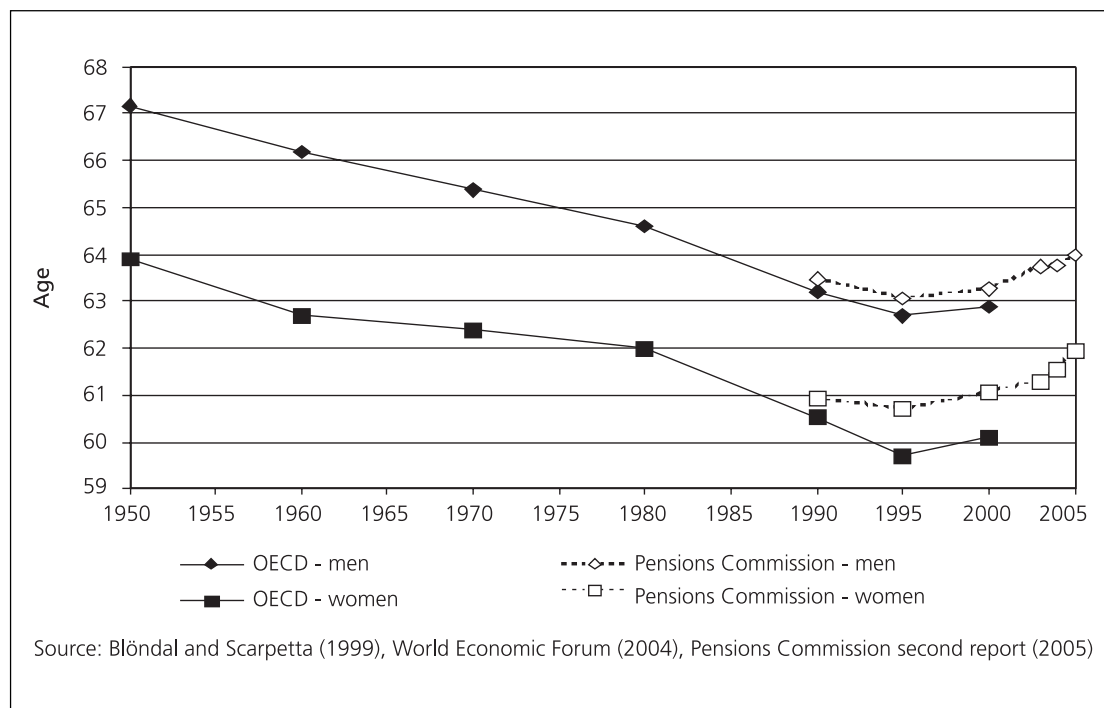
- The introduction of personal accounts to enable and encourage individuals who are not currently saving to start to do so; and
- The streamlining of the regulatory environment, including the abolition of contracting out for defined contribution pension schemes.

The impacts of the increase in the State Pension age and the introduction of personal accounts will be analysed in detail in the remainder of this paper.

1.2 Increasing State Pension age and extending working life

Life expectancy has improved considerably since State retirement pensions were first introduced, and is projected to continue to do so into the future. Despite this trend, the average age of exit from the labour market fell from the 1950s to the mid-1990s. Although this trend has shown signs of reversal in recent years, the average age of retirement remains below historical levels. For example, in 1950 men retired at 67 on average and women at 64. By contrast, comparable figures for the present day show an average retirement age of 64 and 62 respectively (see Figure 1.1), while life expectancy at 65 in 2006 was almost nine years longer than in 1950.

Figure 1.1 Trends in mean age of retirement in the UK



Continuing increases in life expectancy mean that were State Pension age to remain fixed at its present level, the current State Pension system would be paying for progressively longer retirements. Increasing State Pension age in response to increasing longevity, as announced in the White Paper, is intended to ensure that the state retirement pension system can provide a sound foundation for working and saving decisions on a sustainable basis.

The increase in State Pension age will, however, need to be accompanied by cultural and behavioural changes around retirement to produce an increase in the average retirement age. Working longer is the logical response to an ageing population. On an individual basis working longer enables individuals to build up greater savings for retirement and can stabilise the length of time spent in retirement. Additionally, the more people who are in work and contributing to the growth of the economy, the more funds there will be available to support those people who are in retirement.

State Pension age may influence the retirement decision through two channels. The first is that the State Pension age is set at a specific age defined by the Government and, therefore, creates a culture of expectation of retiring at that age. The second is that upon reaching State Pension age, individuals have access to an additional source of income, thus giving people the financial means to stop working.²

While State Pension age is important in influencing people's retirement decision it is only one factor determining the timing of retirement. The most common retirement ages are 60 for women and 65 for men – the current State Pension ages – (see Figure 1.2) suggesting the importance of State Pension age in signalling or as a cultural reference point in determining retirement behaviour. But labour market activity rates show a decline from age 55 onwards demonstrating that other factors are also important. Almost half of all men exit the labour market before reaching State Pension age (see Figure 1.3).

The Government has already put in place or planned a number of measures intended to change the culture and behaviour surrounding retirement. These include the *New Deal 50 plus* employment programme to help older workers, the *Age Positive* campaign, the *Be Ready* promotional campaign to raise awareness ahead of the introduction of age discrimination legislation in October 2006, more generous increments in the State Pension when deferring it and equalisation of State Pension age for men and women between 2010 and 2020.

² Humphrey *et al.*, 2003.

Figure 1.2 Average annual decline in activity rates of single-year cohorts

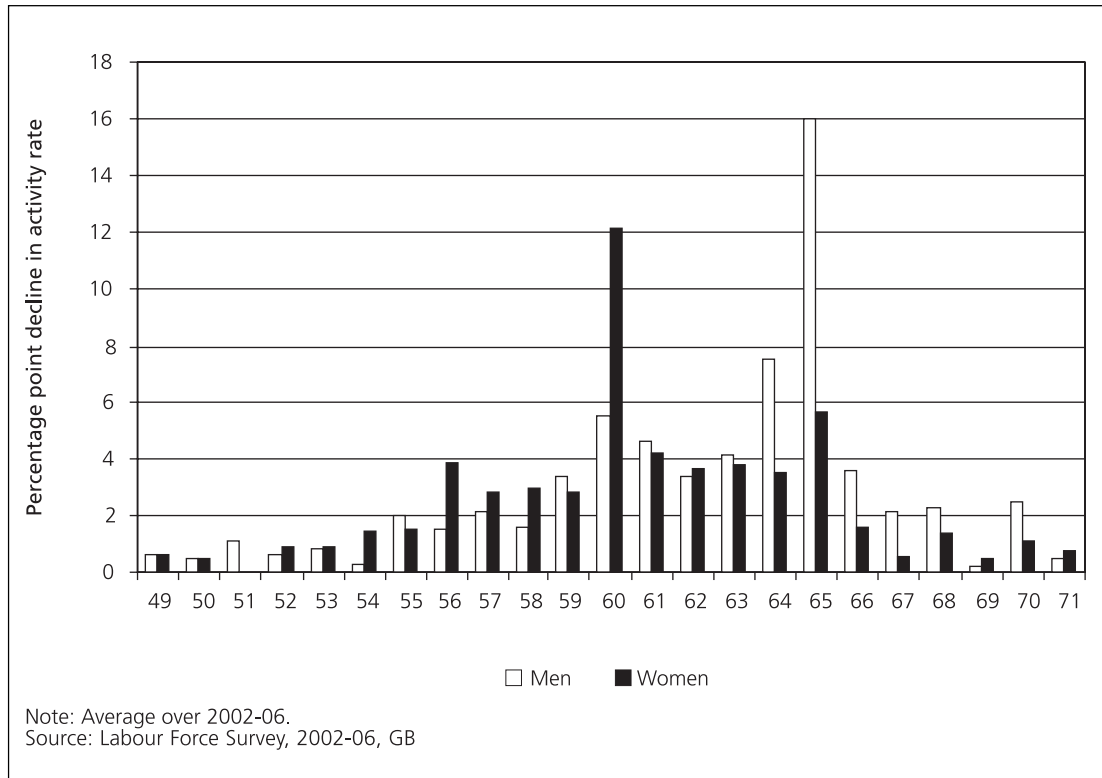
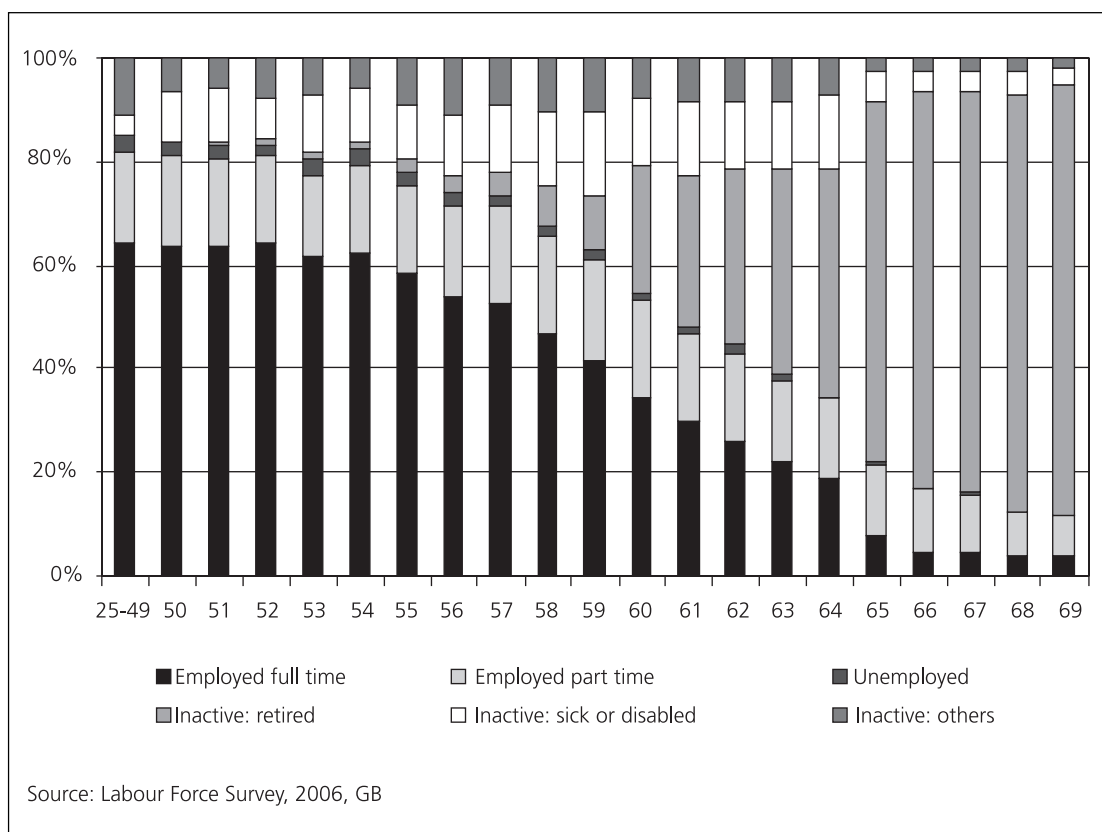


Figure 1.3 Economic activity, by age (men)



The White Paper also proposes a number of measures to extend working life including:

- Consideration of how State Pension deferral might in the future offer greater flexibility, both in terms of the amount drawn and deferred, and allowing people more flexibility to move in and out of work after State Pension age;
- Providing improved communications and information in support of longer working; and
- Working in partnership with employers to encourage them to retain older workers, and to offer them greater flexibility around retirement.

The recent Government publication, *A new deal for welfare: Empowering people to work*³, also proposes a series of measures to boost support for older people returning to work and to improve the information available about options for work and retirement. These include aligning employment support for older long-term unemployed people with that for younger age groups, improving back-to-work support for Jobseeker's Allowance claimants and their dependent partners who are over 50 and piloting of face-to-face guidance sessions with people approaching 50 or over.

The measures outlined above should provide greater support for those wishing to continue in work for longer and those older workers seeking to return to work.

1.3 Personal accounts

In the White Paper, the Government proposed the introduction of a system of personal accounts in 2012. This policy aims to enable individuals not already in a pension scheme to make their own low cost retirement provision. Eligible employees will be automatically enrolled into the new scheme or an existing employer scheme, but have the right to opt out if they wish to. Participants will make contributions along with their employers and the State⁴. These contributions will be on a defined contribution basis, in which the fund at retirement will depend on the level of contributions and fund growth during the accumulation phase. Individuals will have appropriate levels of choice over how to invest their funds. The accounts will be portable between employers and between periods of employment and self-employment.

³ DWP, 2005.

⁴ Employers will have the choice whether to automatically enrol employees into personal accounts or into a different employer-sponsored scheme that qualifies for exemption.

The new scheme will:

- Significantly increase the number of people currently saving for retirement. Modelling suggests that around ten million employees could be newly automatically enrolled into a personal account. In addition to this, it is estimated that a further 0.7 million employees who work for an employer who currently offers an adequate employer pension scheme, but are not members, could be automatically enrolled into their employer scheme. In total, it is estimated that 10.8 million employees could be automatically enrolled into a pension following the reform. Once assumptions are made about the number of employees who are likely to opt out of personal accounts and allowed for opt in membership by the self employed, the central estimate of the number of people in personal accounts is around eight million. In addition around an additional 0.3 million employees would be automatically enrolled and would not opt out of their employer scheme once automatic enrolment is introduced.
- Have low charges so that individuals keep more of their savings. The management charges on personal accounts would be lower than on most currently available personal pensions: the current charge cap for annual management charges for stakeholder pensions is 1.5 per cent in the first ten years falling to one per cent per year after that. Occupational pension schemes and some group personal pension schemes are able to achieve administrative charges equivalent to around 0.3 to 0.5 per cent or less. Therefore, people automatically enrolled into these schemes will also benefit from low charges.

The key features of the scheme will be:

- An organisational structure that ensures low charges and good-quality service for individuals;
- Automatic enrolment for all eligible employees, but with the freedom to opt out;
- A minimum overall level of contribution from employers, employees and the Government, to promote a minimum level of pension saving, with people encouraged to contribute more. The minimum overall contribution is eight per cent of earnings between around £5,000 and £33,000, the split of contributions is as follows:
 - employers contributing three per cent;
 - employees contributing four per cent; and
 - the State contributing one per cent as normal tax relief, as under the current rules;⁵

⁵ One per cent represents basic rate tax relief on individuals' contributions – in addition, individuals may be entitled to higher-rate tax relief and neither employers nor employees pay tax or National Insurance contributions on employer contributions.

- A national minimum employer contribution, increasing incentives to save. For all employees, whether they access pension saving through personal accounts or existing pension provision, if they remain in the scheme they will receive a minimum employer contribution of three per cent of earnings between around £5,000 and £33,000;
- Opt-in access available to those not automatically enrolled, including the self-employed; and
- Portable and flexible accounts, to fit in with modern life and the greater likelihood of people moving between jobs.

1.4 Measuring impacts of policies

This report will look at two different ways of measuring the impact of the increase in State Pension age and the introduction of personal accounts. We first consider economic effects, in the context of which two complementary approaches are used. The first is a partial approach that can quickly provide estimates of the economic effects based on assumptions around changes in employment rates. The second method is more comprehensive and uses NiGEM, a macroeconomic model of the UK economy developed by the National Institute of Economic and Social Research (NIESR), to analyse these effects. Finally we develop an innovative method to estimate the social welfare impact of the introduction of personal accounts.

1.5 Economic impacts

In measuring the economic impacts we are looking at how the reform impacts on the size of the economy or national income, as either measured by the gross domestic product (GDP), which is a measure of the total value of final goods and services produced within a country's borders in a year, or gross national product (GNP) which is the value of all goods and services produced in a country in one year, plus income earned by its residents abroad, minus income payable to non-residents.

If total economic resources are increased, this means that more income is potentially available to individuals for consumption. Chapter 2 looks at a simple partial equilibrium model to estimate the impact of increasing State Pension age, while Chapter 3 uses a dynamic general equilibrium model of the economy to measure the impacts of both State Pension age changes and increases in saving on the size of the economy.

1.6 Welfare impacts

The aim of many reforms of public policy is to make society as a whole feel better off or, in other words, to increase social welfare. To gain insight into the aggregate concept of social welfare, analysing individual welfare, or utility (an economists' term for describing an individual's or a society's wellbeing), is a useful approach.

Research⁶ suggests that, while utility is not identical to the more comprehensible term happiness, the two concepts are closely related. Utility is by no means straightforward to measure. It is influenced by a vast number of factors, some of them intangible. Furthermore, each individual attaches different values to certain things. For example, one person may accumulate as many goods as possible to maximise their wellbeing, while another's happiness may derive from the knowledge that she lives in an environment where her rights are protected by sound institutions and she receives good healthcare when necessary.

For analytical purposes, consumption of goods and services including leisure is usually the main component of utility. This is an abstraction from reality but it is useful in a model context. Furthermore, research has found that income and happiness are correlated, making income an imperfect yet useful indicator for happiness and overall levels of welfare.

Our model estimates social welfare by aggregating the welfare of all individuals in society. In doing so, we assume a utilitarian point of view, that is, we do not attach different weights to different individuals, for example, according to their income before reforms. Instead we simply add all changes in wellbeing to arrive at our aggregate measure.⁷

According to standard economic theory individuals are best off making independent consumption choices. In other words, individuals, in theory, buy the goods and services that for them have the biggest impact on wellbeing, as well as accurately forecasting how much income they will earn, how much they will want to consume in the future and save accordingly. They would thereby maximise individual wellbeing, and with it social welfare, leaving no reason for the government to intervene.

In practice, however, the government will, at a minimum, find justification for intervening in the market due to the existence of public goods, for which there is a demand but which cannot be efficiently supplied by the private sector, for example national defence. Even beyond the provision of public goods, however, it takes a very specific set of circumstances in which the market and hence the individuals in it will produce welfare maximising results. In reality, welfare will not always be maximised in a general sense due to one of the following reasons:

- Imperfect information: consumers are unable to fully compare all available goods in terms of their prices and quality, which may prevent them from making the most efficient consumption decisions. They also cannot fully predict their income and prices of goods in the future, which is especially relevant for retirement pensions.

⁶ Frey and Stutzer, 2002.

⁷ As opposed to, e.g. the Rawlsian view which regards an increase in income of one individual as insignificant for social welfare if the worst off individual of society does not also experience an increase in income.

- The development of behavioural economics is extending our understanding of the cause of imperfect outcomes. For example, it suggests that even if perfect information exists many people do not make the right decisions due to complexity or short-sightedness and inertia.
- Imperfect competition: for example monopoly or collusion that lead to inefficiently high prices.
- Externalities: where an activity by one person produces an unwanted side effect for another person, such as pollution, in which case the Government may decide to impose regulation.
- Increasing returns to scale: this means that it will be most efficient to let a single producer provide a good or service, due to substantial set-up cost or a network.
- The government may also decide to intervene to increase social justice and redistribute income via the benefit system.

Due to one or more of these issues the government may choose to intervene so as to create an environment within which society as a whole can achieve a higher level of welfare. In the final chapter of this paper on social welfare estimates of personal accounts we show how these issues apply in the case of pension saving and, therefore, estimate the welfare gain from intervention.

1.7 What is not in the paper

As we will discuss in Chapter 4, accurately estimating the welfare impacts of longer working lives would require developing a model to take account of individual preferences amongst those affected by the change, something which would be an extremely challenging project and beyond the scope of this paper. Neither do we estimate the welfare impacts of the overall increases in the size of the economy as a result of the changes in State Pension age and increases in pension saving.

This paper does not look at the impact of the reforms to State Pensions. The White Paper contained significant analysis of the impact on individuals and distributional effects. It is outside of the scope of this paper to attempt to analyse the state reform changes using the methods applied here. To measure the impact of changes in the State Pension a model would have to estimate the welfare effects of receiving a higher income, which is less means-tested, for a slightly shorter period, instead of the current state system. This would require a different model and the evaluation of different factors affecting individual welfare.

1.8 Outline of the rest of the paper

This paper is divided into three further chapters which explore a methodological approach to estimating the impact of pension reform. Each chapter takes a different approach to look at the impact of the increase in State Pension age and the introduction of personal accounts and then quantifies the size of the impact using this methodology and a plausible set of assumptions.

Our estimates of the impact should not be taken as definitive: If different methods were adopted it would be possible for a different range of results to be produced. The methodological approaches taken in this paper are innovative and, as the nature of this paper should be seen as consultative, we welcome other views on the issues presented.

2 Economic impact of working longer – a microeconomic approach

2.1 Introduction

The Government's White Paper *Security in retirement: towards a new pensions system* includes proposals to raise State Pension age from 65 to 68 between 2024 and 2046. This chapter looks at how this policy change, combined with measures to extend working life, may contribute to economic output.

The general introduction provided some background to the proposed changes in State Pension age and on the broader Extending Working Life agenda. In this chapter, the impact on GDP of the changes to State Pension age combined with measures to extend working life are estimated from the possible employment impacts of the changes.

2.2 Analytical framework

The general introduction set out the role working longer has in society's response to the challenge of an ageing population. There are also likely to be benefits to individuals and employers from working longer.

For employers, with 40 per cent of the workforce expected to be age 45 and over by 2010, business productivity and competitiveness is increasingly dependent on maximising the contribution of older people. However, many employers hold outdated beliefs that younger workers are more productive than older ones, and discriminate against older people in recruitment and training. This means that current retirement patterns can prematurely disenfranchise healthy and able people, who want to continue working, from the active labour market. These people's productive value to the economy is lost, and their skills and knowledge are lost to employers.

Evidence on the productivity of older workers (based on those aged 50–69) suggests that they are no less productive than younger workers, except in a limited range of jobs requiring rapid reaction or physical strength that people tend to move out of as they become older. Reduction in physical capability and work ability is probably inevitable with age, but chronological age is not a reliable marker. Many older workers are capable of continuing to work and want to do so.⁸

Only where older workers do not receive the same level of training as younger workers doing the same kind of work does their performance show differences. Older workers receiving appropriate job-related training reach the same skill standards as younger workers. Evidence suggests that a reduction in speed or strength is offset by aspects of working that improve with experience, for instance, prioritisation, planning, troubleshooting and motivation. And, technological change is reducing the proportion of jobs involving heavy manual work, for example, in the distribution sector where technology and automation has greatly reduced the amount of physical exertion required.⁹

However, barriers still exist in terms of access to training for older workers. Evidence suggests that training is less likely to be offered to older individuals. The likelihood of someone aged over 55 participating in training is 50 per cent less than that for an adult aged 35-44 and for employed adults training decreases markedly beyond the age of 60.¹⁰ Other evidence shows that encouragement from employers to train tended to tail off after 50-54.¹¹

From the point of view of the individual, delaying their retirement affords them the opportunity to benefit from more earnings and from the opportunity to save more for when they do decide to retire. Increasing State Pension age may have a role to play in assisting the individual in realising these benefits.

A relatively high number of individuals retire early with little consideration of the financial implications of their decision. For example, when asked about the factors they consider when retiring, just under a third (31 per cent) of those not forced into early retirement considered the immediate financial implications. A similarly low proportion considered the longer-term financial implications.¹² This finding, combined with the extent of under-saving for retirement as discussed in Chapter 4 on personal accounts, suggests that, at present, some individuals may be making sub-optimal

⁸ Smeaton and McKay, 2003, for instance, find that men working post-State Pension age are under represented in the construction and manufacturing sectors. They conclude that, as many of the jobs in these sectors require a degree of physical strength, employers may regard them as unsuitable for older workers.

⁹ See Meadows, 2004.

¹⁰ Newton *et al.*, 2005.

¹¹ Humphrey *et al.*, 2003.

¹² Humphrey *et al.*, 2003.

decisions regarding their retirement. These individuals are leaving the labour market earlier than they would if they had more information on the financial implications and their life expectancy than they have at present. In fact, evidence suggests that individuals tend to underestimate their life expectancy significantly. This point will be addressed explicitly in the next chapter on macroeconomic modelling.

Raising State Pension age might increase employment in a number of ways. If some people retire too early due to information failures then increasing State Pension age may help to overcome this by signalling to them that they need to work longer than they otherwise thought. The reduction in income from later access to a State Pension may also result in individuals working for longer. Table 2.1 provides some indication of the extent to which retirement decisions are driven by expectations and financial considerations.

Table 2.1 Reasons for expecting to retire at State Pension age

Reason	Total (percentage)
It is the first opportunity to draw a state retirement pension	39
I always expected to	57
I couldn't get another job after that age	6
I could afford to retire then	28
Other	9

Note: Multiple responses; percentages do not sum to 100.

Source: Factors affecting the labour market participation of older workers, DWP.

However, estimating the social welfare effect of working longer would require accounting for the cost of reduced leisure both for those making optimal and those making sub-optimal retirement decisions. Measuring the welfare impact of the reform would, therefore, require some estimation of the utility/disutility of employment for the different individuals affected. However, no estimates are available, however, for the extent of the work/leisure trade-off or how to account for differing preferences across the affected population. Estimation of the welfare impact would entail developing a model to take account of these preferences, something that would be an extremely challenging project and beyond the scope of this paper.

There may also be a number of non-financial benefits from working longer, which will generate welfare benefits that cannot be easily measured. Research suggests that personal relationships and social networks may be important considerations in decisions about whether or when to retire. Irving *et al.* (2005) found that work provided a social life and social contact for many respondents, particularly those who were single, widowed or divorced. This was particularly true for people with health conditions. The researchers also found that a number of respondents cited the physical and psychological benefits to the individual of remaining in work. They included self-esteem and pride, and mental and physical stimulation and activity,

which some respondents believed help them defer ageing.¹³ Studies also suggest that re-employment for older workers can improve physical functioning and mental health.¹⁴

2.3 Methodology

It is proposed that State Pension age will be increased in stages:

- The first increase, from 65 to 66, to be phased in over two years, starting in April 2024;
- The second increase, from 66 to 67, again phased in over two years, from April 2034; and
- The third increase, from 67 to 68, also to be phased in over two years, from April 2044.

The starting point for estimating the GDP impact of these increases in State Pension age alongside measures to enable people to extend their working lives is to estimate the likely employment increases resulting from the change. The estimates of the increase in employment are then multiplied by assumptions about gross earnings to estimate the increase in labour income and a product market corrector is then used to scale this up to the full economic value.¹⁵

The approach developed to estimate the employment impacts of the proposed changes was to consider possible upper and lower bound estimates of the likely impact.

The lower bound estimate of the employment effect is based on the assumption that behaviour only changes at the ages affected by the State Pension age changes. That is, when State Pension age rises from 65 to 66, only the behaviour of people aged 65 changes in response. It is assumed that, as a result of the change, the change in the employment rate between 64 and 65 is kept the same as between 63 and 64. This pattern is repeated for all age groups affected by the change.

The changes to State Pension age only impact on employment from 2024 when the first increase is introduced. Individuals do not alter their behaviour in anticipation of the changes. When fully implemented (the State Pension age has increased to 68) only the behaviour of people aged 65, 66 and 67 is different to what it otherwise would have been. This is illustrated in Figures 2.1 and 2.2, where, under the lower bound estimate, employment only changes at these ages.

¹³ Humphrey *et al.*, 2003.

¹⁴ Gallo *et al.*, 2000, Frese and Mohr, 1987.

¹⁵ Note that this approach differs to that used to project long-term GDP levels in HM Treasury's long-term public finance report. In particular, the latter uses assumptions concerning aggregate productivity growth, rather than gross earnings, to derive projected GDP levels from long-term projections of employment.

It is possible, however, that this lower bound underestimates the impact of the changes. Behaviour may change at other ages as a result of the financial incentives created by the changes, as well as possible changes in retirement expectations as discussed in the introduction. People who would otherwise retire before State Pension age may now do so a little later as the period of retirement before access to the State Pension becomes possible is now longer, similarly many who would retire after State Pension age may now work even later in life to increase retirement income.

The upper estimate of the effect reflects these wider impacts, based on the assumption that an individual's exit from the labour market moves by the same amount as State Pension age. For estimation purposes, this assumption means that the employment rates at a particular age are applied to the ages immediately above, as State Pension age increases. For example, in the case of the State Pension age increase to 66, the employment rate for those aged 55 will be the same as for those aged 54. Between the ages of 56 and 65, employment rates are the same as they would have been a year previously had State Pension age not been increased (see Figures 2.1 and 2.2). For example, for an individual aged 60, the employment rate will be the same as for an individual aged 59 before the increase in State Pension age has been factored in.

Under the upper bound estimates, it is assumed that the minimum age at which behaviour is affected is 55. This is the age at which, based on trends in age-specific employment rates, the trend towards early retirement tends to become clearly visible (see Figure 1.3). Similarly, it is assumed that there is no impact on the participation and employment of those aged 70 and above. Given the low rates of employment among this group at present (see Table 2.2), any impact of the change is likely to be marginal.

Table 2.2 Current employment by five year age-bands; 55 and over age group

	55 – 59	60 – 64	64 – 69	70+
Employment rate	69%	43%	15%	3%
Number employed	2,600,000	1,350,000	400,000	200,000

Note: Number employed rounded to nearest 50,000.

Source: Labour Force Survey, spring 2006, GB.

One further aspect of this employment scenario is the timing of the behavioural changes. While the first change to State Pension age is not proposed to be introduced until 2024, the estimates assume that people aged 55 and over will alter their behaviour accordingly so someone aged 55 in 2015, who would have otherwise exited the labour market at 55, will alter their behaviour ahead of the anticipated change.

This might be an overestimation of the impact of the changes. It assumes no exit from the labour market over a three-year age range (ages 55, 56 and 57) once the

State Pension increase is fully implemented. A middle estimate based on an average of the two estimates described above has been produced to arrive at a potentially more realistic estimate of the likely impact.

Figures 2.1 and 2.2 summarise the impact that raising State Pension age is estimated to have on the employment rate of men and women aged 55-69 once increased to 68 in 2046 under each of the three employment scenarios.

Figure 2.1 Projected employment rates 2050 – men

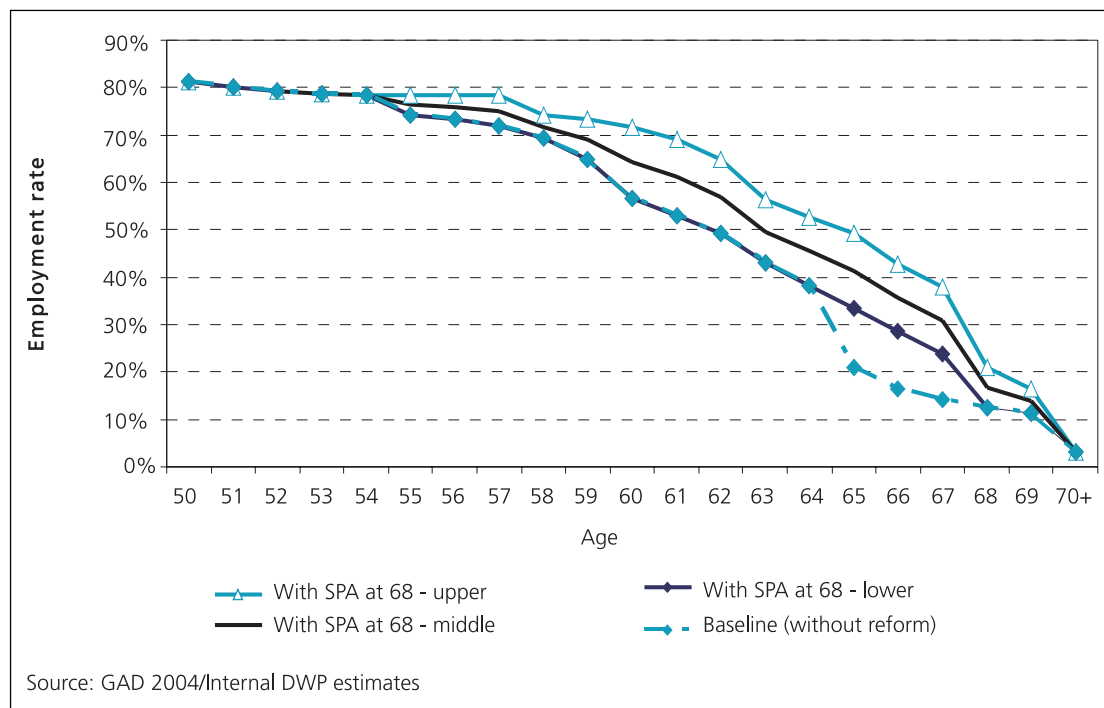
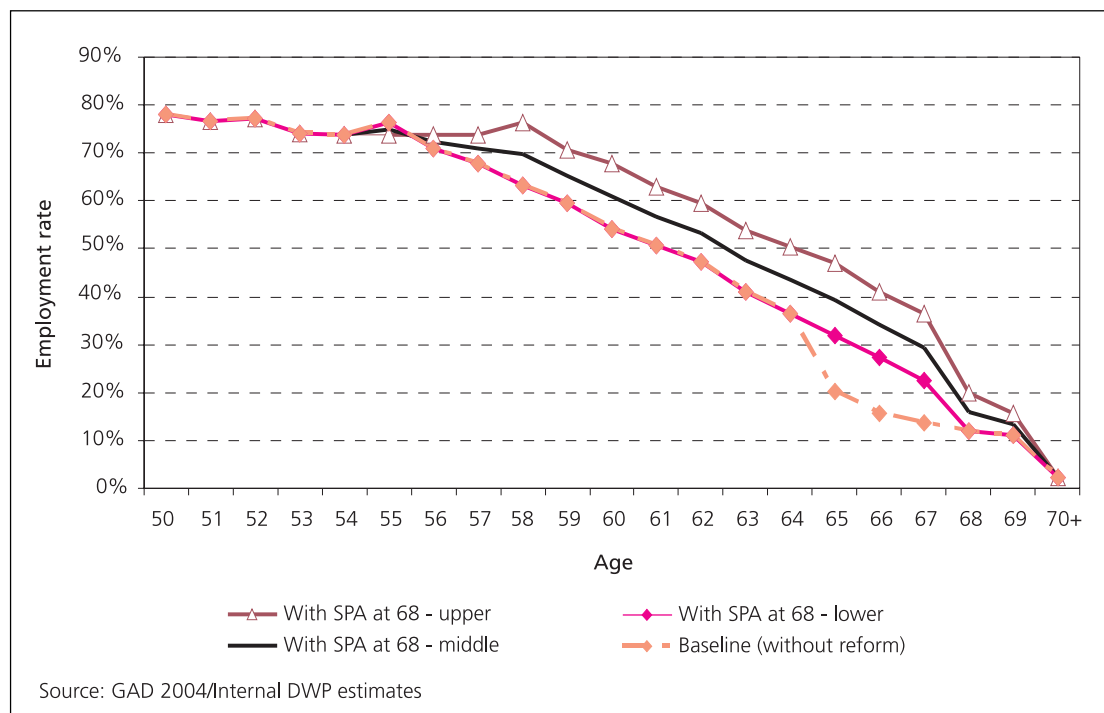


Figure 2.2 Projected employment rates 2050 – women



This approach gives us three estimates (upper, middle and lower) of the likely employment impact of the changes as shown in Figures 2.1 and 2.2. In estimating the employment impacts, the estimates use the HM Treasury projections of employment, developed for the 2005 pre-budget report, as their base.¹⁶ Equalisation of State Pension age between 2010 and 2020 is factored into the baseline.

Under each of the three scenarios we want to know the likely contribution to economic output that the estimated increases in employment will produce. To do so, we use the absolute increase in numbers employed combined with information on hours and earnings of the groups of workers affected by the change. Applying estimates of the annual gross earnings of workers affected under the estimates of employment change allows us to calculate an estimate of the annual aggregate increase in labour income under each of the three scenarios.

Data on earnings and hours was sourced from the Labour Force Survey and based on a four-quarter average (summer 2005 – spring 2006). Information on earnings and hours was obtained for the three age groups affected by the proposed changes; those aged 55-59, aged 60-64 and 65-69. To reflect the different earnings and working patterns of men and women, this information was further broken down by gender for each of the three age groups. Changes in hours and earnings are more visible over five-year age bands than at individual ages while still allowing us to reflect the changing earnings and working patterns of people as they approach State Pension age as well as those continuing to work beyond State Pension age.

The information on earnings and hours is, by its nature, retrospective. It is based on the employment and working patterns of those aged 55-69 currently in the labour force. These may be subject to change in the future as working patterns change and older workers benefit from newly implemented extending working life measures such as age discrimination legislation. Therefore the estimates of hours and earnings contained in this analysis have the potential to either under or overestimate future trends.

In terms of underestimating future trends, it is possible that the older workers affected by the changes to State Pension age may see an increase in gross earnings and hours in the future. At present, a large portion of this group has the option of gradually moving into retirement by continuing to work beyond State Pension age at reduced hours, but supplementing their income with State Pension income. After the introduction of the proposed State Pension age increases the opportunity to supplement earnings with State Pension income will only be available to those aged 68 and over. We may, therefore, see an increase in hours worked amongst the age group affected by the proposed changes.

¹⁶ See <http://www.gad.gov.uk/> for the GAD 2004 based principal projections.

On the other hand, data on hours and earnings may be an overestimate of the future trends we are likely to see as a result of changes to State Pension age. The data on hours and earnings used in this analysis is based on those observed in the workplace and might not fully be representative of all older people. Those who remain in work at present might be more productive than those whose work capacity is adversely affected by illness or disability. It may be that the employment of older workers in the future may feature less productive workers who may work for fewer hours or lower earnings than those employed at present. It is also conceivable that those who retire fully at present may not be able to do so in the future but may seek to retire gradually, reducing their hours as they reach their retirement date.

Both of these are plausible scenarios, but are difficult to predict with any great certainty. In the absence of reliable evidence or information on how these trends might evolve in the future, past patterns of earnings and hours represent the best estimate of future earnings and hours available.

To estimate the future gross earnings of those affected by the increase in State Pension age, average earnings for each group are up-rated by estimated real earnings growth to arrive at future estimates of annual gross earnings. For the purpose of up-rating earnings, we have assumed annual real wage growth of approximately two per cent.¹⁷

To estimate the value of output produced by these additional workers, a product market corrector is used to scale up the increase in labour income resulting from the reforms to the full economic value. This variable, used in economic effectiveness calculations, accounts for the value of workers output being divided between wages and firms' profits and is calculated as the inverse of the labour share of total factor income. For the purpose of the analysis contained here it is estimated at 1.26.

Results of this analysis are presented in the results section below. The methodology employed here is intended to estimate the impact on future GDP of increasing State Pension age alongside measures to extend working life by estimating the employment increases from these changes and reflecting the earnings and productivity profile of the workers affected.

2.4 Limitations and weaknesses in methodology

There is major uncertainty surrounding both future labour market projections and the behavioural responses we expect in response to raising State Pension age and accompanying measures to extend working life. In particular, forecasts of the likely

¹⁷ Given that baseline employment remains roughly constant between now and 2050, this implies that the share of labour in GDP remains constant at today's level.

employment impact of increasing State Pension age are based on strong assumptions as to likely behavioural responses and, as we discuss elsewhere, may either under or over estimate the associated employment impacts of the reform.

A major limitation of this analysis is that it can only capture first-round employment impacts of the proposed reform. The simple modelling used for this analysis does not include any interaction with other economic variables. For example, this excludes any second-round impacts that may result from the increases in employment brought about by raising State Pension age.

To further understand the full impacts of the reform package under analysis here we have asked the NIESR to help model the impacts by using NiGEM, their macroeconomic model for the UK and world economy. The results of this are discussed further in Chapter 3 of this paper.

2.5 Results

The employment effects of the change once the increases in State Pension age are fully implemented (i.e. once State Pension age increases to 68 in 2044) range from approximately 300,000 under the lower bound estimate to 1.6 million under the upper bound estimate. The middle estimate based on an average of these two gives an estimated employment increase of 900,000.

Table 2.3 shows the annual percentage increase in GDP¹⁸ brought about by increasing State Pension age in 'steady state'. It is the increase in GDP in 2050 expressed as a proportion of estimated real GDP in that year. This steady state figure shows what the impact of the changes looks like in the long-term once fully implemented.

Table 2.3 Annual increases in GDP from employment effects of increasing State Pension age in steady state

	Pessimistic estimate	Central estimate	Optimistic estimate
Annual percentage increase in GDP in steady state	0.3	1.4	2.5

Source: DWP calculations.

The range of estimates presented here should be considered in light of the uncertainty surrounding the employment effects of State Pension age increases. As discussed earlier (see Section 2.3), the impact on GDP of the proposed increases in State Pension age are heavily driven by how individuals change their labour market behaviour in response to the changes. This is difficult to predict with any great degree of certainty. Here we have modelled a range of employment scenarios to reflect the degree of uncertainty surrounding changes in labour market behaviour.

¹⁸ Calculated using GDP at factor prices.

The combination of increases in State Pension age with measures to support longer working will make it more likely that larger increases in employment occur.

2.6 Sensitivities

The results of this analysis are strongly influenced by the assumptions we have made and, as we have already outlined, contain a large degree of uncertainty. Here we look at the impact of varying these assumptions.

One of the central assumptions made in producing our main results relates to the pattern of earnings for older workers. We have assumed that the future pattern of total earnings by age remain as they are at present.

In describing the methodology behind our analysis we discussed the information we used to arrive at an assumption regarding earnings and how this assumption may either over or under estimate the total average earnings of older workers going forward. We relax this main assumption regarding the earnings of older worker and look at two alternative scenarios of their future trends.

First we look at the case where total average earnings of those aged 55-69 remain at the same level of those of younger workers (i.e. show no decline with age). This allows us to look at the scenario where the estimates of the future earnings of those affected by increases in State Pension age presented in our central results are too low. To account for this outcome we assume that average total wages for those aged 55-69 do not show any difference from those of younger workers.

Changing this assumption has the greatest impact on the average earnings figure assumed for the 65-69 age group – under our main assumption the average total earnings for this group is assumed to be approximately half that of younger workers. For the 55-59 and 60-64 age groups a significant difference is discernable but not as pronounced.

Changing our earnings assumption, therefore, impacts most significantly on our lower bound estimates. Under the lower bound employment assumption, only those aged 65-69 are affected by the changes and so estimates of GDP impact based on the lower bound employment estimates are most sensitive to this change in our assumptions (see Table 2.4).

Table 2.4 Annual increases in GDP from employment effects of increasing State Pension age in steady state (assuming no decline in earnings for groups affected)

	Pessimistic estimate	Central estimate	Optimistic estimate
Annual percentage increase in GDP in steady state	0.5	1.9	3.3

Source: DWP calculations.

The change to our assumption regarding total earnings nearly doubles the GDP impact estimates under our lower bound employment assumptions compared to the results presented in Table 2.3. This is as expected given the group affected and the impact of the altered assumption on the average earnings of this group.

The middle and upper bound GDP estimates are not as sensitive to changing our earnings assumption as the lower bound estimate. This is largely because the 65-69 group forms a smaller proportion of the effected group under these scenarios so the impact of changing our assumption is dampened by the greater proportion of 55-64 year olds affected by this change who do not see their earnings altered by as much as a result of this change.

For a second sensitivity test of our results we look at a scenario where the wages of the workers impacted by the change are lower on average than what we have assumed in our main results. This allows us to look at the possibility that we have overestimated the future earnings of older workers in our main results.

In this case we look at the scenario where the average wage of older workers is equal to the average wage of the 65-69 year old group (approximately 50 per cent that of younger workers and significantly lower than that observed today). Table 2.5 presents the results of this exercise.

Table 2.5 Annual increases in GDP from employment effects of increasing State Pension age in steady state (assuming average earnings of affected groups equal to the average earnings of 65-69 year olds)

	Pessimistic estimate	Central estimate	Optimistic estimate
Annual percentage increase in GDP in steady state	0.3	1.2	2

Source: DWP calculations.

As we have not altered the earnings profile of the 65-69 age group, there is no change to our lower bound estimates of the steady state impact of the changes to State Pension age. The main difference is to our central and upper estimates, due to the more significant changes in the earnings assumptions for 55-64 year olds who are affected under these employment scenarios as discussed earlier.

The analysis tells us that our results are sensitive to changes in our earnings assumptions. Our lower bound estimates are most sensitive to raising, but least sensitive to lowering, our earnings assumption. This is because under this scenario only 65-67 years olds, who are already assumed to have earnings around half that of younger workers, are affected by the increase in State Pension age. This means that if we have overestimated earnings our lower bound results are unlikely to significantly overestimate the GDP impacts, whereas if we have underestimated earnings our upper bound estimate might significantly underestimate the GDP impacts.

2.7 Conclusion

The analysis on the likely economic impact of working longer as a result of the changes to State Pension age and associated policies designed to extend working life suggests a positive overall impact due to the increased employment and associated earnings, generated as a result of these reforms. The range of estimates should, however, be considered in light of the uncertainty of the likely behavioural response resulting from the State Pension age increases. The range of results presented in our analysis is intended to reflect the uncertainty surrounding the employment response. In the analysis, the uncertainty surrounding future trends in the earnings of older workers is also discussed and sensitivity analysis shows to what extent different assumptions on earnings profiles would lead to different results.

3 Macroeconomic modelling of personal accounts and working longer

3.1 Introduction

This chapter deals with the same part of the reform package discussed in the previous chapter, the measures to extend working life. In addition, it quantifies the impact of the introduction of personal accounts. It presents the results of policy simulations with a macroeconomic model of the UK economy. These help to assess the likely effects of introducing personal accounts and extending working life on a number of macroeconomic variables, in particular on output and income, employment and savings.

The remainder of this chapter is organised as follows. The next section broadly describes the analytical framework and methodology to make clear how they differ from the previous chapter and what the underlying assumptions are. It also includes a discussion of the limitations of a macroeconomic modelling approach. The main sections present the results of the introduction of personal accounts and extending working life and some of the sensitivities around these results. The final section concludes by considering whether the results of the two sets of simulations are additive or not.

3.2 Analytical framework

The approach to estimating the economic effects of the reform proposals will be different from the one followed in the previous chapter. Instead of assessing the reform package by starting from a partial microeconomic perspective, this chapter follows a macroeconomic general equilibrium approach. Such an approach has certain advantages and limitations and should, therefore, be seen as complementary to the results of the previous chapter. In particular, using a macroeconomic model makes it possible to investigate the effects the reforms will have on the wider

economy, whilst allowing for relevant interactions between economic variables. On the other hand, such an approach by its very nature makes it impossible to identify individual effects.

3.3 Methodology

The DWP asked the NIESR to help model the impact of the reform package by using NiGEM, their macroeconomic model for the UK and world economy.

NiGEM is a large estimated quarterly model of the UK and the world that is intended to capture the key features of the economy. It is theoretically coherent and quantified by means of empirical estimation and calibration over recent historical experience. It provides a plausible benchmark for estimating the effects on the economy of a range of different scenarios.¹⁹

It is set in what is essentially a New-Keynesian framework where agents are forward looking, but nominal rigidities, namely sticky prices and adjustment costs, slow down the adjustment to the long-run equilibrium. It includes complete demand and supply sides, as well as extensive monetary and financial sectors. Domestic demand, aggregate supply, and the external sector are linked through the wage-price system, income and wealth, the financial sector, the Government sector, and competitiveness. The external sector links the UK domestic economy to the rest of the world. The theoretical structure and some simulation properties of NiGEM are described in Barrell *et al.* (2004). A brief description of the determination of savings and investment within NiGEM is provided in the annex to this report.

3.4 Limitations and weaknesses in methodology

Using a macroeconomic model such as NiGEM results in a number of limitations. As mentioned above, such a model is not well suited to assess effects for individuals.

A model such as NiGEM does, however, make it possible to assess the impact different interventions have on aggregate consumption. Lifetime consumption is, in principle, the variable that any Government intervention could be seen to optimise with its pension policy.²⁰ So one could argue that we should be able to calculate a Net Present Value (NPV) of the Government's pension reforms, as in a typical cost-benefit analysis such as presented in the Government 'Green Book'.²¹ However, such a number would not be meaningful.

The main problem with such an approach is that an aggregate only makes sense if it has an individual basis. The reason is that in this case it is of crucial importance whose

¹⁹ It is important to note that the specifics of the baseline are not important in generating the simulation results presented here.

²⁰ Or GDP or GNP if we would consider this is an appropriate measure.

²¹ HM Treasury, 2003.

consumption is being affected at what point in time to be able to calculate an appropriate NPV.

There is also a more general problem with using macroeconomic models such as NiGEM for evaluation purposes. NiGEM is a model that assumes individuals have full information, that markets are perfect and the economic agents optimise their behaviour. In contrast, the pension reform proposals are based on analysis that suggests there are informational problems, pension markets are imperfect, and individuals do not seem to optimise consumption throughout their lifetime.

The issue of simulating the outcome of pension reforms in a model that reflects individuals maximising decisions using the information they have available to them is addressed directly when we model the impact of increasing State Pension age. As part of the modelling exercise, it is assumed that people currently underestimate their life expectancy and that they will gradually adjust their expectations as time goes on. We will address this issue in some more detail in the Section 3.6.

The issue of calculating a NPV of pension reform, in particular personal accounts, will be taken up in Chapter 4.

3.5 Assumptions

For the purpose of the simulations described in this report, NIESR has constructed a new baseline economic scenario for NiGEM that runs until 2059, against which the impacts of the reform package are modelled. In this way it was possible to ensure robust assessment of the impact of the relevant policy interventions proposed in the White Paper, *Security in retirement: towards a new pensions system* ('the White Paper' hereafter), up to 2050. Where possible, NiGEM has used the same assumptions as those that were used for the White Paper and in the previous chapter. However, where these assumptions differ, they generally have no significant impact on the results presented here.

As most of the Government interventions considered are expected to have an impact on consumption, we provide the relevant equation in NiGEM here:²²

$$C(t) = (\ominus + \rho) * (HUW(t) + NHW(t)),$$

where HUW is human wealth and NHW is financial and housing and asset based wealth. The Marginal Propensity to Consume (MPC) is made up of the premium on the future (\ominus) and the probability of death (ρ). The higher \ominus and ρ , the less important is the future, and, therefore, the higher current consumption will be.

As already noted in the introduction, personal accounts are intended to provide a new low-cost defined contribution pension scheme for those who do not have access to an alternative employer scheme that meets certain minimum standards. It

²² See also Blanchard and Fischer, 1989.

is estimated that annual contributions will amount to £7-8 billion once the scheme is fully running. However, it is unlikely that all of the contributions into personal accounts will be 'new' or additional savings, as a number of people will substitute away from existing savings once they start contributing to personal accounts. As mentioned in the chapter on personal accounts, the Government estimates that around 60 per cent of savings in personal accounts will be new savings, resulting in £4-5 billion of additional savings each year due to personal accounts.²³

To simulate the introduction of personal accounts in NiGEM, we effectively lowered the MPC, a variable that describes what proportion of income is spent on consumption, in the equation that determines consumption behaviour. This implies that, all else being equal, individuals will save more at every level of income. The rationale behind this from a modelling point of view is that introducing automatic enrolment and personal accounts will change what could be considered a sub-optimally high MPC. This change in the MPC would be the result of overcoming some of the underlying psychological barriers to saving, such as inertia and myopia, whilst providing a new simple low-cost savings vehicle to invest pension contributions efficiently.

3.6 Personal accounts – results

Following the proposals in the White Paper, it is assumed that personal accounts will be introduced in 2012 and that there will be a phasing-in period of three years. In line with the estimate presented above, we have simulated a total savings increase of £4.5 billion in our central scenario.²⁴ Figure 3.1 shows what happens to the personal savings rate (as a percentage of disposable income) in the central scenario. From 2012 the savings rate increases quickly in the first three years, in line with the phasing-in.²⁵ After this it settles around 0.5 percentage point above the base case until the end of the forecasting period presented here, in 2050.²⁶

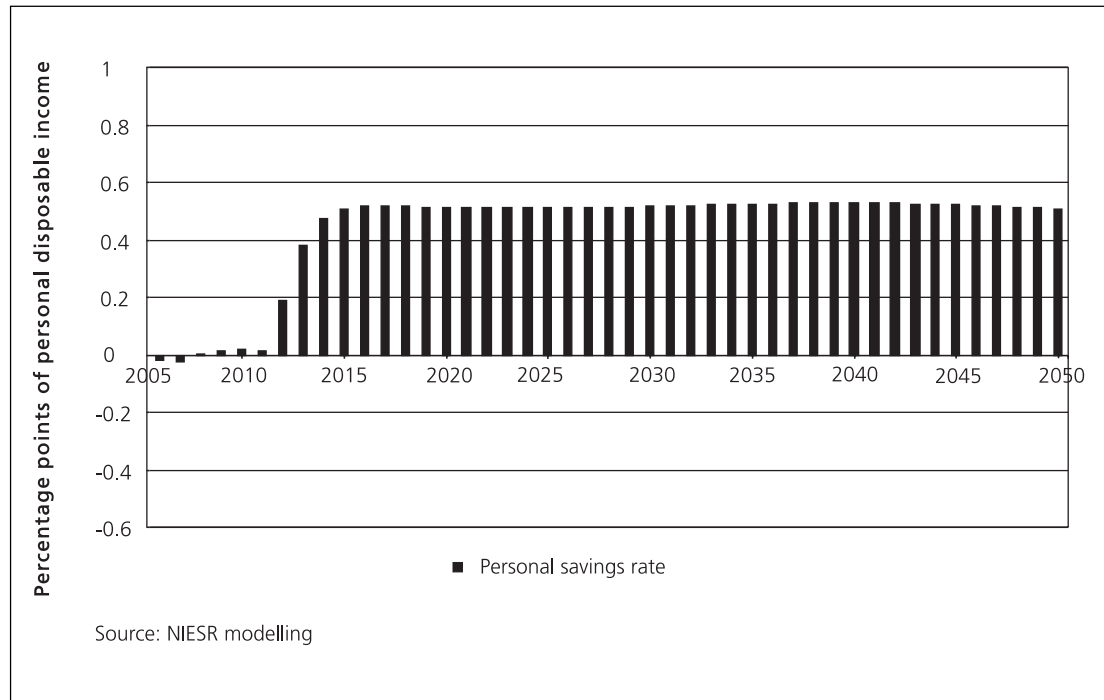
²³ See Regulatory impact assessment to the White Paper Security in retirement: towards a new pensions system, 2006, and Hawksworth, 2006.

²⁴ In 2006 earnings terms, i.e. the nominal numbers will be significantly higher in 2012 and onwards as they are uprated by economy-wide earnings.

²⁵ As is clear from the graph, the savings rates also move marginally in the run-up to 2012; this has no direct connection with personal accounts, but is the result of endogenous changes in the model that result from economic agents anticipating the introduction in 2012.

²⁶ As noted, the MPC in NiGEM is changed permanently to simulate the possible impact of personal accounts. This is based on the premise that personal accounts will be instrumental in permanently raising the personal savings rate, as was supported by the evidence presented in Hawksworth, 2006. In practice, it might be that, whatever the initial offset, there will be stronger (or weaker) substitution effects throughout time.

Figure 3.1 Impact of personal accounts on saving – central scenario



The savings increase associated with the introduction of personal accounts implies lower consumption in the short-term, which initially has a downward effect on economic activity. Figure 3.2 plots the path that two different measures of economic activity, GDP and GNP are forecast to follow between now and 2050 compared to the base case. GDP represents annual domestic production, whereas GNP also takes into account (net) income received from abroad.

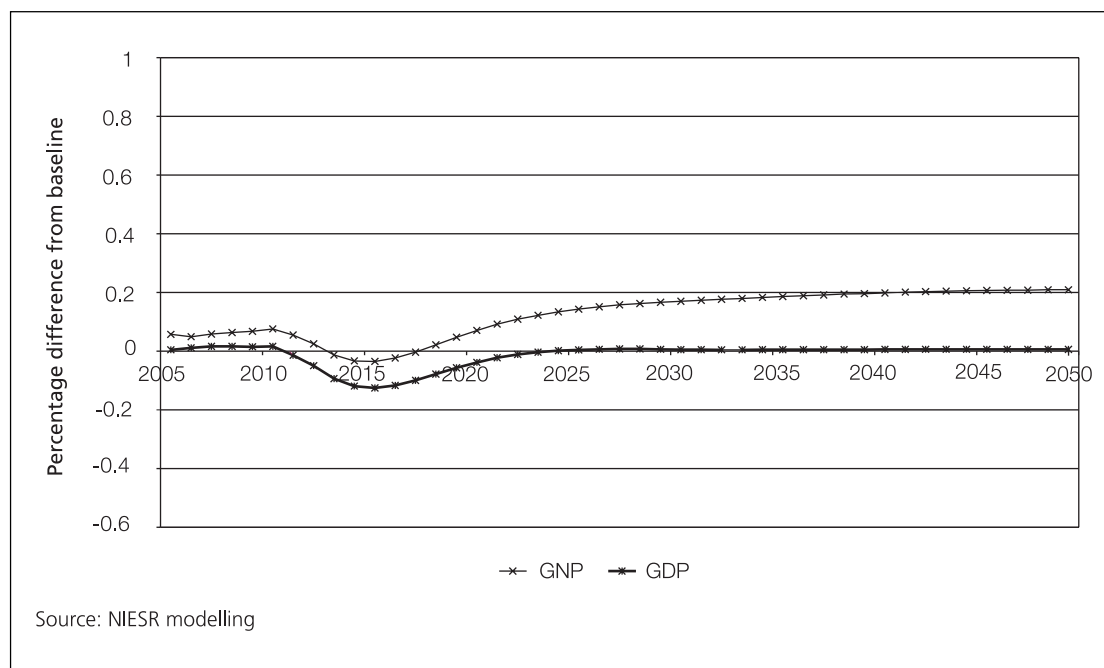
Looking at GDP, the most commonly used indicator of economic activity, the graph shows a very small increase in economic activity between now and 2012.²⁷ This has to do with the fact that individuals and financial markets are assumed to be forward looking. Financial markets anticipate that future monetary policy will react to lower consumption by lowering interest rates. As a result exchange rates will react immediately and will 'jump' down to a new equilibrium. In turn, the lower exchange rate causes exports to rise, which results in a small increase in economic activity.

The small decrease in GDP compared to the baseline from 2012 onwards is caused by the initial savings increase, which results in lower consumption in the short run.

²⁷ It is important to keep in mind that here and in the remainder of this chapter any effects are (level) differences compared to the base case. When economic activity is concerned, this base case forecasts an average long-term growth rate of around 2¼ per cent. Therefore, if one would want to find the growth rate in any particular year one should roughly add 2¼ per cent to the (level) difference in that particular year and the previous year. For all scenarios concerned this implies that annual growth rates are always projected to be positive.

The economy then gradually reverts back to the original growth path as it adjusts to the new level of savings in the economy. It should be emphasised that all of the changes described here are very small. For example, the cumulative downward effect does not go beyond 0.15 per cent, and the largest impact on economic growth in any given year remains below 0.05 per cent, a magnitude that is not likely to be detectable in practice.

Figure 3.2 Impact of personal accounts on economic activity – central scenario



It is immediately clear from comparing the paths of GDP and GNP that they produce a very similar pattern. The main difference between the two is that GNP is higher at any point in time; it settles around 0.2 per cent above the base case, still representing a limited effect.

The reason that GNP is higher than GDP in this scenario has to do with the fact that it includes investment income received from abroad. NiGEM models the UK as a small open economy in which investment decisions are taken independently from the domestic savings decisions. If, as in this case, the domestic supply of savings increases without a fundamental change in the profitability of investment, most of these savings will go abroad. This in turn leads to a build-up of foreign capital. The associated investment returns that flow back do not show up in the GDP measure of economic activity but are reflected in GNP.²⁸

²⁸ As an aggregate model, NiGEM is not designed to describe the investment allocation of personal accounts. The overall portfolio of the economy has to adjust to contain more foreign assets, even if personal accounts do not, and in competitive financial system this process takes place through very minor adjustments in returns.

Given the inherent uncertainty around participation rates and the exact level of additional savings, we have modelled two additional scenarios which, together with our central scenario, should provide a realistic range of outcomes in terms of additional savings. The conservative and optimistic scenarios model additional savings of respectively £2.5 and £7 billion.²⁹ The results of these analyses show the same patterns in savings behaviour and economic activity as the central scenario. The long-term effect on GDP is again close to zero, whereas the long-term effect on GNP is 0.1 and 0.3 per cent respectively in the conservative and optimistic scenarios.

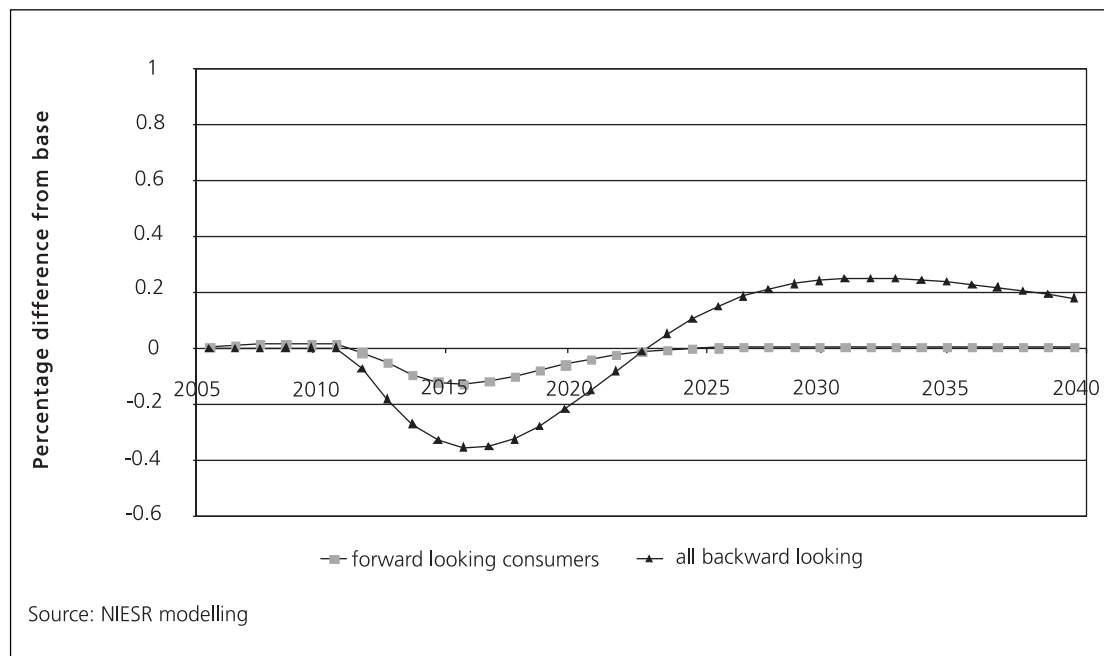
3.7 Personal accounts – sensitivities

As noted above, NiGEM is a model that assumes all economic actors are forward looking, i.e. they adjust their behaviour today to events which they know will occur in the future, though there are some frictions in the adjustment process. To test how sensitive the results are to this assumption, the scenarios were also run in a model with financial markets, wages, business investment and consumers who are all backward looking, in that reactions depend only on past events and not expectations of the future.

Unsurprisingly, the economy shows more of a cycle with backward looking behaviour, as everybody acts as if they are totally surprised by the policy change. However, even with backward looking agents, the short-term effect on GDP is still relatively small (Figure 3.3). If only consumers are backward looking, the impact is roughly the same as in the case with forward looking consumers. If other economic agents, i.e. financial markets and businesses selling goods to consumers, are also surprised by the new policy, the cumulative downward effect on output is magnified about threefold. Compared to forward looking agents, there is also more of an upswing after the initial shock, resulting in a cumulative positive effect for a number of years after 2023, with a peak just around 0.25 per cent in 2032, after which GDP gradually falls again in the direction of the base case.

²⁹ As before, in 2006 earnings.

Figure 3.3 Impact of personal accounts on GDP – backward looking behaviour by economic agents



3.8 Extending working life – results

The introduction presented the rationale for working longer in a society in which people on average live substantially longer than before. In the pension context, the most important measure to extend working life is the increase of the State Pension age.

The previous chapter, dealing with increasing State Pension age and extending working life, explains how raising State Pension age might increase employment in a number of ways. If some people retire too early due to information failures then increasing State Pension age may help to overcome this by signalling to them that they need to work longer than they otherwise thought. The reduction in income from later access to a State Pension may also result in individuals working longer.

As the Government proposals see State Pension age for both men and women gradually increase by three years – from 65 to 68³⁰ – we have modelled that individuals adjust their estimates of their life expectancy by three years as well as a result of the reform package. In other words, we have assumed that individuals see an increase in State Pension age as a signal that their life expectancy has increased by the same amount. This might seem a somewhat simplistic behavioural assumption at first, as we actually estimate life expectancy to increase by more than three years between now and 2050, but fits with a world of imperfect information and individuals that can be considered having a bounded rationality.³¹ As a result,

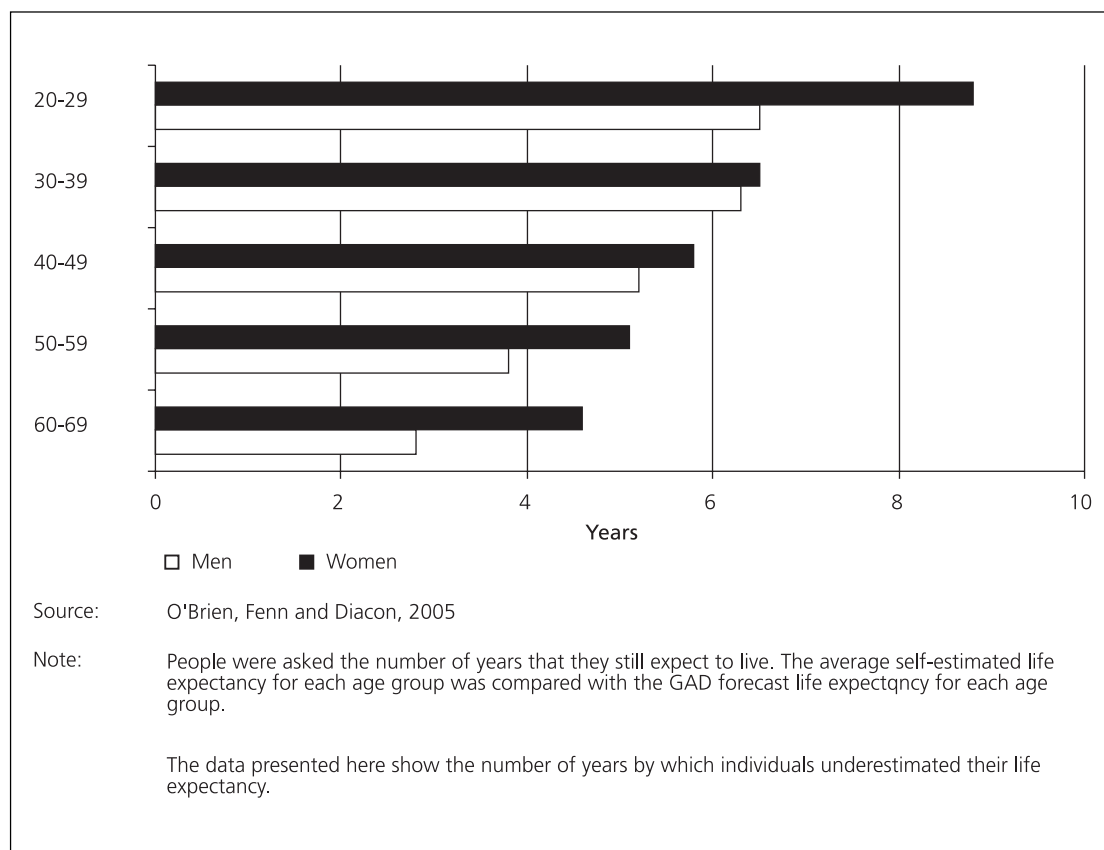
³⁰ That is, after the equalisation of retirement ages for men and women to 65 between 2010 and 2020.

³¹ See, for example, Kahneman, 2003.

individuals change their behaviour infrequently and often use rules of thumb to drive their behaviour. It is assumed that the adjustment of life expectancy is a gradual process that will take ten years to complete.

The available evidence clearly suggests that most individuals do underestimate their life expectancy, but that this declines with age. As is clear from Figure 3.4, even those close to retirement on average appear to underestimate their life expectancy by more than three years, which makes our assumption a reasonable one.³²

Figure 3.4 Individual underestimates of life expectancy, by age



³² The findings presented in Figure 3.4 are reproduced from the second report of the Pensions Commission, 2005, p. 93. In Appendix D the report also presents evidence from a National Statistics Omnibus survey, which confirms the findings of O'Brien, Fenn and Diacon, 2005.

Figure 3.5 shows the increase in the level of employment in the central scenario, which leads to about 900,000 extra workers by 2050, equivalent to an increase of 2.7 per cent.³³ The underlying increase in labour supply is the same one that was used for the central scenario in the previous chapter; however, the increase in percentage terms differs slightly as NiGEM has its own labour market baseline that shows marginal differences compared to the baseline used in Chapter 2.

Figure 3.5 Impact of longer working and life expectancy on employment

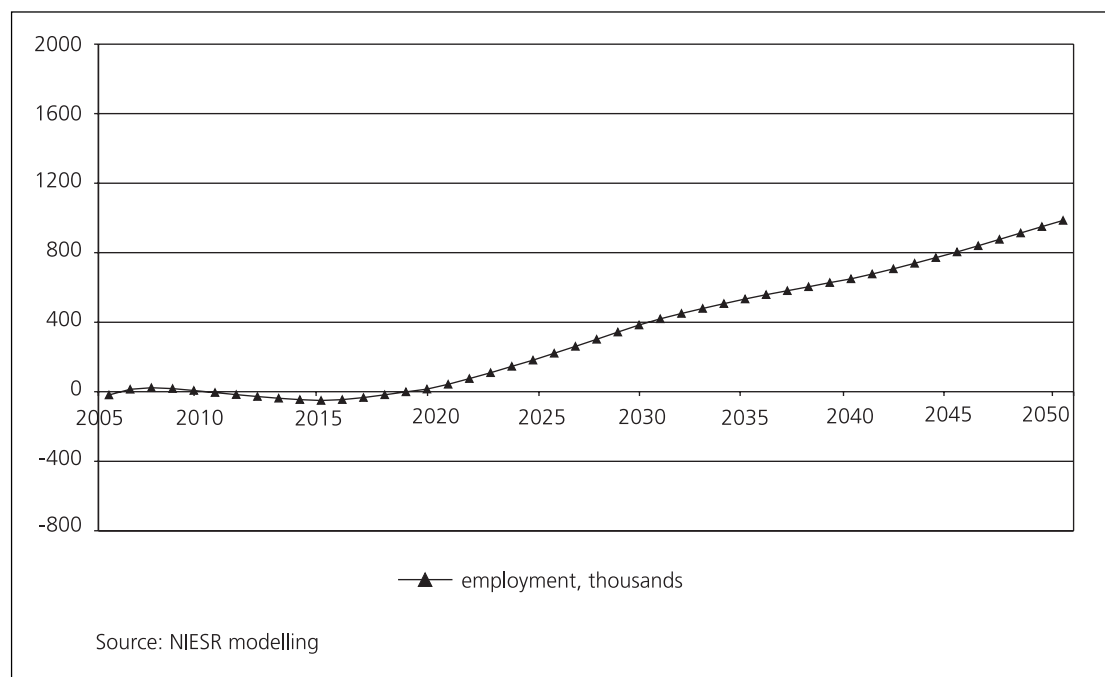


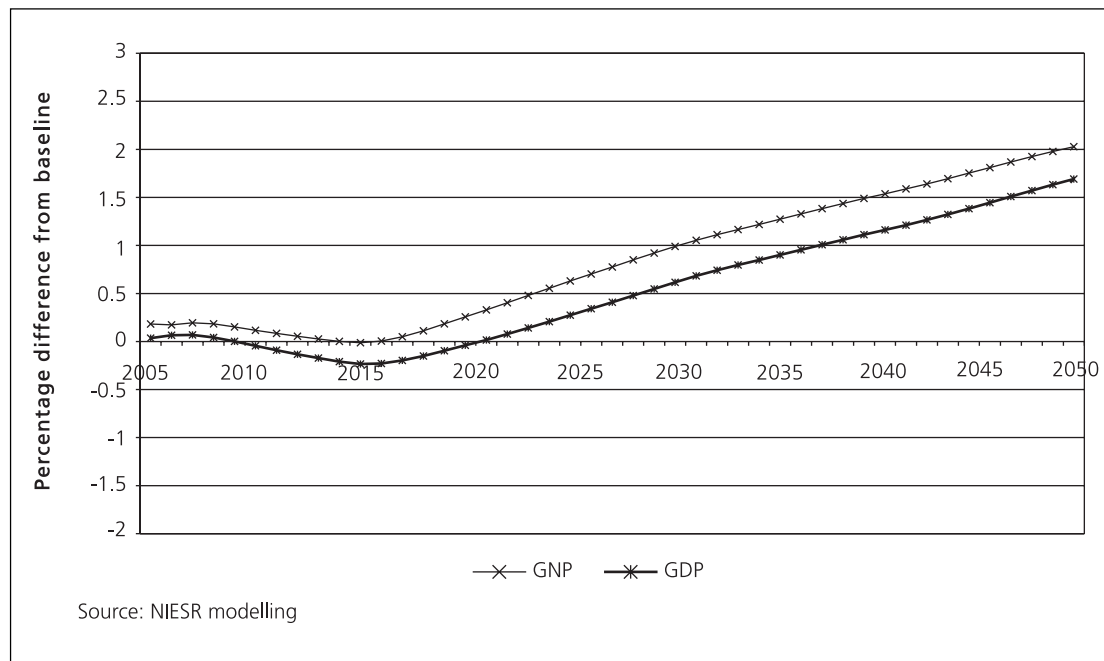
Figure 3.6 shows that extending working life has a substantial impact on economic activity, particularly if we compare it to the effect of introducing personal accounts. GDP roughly rises in line with the increase in labour supply. However, the increase is not one-for-one, which has to do with the fact that the employment increase does not take account of the effective hours worked. As it is assumed that the additional workers on average will work fewer hours than the rest of the working age

³³ The graph shows some slight variation in employment in the run-up to the first change in State Pension age in 2026. This has to do with the extra savings that result from individuals adjusting their life expectancy. A fall in consumption that follows from a change in the perception of the length of life and a reorientation of production to exports may cause a slight reduction in the level of demand and employment as the economy adjusts. The more forward looking the wage bargaining process is, the smaller the impact on output will be when savings rise. See Barrell and Dury, 2003, for further discussion on this point.

population, the effect on GDP will be correspondingly smaller. In this scenario, it is estimated that GDP will be 1.7 per cent higher than the base case in 2050.³⁴

The impact of 1.7 per cent is higher than the 1.4 per cent in the central scenario of the previous chapter. This is partly explained by the fact that we are now introducing the labour supply changes in a fully specified model that takes account of relevant interactions of economic variables. However, one underlying assumption in NiGEM is also a relevant driver behind the result: NiGEM assumes that all labour supply is equally productive. In contrast, the previous chapter assumed that the additional labour supply would earn lower wages – i.e. be less productive – than the rest of the economy.

Figure 3.6 Impact of longer working and adjusted life expectancy on economic activity



³⁴ Older workers work fewer hours. This simulation used the same assumption on hours worked as the previous chapter, 74 per cent. This implies that the effective increase in employment was 2.0 per cent. The main reason the GDP impact of 1.7 per cent is slightly lower has to do with the fact that not all economy wide investments tend to move in line with changes in employment (e.g. Government investment).

It is interesting to note what happens with the savings rate. Figure 3.7 shows a substantial increase in the savings rate. As a result of the adjustment of their life expectancy, individuals realise they will have a longer retirement than previously expected. If they do not adjust their behaviour, they will end up with lower incomes in retirement than desired. As part of our simulation, we assume that people will work longer to make up for this potential shortfall. The result of our modelling exercise shows that the increase in the length of the average working life that we have modelled is not sufficient to bring income in retirement up to the desired level, but that savings during working life will be increased as well.³⁵

The increase in savings associated with the upward adjustment of life expectancy explains why the increase in GNP (2.0 per cent) is higher than that of GDP (1.7 per cent), as part of the savings will be invested abroad. However, the difference is limited to 0.3 percentage point because there is also a higher domestic demand for savings. This is the result of the increased labour supply, which in turn will lead to a higher demand for capital as the extra labour supply is absorbed in the economy.

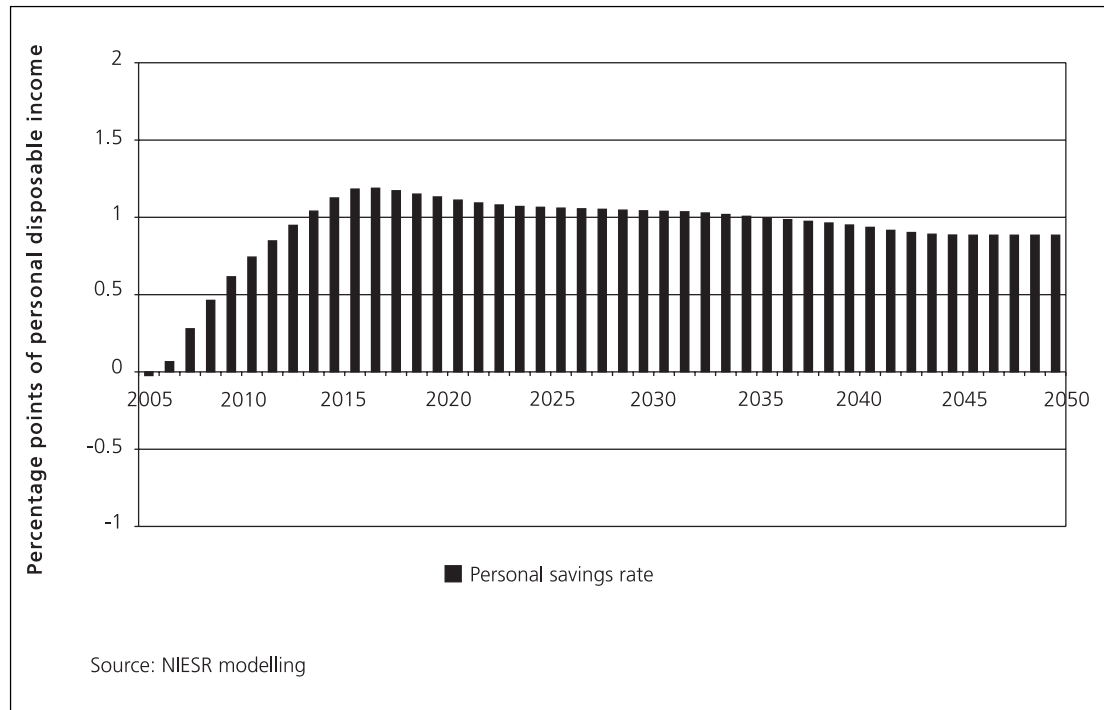
There is uncertainty about the size of the impact of increasing State Pension age on labour supply and thus on the economy as a whole. We have, therefore, also done simulations using a smaller and larger labour market impact³⁶. For these simulations, we have used the same assumptions as those of the previous chapter. In the 'low participation' scenario this leads to about 0.3 million additional workers in 2050, with the number for the 'high participation' scenario being around 1.6 million.

The two scenarios show broadly the same pattern in employment, GDP and GNP. The main difference is that the savings rate in the 'high' scenario shows more of a decline towards the end of the simulation period. This is due to the 'trade-off' between longer working and higher saving as a means to increase retirement income; the high participation scenario implies that individuals have to save less to reach their desired replacement rate in retirement. As a result, the difference between GDP and GNP is smaller in the high participation scenario. The GDP impact in 2050 in the high and low participation scenario is 2.9 and 0.4 per cent respectively. The corresponding GNP impacts are 3.1 and 0.9 per cent respectively.

³⁵ If forward looking individuals know that they will be working longer, but do not expect to die any later then their need for savings to use in their (shorter) retirement is reduced, and hence they may save less as soon as they decide to work longer. This may indeed be why US citizens, who work significantly longer than UK citizens, save less, as Sefton and Kirsanova, 2006, discuss. Given that the model has forward looking consumers, without modelling an adjustment of life expectancy, NiGEM would show a decrease in savings as a result of imposed longer working lives, as optimising agents that work longer would need to put less money aside to get the same income in retirement.

³⁶ The change in the expected life expectancy – three years – remains the same for all scenarios.

Figure 3.7 Savings impacts of longer working and adjusted life expectancy

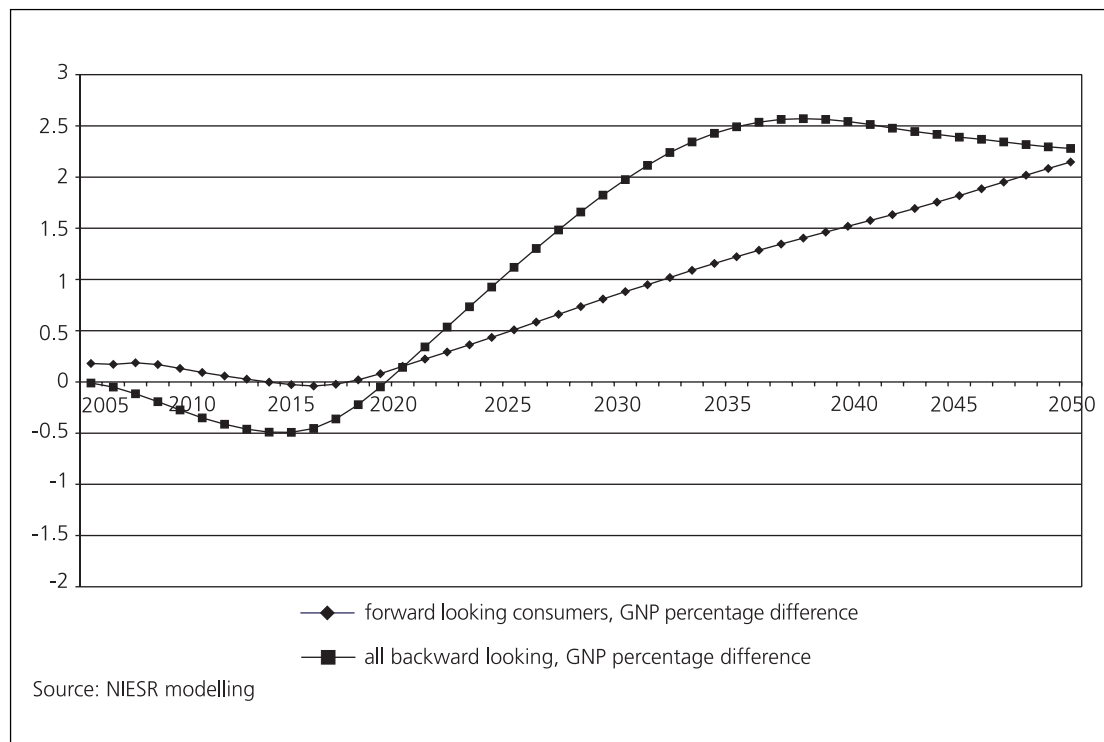


3.9 Extending working life – sensitivities

To assess how sensitive our results are to the modelling assumption of forward looking economic agents, we have also run a number of scenarios with backward looking consumers and backward looking financial, labour and investment markets. If only consumers are backward looking, i.e. they act as if they are completely surprised by the changes in State Pension age, the GDP effects are very similar to those shown above.³⁷ If not only consumers, but also other economic agents behave in a backward looking fashion, effects differ and are more cyclical (see Figure 3.8).

³⁷ However, it is perhaps difficult to imagine a scenario in which individuals are completely surprised by the changes in State Pension age, whilst at the same time we consider them 'forward looking' enough to adjust their life expectancy and act accordingly.

Figure 3.8 Impact of longer working and adjusted life expectancy on economic activity – backward looking behaviour by economic agents



3.10 Modelling the different parts together

Our final scenario puts the two parts of the reform package together. Figures 3.9 and 3.10 show what happens to savings and economic activity if we assume that we can add together the two policies described in the previous sections. This exercise shows that personal savings rates would increase by about 1.5 percentage points, roughly the same as the sum of the separate increases. This higher savings rate is reflected in a higher GNP, which is 2.3 per cent higher than the base case in 2050. On the other hand, GDP and employment are roughly the same as in the scenarios presented in the section on longer working, as the introduction of personal accounts is unlikely to have a substantial impact on these variables.

One can debate whether the impacts of personal accounts and extending working life should be assessed jointly or not. Contrary to the simulations we have presented here, personal accounts could be seen as the vehicle that people will use when they adjust their savings as they become more aware of the fact that they will live much longer than previously anticipated. This seems a realistic assumption, as personal accounts are primarily set up to help those who are currently under-saving. The reason for this under-saving is of secondary importance. It is likely that there are multiple reasons for this. In practice, both the behavioural barriers that were mentioned in the paragraphs on personal accounts and the adjustment of expectations that were modelled in the sections on longer working, are likely to be relevant factors. However, as the size of the savings increase in the longer working scenarios

is already much larger than that in personal accounts, it seems unlikely that in practice there will be a savings impact as large as the one shown in Figure 3.9.

Figure 3.9 Joint savings impact of personal accounts and longer working with adjusted life expectancy

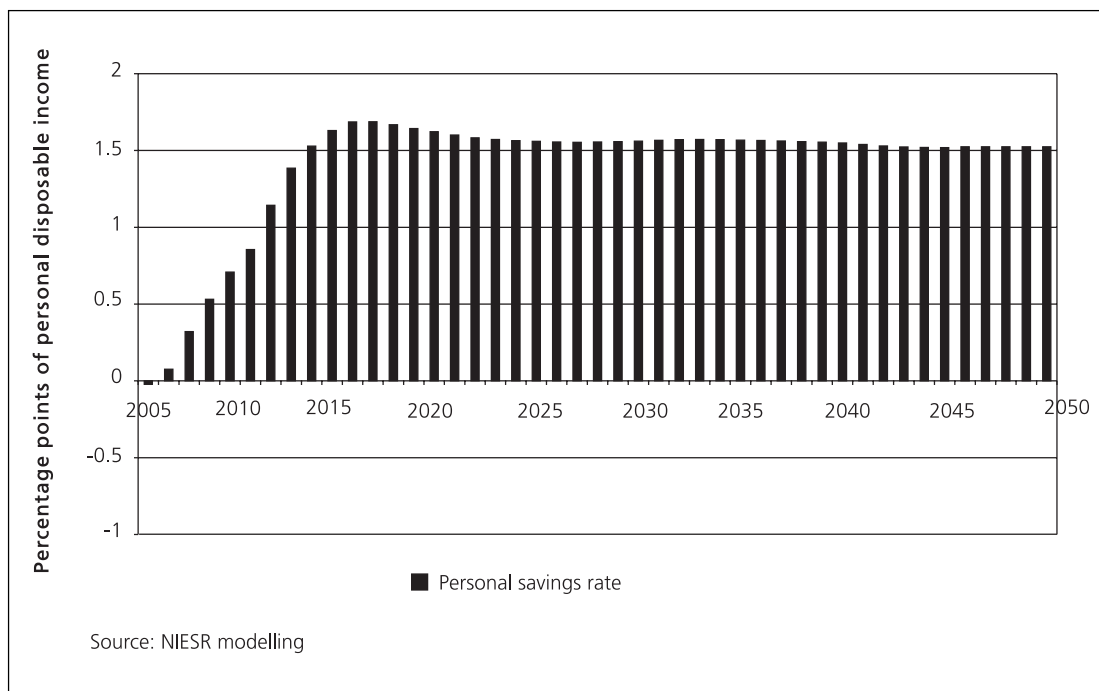
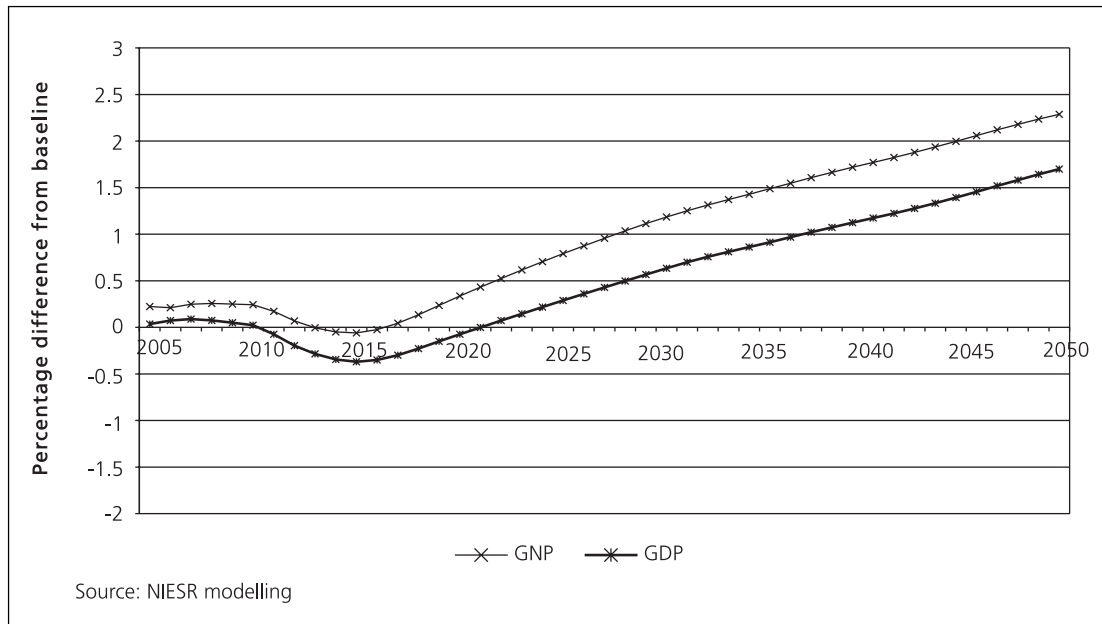


Figure 3.10 Joint impact on economic activity of personal accounts and longer working with adjusted life expectancy



3.11 Conclusion

This chapter has assessed the macroeconomic impact of two major parts of the reform, the introduction of personal accounts and increasing State Pension age which is expected to extend working lives. The results show that the impact of personal accounts is mainly on incomes (as reflected in GNP) and is small but positive. In our central scenario, incomes are 0.2 per cent higher in the long-term. The impact of longer working is both on GDP and incomes and is estimated to be substantially larger. In our central scenario, GDP increases by 1.7 per cent, with incomes being 2.0 per cent higher.

Both sets of simulations were subjected to alternative scenarios and sensitivities. The alternative scenarios show a relatively wide range of possible impacts, but they all remain clearly positive. Our sensitivity analysis has mainly focused on when economic agents (i.e. consumers, businesses) incorporate knowledge of the new policies into their behaviour. If economic agents act as if they have absolutely no prior knowledge, the short-term effects tend to be amplified, though long-term effects tend to be roughly the same as in the case when economic agents anticipate the new policies.

The final section showed what would happen if the effects of the two sets of policies were additive. It was argued that in practice this would not be wholly the case, as personal accounts would likely be an important vehicle for the additional savings that would result from individuals adjusting their life expectancy by three years.

4 Estimating the social welfare impact of consumption smoothing through personal accounts

4.1 Introduction

The introduction of personal accounts, automatic enrolment and minimum employer contributions (as outlined in the Introduction) will have a significant impact on those who are currently not saving for retirement, but who will be once the reforms are introduced. This may be a self-evident fact; however the purpose of this chapter is to focus on these people and explore a method which allows us to quantify the size of the social welfare gain produced by these particular reforms.

However, we do not estimate the social welfare impacts of longer working lives, as this would require developing a model to take account of individual preferences amongst those affected by the change. This would involve estimating the losses or (non-financial) gains individuals derive directly from working. There is no consensus as to the disutility of work and to create a model to estimate it would be beyond the scope of this paper. Neither do we estimate the welfare impacts of the overall increases in the size of the economy as a result of the changes in State Pension age and increases in pension saving. The reason we focus on the introduction of personal accounts in this chapter is that it is a relatively simple example to use to explore how social welfare impacts of reforms could be measured.

4.2 Analytical framework

Saving for retirement is central to the economic concept of consumption smoothing and, therefore, to maximising wellbeing throughout life. Individuals have varying levels of income in different periods of their life. For example, the majority of individuals in full-time education generally have low incomes and jobs earlier in life are likely to generate smaller incomes than those later in someone's career. Most people's consumption, however, does not follow this income pattern exactly; broadly speaking most individuals borrow when they are younger and on relatively low incomes and save throughout their working life to ensure a higher standard of living in retirement than that afforded by their State Pension entitlement only. This concept implies that there is a benefit in transferring income from periods of relatively high to those of relatively low income, in other words to smooth income over an individual's lifecycle through saving and thus facilitating consumption smoothing.

Current pension saving behaviour does not conform to the conditions required to have optimal outcomes in terms of consumption smoothing throughout life: there are both demand and supply problems. In *Security in Retirement: towards a new pension system*³⁸, the White Paper published in May 2006, it was estimated that at least seven million people are under-saving for retirement. This means that their current savings behaviour and wealth holdings are such that they are at risk of a significant fall in living standards at retirement and they are not smoothing consumption in a way to maximise utility over their lifetimes. There are a number of different reasons why demand and supply do not live up to the perfect economic standard as set out in the introduction:

- Informational problems: there is widespread evidence that people have only a limited understanding of pension issues. For example, a survey carried out on behalf of the Pensions Commission in 2005 found that 20 per cent of people felt that they knew little or nothing about pension issues.³⁹ On National Pensions Day in March 2006 over 1000 people across the UK debated pension reform. At the start of the debate only 13 per cent of participants agreed with the statement 'I know a lot about pensions.' Even if individuals did understand the basics, it is highly complex to work out how much they should be saving in pensions, or other products, or to make detailed asset allocation decisions.

³⁸ DWP, 2006.

³⁹ Pensions Commission, 2005.

- Behavioural economics suggests that there are inherent barriers for individuals to save optimally even if the informational barriers were overcome. Inertia and procrastination mean that individuals, even when they understand pensions and realise that they need to be saving, find it hard to begin to save. Myopia means that people are short-sighted, and are unable to clearly see the needs of their future self. Even though they would like to save, current spending pressures often seem more important than saving for the future. In economic terms, this implies that individuals have higher discount rates of future benefits the closer they get to the point of receiving the benefit (e.g. hyperbolic discount rates). Individuals also fail to review savings behaviour over time and fail to account for changes in circumstances, such as increases in life expectancy, changes in rates of return or earnings.
- The problems on the demand side for pensions also create problems on the supply side. Firstly, the tendency of individuals to underestimate their future needs as well as to delay relatively complex decisions, individuals need to be actively persuaded by providers of the need to have a pension on an individual basis. This is particularly true when their employers are disengaged from pension provision. Secondly the complexity of pension products means that individuals need to be protected by regulation that prevents misselling of pensions. Both of these issues make the process of selling a pension expensive which leads to high annual management charges to recoup the costs to the provider of selling a pension, this will have a significant impact on fund growth. This problem is exacerbated when employers are small because providers find it more difficult to achieve economies of scale.

The proposed package of reforms aims to overcome these barriers and enable more people to save.

- The minimum employer contribution helps people to see saving is valuable, overcoming the informational problems of working out whether to save. The proposed balance of contribution rates means that the contribution by the individual is effectively matched by the combination of the tax relief and the employer contribution, thus increasing the value of saving. The analysis presented in *Financial incentives to save for retirement*⁴⁰ shows that the employer contribution and tax relief tends to improve the incentives for individuals to save. As the incentive to save is increased, the participation rate in pensions also increases. Evidence shows that the existence of an employer contribution significantly increases participation in an employer pension⁴¹. The existence of an employer contribution is a clear signal to the individual that saving in a pension is a good idea, which may overcome some of the behavioural barriers to saving.

⁴⁰ McCauley and Sandbrook, forthcoming.

⁴¹ McKay, 2006.

- Automatic enrolment into a pension will contribute towards overcoming the informational problem of working out in which product the individual should save. It also tackles behavioural barriers, such as inertia, that currently prevent individuals from saving, even when they recognise that it is in their interests to do so. Evidence suggests that automatic enrolment is one of the most effective ways of combating people's tendency not to act when faced with difficult financial decisions. It will play a key role in achieving high participation rates for personal accounts and existing employer schemes. The Employers' Pension Provision 2005 survey findings show a strong link between automatic enrolment and increased levels of pension scheme membership. Within private firms with 20 or more employees, the proportion of employees who were in a pension averaged 60 per cent where the firm used automatic enrolment. This compared to 41 per cent for traditional opt-in pension schemes.⁴² In case studies of four private sector schemes, automatic enrolment was associated with increased participation rates.⁴³ For example, in one firm the participation rate went from 25 per cent for existing employees, to 80 per cent for new joiners who were automatically enrolled.
- The design of the personal accounts scheme will tackle the causes of high charges in personal pensions, by minimising the reasons for individuals to stop contributing to a given pension fund and the up-front marketing and distribution costs. Through automatic enrolment the need for up-front marketing costs is reduced. Furthermore the clearing-house allows individuals to contribute to the same fund when they change jobs, which significantly reduces the cost and hence allows a lower annual management charge. This reduction in the charges increases the potential retirement income for an individual producing a real efficiency gain.

By tackling these inherent problems personal accounts should better enable many individuals to save for retirement. Improved income and hence consumption smoothing should increase individual welfare. The approach taken in this piece of work is to focus on the welfare impacts of improved consumption smoothing across the lifecycle.

It is possible to look at the benefits of saving in other ways, for example looking just at the financial returns. *Financial incentives to save for retirement*⁴⁴ focuses on the financial rewards of saving, but does not account for the relative value of that saving. There are also other potential sources of welfare gain through the creation of

⁴² The difference in membership between automatic enrolment and traditional opt-in mechanisms is larger when looking at the median level of membership rather than the mean.

⁴³ Horack and Wood, 2005. Note: other factors including a required employee contribution, supporting communications and employer commitment may have influenced the outcomes achieved.

⁴⁴ McCauley and Sandbrook, forthcoming.

personal accounts; however these are not included in this analysis. One possible welfare gain is that individuals saving in personal accounts who would not have saved otherwise may have increased confidence about retirement as they have started to make provision for retirement.

4.3 Methodology

As explained in the previous section, the approach taken to measure the social welfare impact of personal accounts is to consider the value of improved consumption smoothing. Consumption is the economic focus, rather than income smoothing, because it is the actual consumption that is assumed to generate utility not the receipt of income in its own right. However, as consumption is difficult to measure it is assumed that income measures consumption opportunities. Therefore, social welfare changes are measured in this paper by looking at income.

The methodology employed is relatively simple in outline. It involves estimating the value of income smoothing for the individual and aggregating this up to the population for a given year and then adding together the results over time (we are looking at the period from the introduction of personal accounts in 2012 to 2050). The approach taken involves many simplifications and particular assumptions which could have an impact on the results. However, as this paper is an exploration of how the welfare impacts could be assessed, using a simplified model allows the most important factors to be considered.

Outline of method:

1. Divide population into groups based on income and age.
2. Estimate the weighted NPV of the utility an individual derived from saving in personal accounts, for representative individuals from each group.
3. Aggregate NPV of saving to the number of people saving in personal accounts in each given year (making an allowance for the proportions of saving that are new and that are transferred from other vehicles).
4. Estimate NPV of the gain over time by in turn discounting NPV for each year and aggregating over the time period (2012-2050).

(1) Segmenting the population: The impact of personal accounts and the default contribution level will differ depending on individual characteristics, most importantly age and income level. This is firstly because the income that individuals will receive in retirement from the state will vary over time as the State Pension system evolves. Secondly, the income an individual can receive from personal accounts will depend on the length of time they save into personal accounts. To enable these aspects to be captured we have split the population into a number of income groups and age groups.

(2) Estimating the weighted NPV of the utility an individual derived from saving in personal accounts: The costs of pension saving occurs significantly before the benefits are realised by the individual, therefore, we need to use a technique to value costs and benefits that fall in different time periods. The NPV is calculated by discounting future benefits and costs using an appropriate rate, and subtracting the total of discounted costs from the total of discounted benefits. Discounting takes into account the delay faced by the individual in receiving an income stream, in this case the pension. The discount rate can include a variety of different factors, such as the rate of time preference (which measures the desire to consume now rather than in the future), the uncertainty of the income stream and the interest rate that could have been achieved on any investment option.

To estimate the value of the consumption smoothing across the lifecycle we attach weights to different levels of consumption. In doing this we have taken a deliberately simple approach. Instead of using an inter-temporal consumption function which allows for the optimisation of consumption over time taking into account income, the rate of time preference, interest rates and so on, we have adopted a simple approach drawing on the Green Book⁴⁵. This simplified approach follows the Green Book's approach to measuring the value of redistribution. This approach is based on the relative income levels of the individuals whose income is being redistributed. The central assumption is the existence of diminishing marginal utility of consumption, which means that an additional £1 of consumption is valued less as income increases. This assumption implies that individuals with different income levels will have different levels of (marginal) utility. We have adapted this approach to examine the impact of redistributing income across the lifetime, in which the welfare impact of saving is the value of the redistribution of income between the different time periods⁴⁶.

The Green Book adopts a simple functional form to describe utility:

$$\text{Utility} = \log(\text{consumption})$$

which means that the marginal utility of consumption is equal to the inverse of consumption, or:

$$\delta U(c)/\delta c = 1/c,$$

so if consumption halves, the marginal utility of consumption doubles.

⁴⁵ HM Treasury, 2003.

⁴⁶ An underlying simplifying assumption is that individuals have the same utility function throughout their lifetime. We are not exploring redistribution between individuals because this is not a major feature of personal accounts. An alternative would be to use an intertemporal utility function, however, the Green Book framework adopted here would not be feasible under this approach.

Thus to take a pension example, an individual, who earns £20,000 while working, receives £10,000 in State Pensions. He/she contributes £1,000 to a private pension which pays out £1,000 in retirement.⁴⁷

$$\text{utility gained} = \text{pension/retirement income} = \text{£1,000/£10,000}$$

$$\text{utility foregone} = \text{contribution/working income} = \text{£1,000/£20,000}$$

Net change in utility = utility gained – utility foregone

$$= 1,000/20,000 \text{ }^{48}$$

Multiplying this abstract gain of 1,000/20,000 units of utility with working life income, we arrive at a net gain of £1,000.

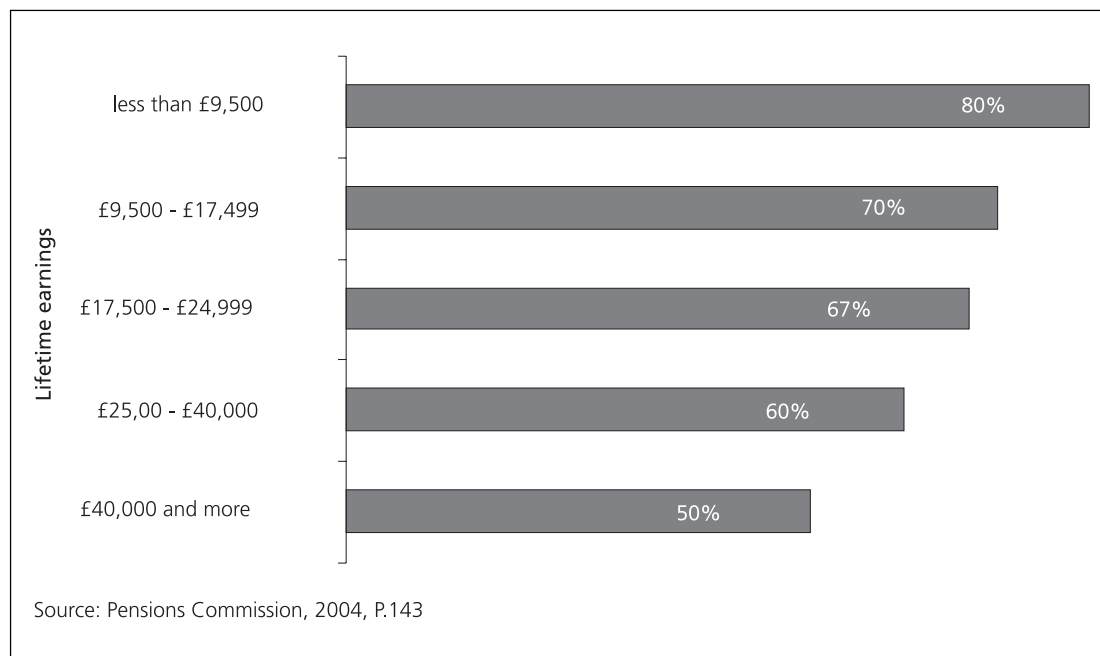
Although individuals seek to smooth their income into retirement, evidence suggests that unconstrained individuals do not seek to fully replace their in-work income, and that gross replacement rates, the ratio of retirement income to in-work income, of less than 100 per cent will deliver the same living standards in retirement as they do in working life. This is due to the fact that individuals often face lower expenditure in retirement, for example, because they no longer face work related costs, they may have paid off their mortgage, they no longer have to pay pension or national insurance contributions, or indeed because some of the consumption during their working lives is now compensated for by more State Pension age time. We have, therefore, adapted the weighting approach to take into account the benchmark replacement rates used by the Pensions Commission, which was confirmed through a later survey which asked individuals about their desired income in retirement.⁴⁹ Figure 4.1 shows the range of replacement rates used, which vary according to income as it is assumed that individuals with higher earnings do not need to replace as much income in retirement to maintain their standard of living.

⁴⁷ This example is simplified, so the impact of tax relief and investment growth is not included.

⁴⁸ The unit '£' cancels out in the calculation.

⁴⁹ Pensions Commission, 2005.

Figure 4.1 Benchmark replacement rates assumed for pensions commission modelling: percentage of gross earnings



Saving in personal accounts at the default level will not necessarily put individuals on their benchmark replacement rate; however, it will enable more individuals to move closer to their target level of provision. The benchmark replacement rate for the median earner according to the Pensions Commission is 67 per cent. To adapt the marginal utility of consumption equation to account for individuals not wanting 100 per cent replacement rate we create a weighting function based on how close the individual is to the benchmark replacement rate. The closer someone gets to the benchmark replacement rate the smaller the weighting. The replacement rate measures income, but this is assumed to act as a proxy for levels of consumption both in work and in retirement as consumption opportunities are based on income over an individual's lifetime. The weighting function, W , is estimated using the following equations:

$$\begin{aligned}
 W &= \text{Benchmark consumption} * (1/\text{consumption in retirement}) \\
 &= \text{Benchmark replacement rate} * (1/\text{achieved replacement rate in retirement}) \\
 &= \frac{\text{Benchmark replacement rate}}{\text{Achieved replacement rate}}
 \end{aligned}$$

Therefore, if an individual were seeking to fully replace their income, the value of redistributing income from working life to retirement would be identical to the original unweighted formula above. However, if the benchmark replacement rate is less than full replacement of income, then the weight applied to the consumption function will adjust for this.

Table 4.1 sets out the range of weightings used for this analysis based on someone with earnings just above the median. The high weighting is based on the replacement rate achieved from state provision alone. The first pound of saving, therefore,

increases people’s replacement rate from this point and, therefore, is the most valuable slice of redistribution given our assumed shape of the consumption function. The low weighting is based on the replacement rate the median earner would achieve if they saved in personal accounts at the minimum level throughout working life.⁵⁰ This approach measures the value of the final £1 put into personal accounts, which is the least valuable slice of redistribution. The central assumption is the average of these two and can be seen as the weighting on the average pound contributed to personal accounts.

Table 4.1 Weighting factors applied under the different scenarios assuming annual earnings of £25,000

Benchmark replacement rate	60%
Replacement rate achieved with no saving	34%
Replacement rate achieved with saving at default level	45%
High weighting (benchmark replacement rate/replacement rate with no saving)	1.8
Low weighting (benchmark replacement rate/replacement rate with saving)	1.3
Average weighting	1.6

The achieved replacement rate is based on the State Pension system proposed in the White Paper and has been measured on a gross income basis, but including entitlement to Pension Credit.⁵¹

The next step in estimating the weighted NPV of pension saving is to estimate the income stream produced by pension saving. This is estimated by calculating the pension pot that an individual can accumulate over time from saving £1 in personal accounts. When the person reaches State Pension age, it is assumed that they annuitise this income which then produces a guaranteed income for each year of their retirement. Then, to estimate the weighted NPV the annuity income is weighted by the appropriate factor and then discounted to account for the delay in receiving this income stream⁵².

Not all saving in personal accounts is assumed to be new saving. It is likely that some of the saving in personal accounts is saving transferred from other vehicles. We estimate that there is a positive value to this transfer of saving, because if an

⁵⁰ In this model we have simplified the contribution rate to be eight per cent for the individual, which takes into account the individual’s and the employer’s contributions as well as tax relief. Our model does not consider possible second-round effects of employer contributions, such as employers passing on extra costs through wages or prices, which would change the impact on the gains to individuals, as these are extremely difficult to predict. This does not, however, make our model less robust, as it is still able to give a useful indication of the social welfare benefits of the introduction of personal accounts.

⁵¹ Entitlement to Council Tax Benefit has been excluded from this modelling.

⁵² Assuming the whole fund is converted to an index linked annuity.

individual, switches personal accounts are likely to have lower charges than the other vehicles. To estimate the value of switching saving the weighted NPV is calculated for the original savings vehicle (assumed to have stakeholder pension charges of 1.5 per cent AMC for the first ten years with one per cent AMC thereafter) and the gain from switching is the difference between the weighted NPV for other saving compared to the NPV of saving in personal accounts.

Table 4.2 sets out the estimated NPV and weighted NPV for a man aged 30 in 2012 making a £1 contribution to personal accounts in 2012 using the low weighting factor. This shows that if the income for personal accounts is not weighted there is no welfare gain for saving in a personal account; this is because we conservatively assume that the discount rate applied to future income is greater than the net return achieved on saving. However, once the value of redistribution of income over time is included there is a gain from saving in a pension. It can be beneficial for individuals who are currently saving into other savings products with similar expected returns to cease to do so and start saving in personal accounts provided that charges on the former are comparatively high.

Table 4.2 Net present value of saving £1 for a man aged 30 in 2012 saving in 2012

	Net present value	Weighted NPV
In personal accounts	-£0.13	£0.20
In personal accounts instead of other savings product	£0.17	£0.23

Notes: The NPV of saving in personal accounts is negative because the simplified approach assumes that all contributions (eight per cent) are made by individuals. If this was calculated on the share of contributions actually made by individuals (four per cent) this would be significantly higher.

(3) Aggregating the results to the population: We are assuming a simple, non-weighted, utilitarian, aggregate welfare function as the sum of individual utilities. Therefore, to estimate the social welfare gain we have to aggregate the individual utility functions. Thus the approach is to aggregate the estimated weighted NPV for each sub group weighted by the relative size of the group. This is based on estimates by the DWP of the group likely to be in personal accounts over time.⁵³

The benefit of saving is estimated by calculating the value of each £1 contribution. Therefore, to be able to add each group together, we estimate the total contribution made each year by each group, which is eight per cent of earnings between £5,000 and £33,000. Then, to estimate the total welfare gain of personal accounts, this is multiplied by the weighted NPV of that group for that year of contributions.

⁵³ DWP, 2006.

As we have explained above, a proportion of saving in personal accounts will be saving diverted from other forms of saving. A research report, conducted by PricewaterhouseCoopers, examining the likely impact on savings levels of personal accounts, supports an assumption that a significant part of saving in personal accounts will be new saving.⁵⁴ Therefore, in aggregating the results we have assumed that a proportion (60 per cent) of the contributions made by each subgroup each year is new saving, and has the weighted NPV of personal accounts applied to the contributions. The rest of the saving is switched saving, so that proportion of contributions (40 per cent) is multiplied by the weighted NPV of switched saving.

(4) Estimating the NPV over time: Once the aggregate NPV of contributions in each year has been calculated, as set out above, this can be used to estimate the social welfare impact over time. This is estimated by taking the estimate of the benefit of contributions in each year and calculating the net present value of this series. This has to be a discounted sum of the individual years' benefits, because the in-year estimate is estimating the value of the contributions in that year, and then we need to discount that back to today to estimate the value of the increase in wellbeing resulting from the introduction of personal accounts over time.

4.4 Limitations and weaknesses in methodology

This approach and method to estimate the welfare gain from personal accounts is simplified as it is an exploration of how the welfare impacts of personal accounts could be estimated. There are a number of things that have been excluded from the analysis which could impact on the results.

The model is only including the impact of contributions made between 2012 and 2050. It is likely that the impact of personal accounts on savings behaviour will continue past this point, therefore, the welfare impact will continue over time, and potentially increase further.

The analysis of what income individuals receive in retirement is based on constant earnings profiles and there is no account taken of household size neither during individuals' working lives nor in their retirement.

This means that in retirement individuals' welfare position is based only on their own earnings and contributions history, not on the position of their household. The simplified consumption function does not account for whether individuals would choose to save in a different pattern depending on their household size (such as saving very little when they have young children and then saving more when the children leave home).

⁵⁴ Hawksworth, 2006.

However, in using an individual basis to consider savings decisions we are following the treatment by Kirsavnova and Sefton, (2006), which was informed by empirical work showing that lifecycle savings patterns could be identified at the individual but not household level.⁵⁵

As mentioned above, our analysis uses a simple earnings function in which each individual has constant earnings in earnings terms throughout their working life. The value of saving is measured relative to a replacement rate target and an estimate of State Pension entitlement which assumes constant earnings over time. If individuals benefit from earnings which vary in earnings terms over time, the value of redistribution over their lifetime will have a different pattern. However, if individuals retirement aspirations are based on their income towards the end of their working life, the value of redistributing income from working life to retirement is likely to be higher, which means the welfare gain could be larger. To fully account for this the model would have to allow individuals to defer saving to later in working life when their income is higher once discount rates and investment returns are taken into account, which was beyond the scope of this exploratory paper.

The log utility function as adopted by the Green Book has been chosen to be in line with Government best practice in evaluating policy options, but is also supported by a wide range of academic research and avoids having to make more assumptions about parameters than is strictly necessary. This is a simplification, but it is precisely for this reason that log utility is agreed in academic circles to be extremely useful for modelling purposes.⁵⁶ One assumption within the log utility function is that there is no accounting for risk aversion. This means that the variation in investment returns and the impact this could have on individuals, in affecting their final income, but also in creating uncertainty about retirement income during working life has been excluded. If the variation in investment returns was considerable, then this could reduce any aggregate welfare benefit. However, if higher estimates of risk aversion were included, this would increase the value of redistributing income to retirement to avoid large drops in consumption.

In addition to these limitations of the adopted model, potential second best effects on other related potentially distorted markets have not been quantified but we do not expect them to be large. We have identified two markets which may both be distorted and be affected by the introduction of personal accounts: the labour market for older workers and the market for personal debt.

⁵⁵ Kirsavnova and Sefton, 2006.

⁵⁶ See, for example, Romer, 2001.

- An alternative to saving more for retirement is to work for longer, and, as the White Paper identifies, the labour market for older workers is currently distorted and older workers may find it difficult to find jobs which are flexible to their requirements. Therefore, the introduction of personal accounts, which will enable more people to save more for retirement, may mean that the distortions of the labour market become less significant to individuals, which will improve welfare. However, the magnitude of this benefit is not possible to measure and would in any event be reduced by policies on extending working life in the White Paper since they should improve the efficiency of the labour market. Chapter 2 sets out the impacts of longer working lives on GDP and Chapter 3 sets out combined macroeconomic modelling of both changes in saving as well as changes in working life.
- Individuals can choose between saving and repaying borrowing to smooth consumption, and there are worries that the market for short-term debt is distorted by excessive marketing and some of the same behavioural economics issues that impact on long-term saving. The introduction of automatic enrolment is intended to lead to more individuals saving for retirement, but it may also encourage some individuals to take out short-term loans to finance current consumption. This may then lead to a further distortion to individuals' portfolios as they find themselves with significant short-term debt and inaccessible long-term savings with a lower rate of return, which reduces the welfare gains from personal accounts. We believe that many people with expensive debts will opt out of personal accounts (partly as a result of information products specifically targeted at this group), and that the cost will be small.

This analysis of the income smoothing impacts of personal accounts does not include anything on the potential welfare effects of increased savings leading to higher economic growth, or the economic impact of reduced consumption during working life. Chapter 3 explores the macroeconomic impacts of the reform package. This paper does not attempt to measure other aspects of increased welfare from saving, such as the increased sense of security about retirement as a result of saving.

4.5 Assumptions

Our model assumes:

- 3.5 per cent real rate of return, which is reduced by 0.5 per cent for saving in personal accounts or by 1.5 per cent for the first ten years and one per cent thereafter in other pensions, to account for the annual management charge.

- A social discount rate of 3.5 per cent in the short-term (then decreased to long-term rate of three per cent to account for uncertainty) as recommended in the Green Book guidance. The rate of return does not exceed the discount rate in our model, which thus avoids illusory welfare gains. If looked at on an individual level discount rates may of course vary, but in the context of this model it is neither practical nor useful to apply a variety of different rates. Instead we apply a sensible social discount rate in line with based on the Green Book recommendations;⁵⁷
- An annuity rate of 5.6 per cent based on a single-life price linked annuity with 20 year life expectancy is purchased with the fund;
- Personal accounts are introduced in 2012; and
- The net present value is calculated on the benefits of contributions up to 2050.

4.6 Results

Table 4.3 sets out the central range of results, using different assumptions on the proportion of saving which is additional to current savings levels.

Table 4.3 Estimated social welfare impact of personal accounts contributions from 2012 - 2050

2012 – 2050 NPV	Additionality		
	Low (50%) £ (bn)	Central (60%) £ (bn)	High (70%) £ (bn)
Weighting			
Low	30	30	30
Average	40	45	45
High	50	55	60

Using the most conservative assumptions and this simple methodology; that is, only 50 per cent of saving in personal accounts is new saving, and that the weighting used places a low value on redistribution of income over the lifetime, even the simple method set out above produces an estimate of a welfare gain equivalent to £30 billion in NPV terms. This means that people over time could feel as if they had £30 billion more in lifetime income. Using the most optimistic of the assumptions gives a gain which could be as large as £60 billion.

⁵⁷ HM Treasury, 2003.

4.7 Sensitivities

As this analysis is driven by assumptions, it is important to look at the impact of varying assumptions. We look in turn at the key sensitivities, while using our estimates on the additionality of saving (central at 60 per cent) and the weighting of income at their respective central levels and keeping the assumptions on stakeholder annual management charges, annuity rates and life expectancy post retirement constant.

It is likely that the discount rate and the rate of return over time move in line, if there is a significant difference between the discount rate and the rate of return then the rate of return will change over time in response to the level of available capital. Table 2.3 sets out the impact of the discount rate and rate of return jointly varying while holding the other assumptions constant. Reducing the discount rate and rate of return increases the social welfare gain, because the impact of the discount rate dominates. The lower discount rate significantly increases the benefits as individuals become more willing to wait for consumption.

Table 4.4 Sensitivity analysis of varying the discount rate and rate of return

	Discount rate and gross rate of return		
	2.5% £ (bn)	Central assumption £ (bn)	4.5% £ (bn)
Welfare benefit	55	45	35

By varying replacement rates we change the weighting applied, which measure the value of redistribution. In the high case, benchmark replacement rates are ten percentage points higher than they were in the central case. This has the impact of increasing the high weighting for the median earner, presented in Table 2.2 from 1.6 to 1.9. However, the impact of increase in replacement rates is dampened because although the weighted NPV of saving in personal accounts increases, the weighted NPV of switching saving from other vehicles remains constant. This is because the value of switching is the difference between the weighted NPV of saving in a Personal Account and other vehicles, and these move together when the target replacement rate is increased.

Table 4.5 Sensitivity analysis of different benchmark replacement rates

	Replacement rate		
	Lower by 10% £ (bn)	Central assumption £ (bn)	Higher by 10% £ (bn)
Welfare benefit	20	45	65

The impact of changing the annual management charge to 0.4 per cent or to 0.6 per cent also impacts on the welfare gain, as this affects the efficiency gain from saving in personal accounts relative to stakeholders as well as affecting the gain from saving in personal accounts. Where the charges are higher the welfare gain is smaller.

Table 4.6 Sensitivity analysis of varying the annual management charge

	Annual management charge		
	0.4% real £ (bn)	Central assumption £ (bn)	0.6% real £ (bn)
Welfare benefit	50	45	40

4.8 Conclusion

This analysis suggests that a conservative estimate of the social welfare gain associated with the introduction of personal accounts enabling better consumption smoothing across the lifecycle is substantial and positive. This estimate is subject to a wide range of uncertainty. However, this method of estimating a welfare gain from increased saving and quantification does suggest that there is a benefit to society in increasing savings over time.

5 Conclusion

The Government White Paper *Security in retirement: towards a new pensions system*, published in May 2006, contained a pension reform package that is designed to provide a long-lasting framework. It also announced the intention to produce this technical paper, to assess in more detail the economic and social welfare impacts of two particular aspects of the reforms, the introduction of personal accounts and measures to extend working life. This paper explored possible methodological approaches to measuring economic and social welfare effects and provided quantitative estimates. This paper is not a definitive statement on the magnitude of the effects of pension reform, about which there is substantial uncertainty, but suggests the direction and possible scale of the impacts.

This paper has looked at two different ways of measuring the impact of the introduction of State Pension age policies and personal accounts. It first considered economic effects, in the context of which two complementary approaches are used. The first is a partial approach that can quickly provide estimates of the economic effects of increasing State Pension age based on assumptions around changes in employment rates. The second, more comprehensive, method uses NiGEM, a macroeconomic model of the UK economy developed by the National Institute of Economic and Social Research (NIESR). With this model, both the economic effects of increases in State Pension age and the introduction of personal accounts were analysed. Finally, an innovative method to estimate the social welfare impacts of personal accounts was developed.

In measuring the economic impacts, two measures of the size of the economy were used. Firstly, gross domestic product (GDP), which is a measure of the total value of final goods and services produced within a country's borders in a year. Secondly, gross national product (GNP) which is the value of all goods and services produced in a country in one year, plus income earned by its residents abroad, minus income payable to non-residents.

Chapter 2 used a simple microeconomic approach to estimate the impact of increasing State Pension age. The analysis suggests that the changes to State Pension age and the associated policies to extend working lives will have a positive economic impact through additional labour supplied by older workers. In the central

scenario, this would increase GDP by around 1.4 per cent. The chapter presents a range of results to reflect the uncertainty surrounding the employment response. In the analysis, the uncertainty surrounding future trends in the earnings of older workers is also discussed and sensitivity analysis shows to what extent different assumptions on earnings profiles would lead to different results.

The subsequent chapter used a dynamic general equilibrium model to assess the macroeconomic impact of increasing State Pension age as well as the introduction of personal accounts. The results show that the impact of personal accounts is mainly on incomes (as reflected in GNP) and is small but positive. In our central scenario, incomes are 0.2 per cent higher in the long term. The impact of longer working is both on GDP and incomes and is estimated to be substantially larger. In our central scenario, GDP increases by 1.7 per cent, with incomes being 2.0 per cent higher.

Both sets of simulations were subjected to alternative scenarios and sensitivities. The alternative scenarios show a relatively wide range of possible impacts, but they all remain clearly positive. Our sensitivity analysis has mainly focussed on when economic agents (i.e. consumers, businesses) incorporate knowledge of the new policies into their behaviour. If economic agents act as if they have absolutely no prior knowledge, the short-term effects tend to be amplified, though long-term effects tend to be roughly the same as in the case when economic agents anticipate the new policies.

The final section showed what would happen if the effects of the two sets of policies were additive. It was argued that in practice this would not be wholly the case, as personal accounts would likely be an important vehicle for the additional savings that would result from individuals adjusting their life expectancy by three years. The overall impact of changes to State Pension age and the introduction of personal accounts on UK incomes is likely to be in the range of 0.9-3.1 per cent. In terms of today's economy, this is equivalent to around £11-38 billion.

The fourth and final chapter developed a methodology to estimate the social welfare benefit of introducing personal accounts by aggregating the welfare of all individuals in society. The results suggest that a conservative estimate of the social welfare gain associated with the introduction of personal accounts - which enables better consumption smoothing across the lifecycle - is substantial and positive.

The estimates of the different impact presented in this paper should not be taken as definitive; if different methods were adopted it would be possible for a different range of results to be produced. The methodological approaches developed in this paper are innovative and, as the nature of this paper should be seen as consultative, we welcome other views on the issues presented.

Appendix

Savings and investment within NiGEM

For the scenarios we analyse here, the description within NiGEM of household sector savings and of national savings and investment deserves some comment. Households receive income from employment, transfer income from the public sector, and income from households' net financial assets. Households' financial assets include assets held overseas, government debt, deposits held in monetary institutions and equity holdings. Of that income households pay tax, consume and save. In the long run the household savings ratio, i.e. the share of households' disposable income that is not consumed, is determined by the ratio of household wealth to income. Household wealth includes financial assets less financial liabilities, the majority of which is mortgage debt, and housing wealth. In the short run the savings ratio is affected by different dynamics between consumption expenditure, the two wealth components and disposable income. The estimated equation for household consumption, embodying the long run savings ratio described here, is reported in Barrell *et al.* (2003), and in most scenarios we utilise the assumption that individuals form (correct) expectations about their future incomes when making their consumption decisions in relation to 'permanent income'.

By identity a change in household sector savings must be mirrored in a change in investment either at home or abroad, unless it is associated with an offsetting change in saving elsewhere in the economy. Within NiGEM three categories of domestic investment are modelled separately. The company sector invests in capital so that in the long run the marginal rate of return to capital equals its real user cost. The underlying production function is CES (constant elasticity of substitution) and this means that it is the capital-output ratio that is determined by the real user cost of capital. Government investment is determined by policy in the short run. In the longer term, all else equal, it is expected to grow in relation to needs reflected in the age structure of the population. Housing investment rises with household sector personal incomes and is reduced by a rise in the long-term real interest rate.

Government saving is determined by tax revenues less public sector expenditures, and these are determined endogenously within NiGEM, with targets set for the level of government borrowing. Company sector savings are determined as the residual category of the savings-investment identity. The excess of investment over saving for the UK economy as a whole is represented by the current account deficit of the balance of payments. Within NiGEM competitiveness, export and import demand are all endogenously determined and reflect trade with a broad range of other economies. Income derived from net foreign assets held abroad, or net property income, is determined by rates of return on assets held abroad and on foreign held assets in the UK. Net foreign assets reflect the cumulated surpluses on the current account.

References

- Barr, N. (1998) *The Economics of the Welfare State*, 3rd edition, Oxford: Oxford University Press.
- Barrell, R. (2004) 'UK Savings and Pensions', *National Institute Economic Review*, Vol. 190, No. 1, pp. 55-57.
- Barrell, R., Choy, A. and Riley, R. (2003) 'Consumption and housing wealth in the UK', *National Institute Economic Review*, Vol. 186, No. 1, pp. 53-56.
- Barrell, R. and Dury, K. (2003) 'Asymmetric labour markets in a converging Europe: do differences matter?', *National Institute Economic Review*, Issue 183, No. 1, pp. 56-65.
- Blanchard, O.J. and Fischer, S. (1989) *Lectures on Macroeconomics*, Cambridge, MA: MIT Press.
- Blöndal, S. and Scarpetta, S. (1999), 'The Retirement Decision in OECD Countries', OECD Economics Department, *Working Papers Series*, No.202.
- Department for Work and Pensions (2005), 'Green Paper: A new deal for welfare: Empowering people to work', London: The Stationery Office.
- Department for Work and Pensions (2006), 'White Paper: Security in retirement: towards a new pension system' London: The Stationery Office.
- Department for Work and Pensions (2006), 'White Paper: Security in retirement: towards a new pension system. Regulatory Impact Assessment and Technical Appendices' London: The Stationery Office.
- Frese, M. and Mohr, G. (1987), 'Prolonged unemployment and depression in older workers: a longitudinal study of intervening variables', *Social Science & Medicine*, Vol. 25, No. 2, pp. 173-178.
- Frey, B. and Stutzer, A. (2002), 'What can Economists learn from happiness research?', *Journal of Economic Literature*, Vol. 40, No. 2, pp. 402-435.
- Gallo, W., Bradley, E., Siegel, M. and Kasl, S. (2000), 'Health Effects of Involuntary Job Loss among Older Workers', *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, Vol. 55, pp. 131-140.

Hawksworth, J., PricewaterhouseCoopers (2006) 'Review of research relevant to assessing the impact of the proposed National Pensions Savings Scheme on household savings', *DWP Research Report Series*, No. 373.

H.M. Treasury (2003) *The green book: appraisal and evaluation in central government*, London: The Stationery Office.

H.M. Treasury Economic Assessment Team (2004), *Macroeconomic Model Documentation*.

Humphrey, A., Costigan, P., Pickering, K., Stratford, N. and Barnes, M. (2003), 'Factors affecting the labour market behaviour of older workers', *DWP Research Report series*, No. 200.

Kahneman, D. (2003) 'A Psychological Perspective on Economics', *American Economic Review*, Vol. 93, No.2, pp 162-168.

Kirsanova, T. and Sefton, J. (2006) 'A Comparison of National Saving Rates in the UK, US and Italy', *European Economic Review* (forthcoming).

McCauley, E. and Sandbrook, W. (forthcoming) *Financial incentives to save for retirement*. DWP Research Report Series, No.403.

Meadows, P. (2004), *The economic contribution of older people*, Age Concern Books, Brecon.

Newton, B., Hurstfield, J., Miller, J., Akroyd, K. and Gifford, J. (2005), 'Training participation by age amongst unemployed and inactive people' *DWP Research Report series*, No. 291.

O'Brien, C., Fenn, P., and Diacon, S. (2005) *How long do people expect to live? Results and implications*, Centre for Risk & Insurance Studies, University of Nottingham.

Office for National Statistics (2006), *Labour Force Survey Spring 2006*.

Pensions Commission (2004), *Pensions: Challenges and Choices: the First Report of the Pensions Commission*, London: The Stationery Office.

Pensions Commission (2005), *A New Pension Settlement for the Twenty-First Century – The Second Report of the Pensions Commission*, London: The Stationery Office.

Romer, D. (2001), *Advanced Macroeconomics*, Berkeley, CA: McGrawHill.

Smeaton, D. and McKay, S. (2003), 'Working after State Pension age: Quantitative analysis', *DWP Research Report Series*, No.182.

World Economic Forum (2004), 'Living Happily Ever After: The Economic Implications of Ageing Societies', World Economic Forum.

Online sources:

<http://www.gad.gov.uk/>