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Decision-making in Defined Contribution Pension Plans

By

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This thesis is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination which has lead to the award of a degree.

Abstract

This thesis – which comprises mainly a collection of published articles - is about the saving and investment decision-making of members of defined contribution (DC) pension plans.

An analysis of the decisions individuals make when saving for retirement fits well within the growing literature on behavioural economics and finance, which is based on the idea that many individuals are subject to behavioural traits that can lead to errors in decision-making. This literature is influential in the ideas developed and hypotheses tested in this thesis.

The analysis in this thesis uses different methods – focus groups, postal surveys, and analysis of administrative data - to investigate the approaches DC scheme members take to saving and investment decisions and to assess the consistency of those approaches with traditional and behavioural theory. On balance the behavioural theories appear better representations of what members do.

The thesis also presents analysis where a simulation model is used to investigate the effects of inertia (in terms of joining decisions) and default bias (in terms of investment choice) on the pension outcomes DC scheme members are likely to enjoy.

The thesis concludes with policy suggestions concerned with improving the design of DC pension plans and directions for further research.

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Chapter One: Introduction

This thesis – which comprises mainly a collection of published articles - is about the saving and investment decision-making of members of defined contribution pension plans.

The point of departure is that:

- a shift from defined benefit (DB) schemes to defined contribution (DC) schemes for occupational pension provision is underway and is likely to continue for the foreseeable future
- DC schemes put more of the risk and responsibility of retirement saving onto individual scheme members
- the balance of evidence is that scheme members are typically not well-placed to deal with this shift of risk and responsibility.

An analysis of the decisions individuals make when saving for retirement fits well within the growing literature on behavioural economics and finance, which is based on the idea that many individuals are subject to behavioural traits that can lead to errors in decision-making. This literature is influential in the ideas developed and hypotheses tested in this thesis.

Traditional economics relies in broad terms on assumptions that individuals are rational utility maximisers. Traditional finance theory largely develops along similar lines, in terms of ideas like Markowitz mean-variance optimisation (Markowitz, 1952) and the Capital Asset Pricing Model (for example, Sharpe, 1964). Behavioural economics and behavioural finance, in contrast, contend that individuals are subject to behavioural biases and traits that can, in certain circumstances, lead them to make sub-optimal decisions ("mistakes"). Proponents of behavioural economics typically argue that the biases are sufficiently 'hard-wired' that they are unlikely to be overcome by learning from mistakes. (See for example, Barberis and Thaler, 2003.)

Behavioural economics can be argued to be particularly relevant to retirement saving decisions made by individuals, particularly in a DC environment and especially where the individuals do not benefit from one-to-one professional advice. (See Mitchell and Utkus, 2004) The individuals are making high stakes decisions, generally without the ability to learn by doing through repeated trials.

Institutional background

Pension schemes (or plans) are vehicles that allow individuals to provide for an income in retirement. Pension provision is typically categorised as comprising three tiers or pillars:

Pillar One: Compulsory state pensions, typically provided by government on a pay-as-you-go basis out of current taxation. Individuals may or may not pay earmarked taxes in return for the right to receive future benefits, e.g. national insurance contributions in the UK.

Pillar Two: Occupational pensions provided by employers. Typically, these are not compulsory. The arrangements can be defined benefit, defined contribution, or some hybrid of the two. These distinctions are discussed below. Employees may or may not have to contribute to the arrangements in order to be eligible for benefits.

Pillar Three: Voluntary additional private savings. These are typically only available on a defined contribution basis and only the individual contributes to the scheme, albeit members may receive tax benefits on their contributions.

Our concern here in terms of member decision-making is with pillars two and three, given that there are relatively few decisions that individuals have to make in terms of pillar one state pensions.

Pension plans typically provide tax benefits relative to other forms of savings and investments. For example, in the UK contributions (within applicable limits) are

made from pre-tax income, returns in the fund are partially tax-exempt (dividends are subject to taxation at the corporate level), and the benefits are partially taxed (typically 25% of fund value is available as a tax-free lump sum). In return for these tax benefits, there are restrictions on access designed to ensure the funds are used for retirement income provision rather than being spent prior to retirement. In some countries, again notably the UK, the bulk of the retirement fund must be used to purchase a life annuity to insure against the risk of the individual outliving the available capital.

Defined benefit and defined contribution schemes

Pillar two occupational pensions can be on a DB or a DC basis, or be some hybrid of the two.

Defined benefit schemes are where the employer promises a pension in terms of the delivered benefits. For example, in a final salary DB scheme the employer may promise a pension of one-eightieth of final salary for every year of employment service. The pension payable will depend on final salary, length of membership of the plan and the accrual rate. In most cases the pension is payable from retirement until death, or the spouse's death if later and there are survivor benefits. The member may be required to make contributions in return for being eligible for benefits, but the employer will be responsible for the balance of costs in meeting the promised benefits.

In a DC scheme the employer and / or the employee pay contributions into a pension account. The contributions are invested and the accumulated sum is available to the member at retirement either as a lump sum (as typical in the US) or as an amount available to purchase an annuity (for example, as typical in the UK). Typically the scheme will allow the member to allocate contributions to one or more mutual funds made available in the scheme. An important distinction of DC is that the member bears most of the risk in terms of the performance of the investments being

insufficient to provide the desired level of retirement income. The employer promise is in terms of cash paid into the scheme rather than in terms of the achieved outcome.

Hybrid schemes combine elements of DB and DC. For example a scheme may operate on a DC basis, but be underpinned by a level of defined benefit which will be the minimum amount paid out if the DC investments perform poorly. Alternatively, a "cash-balance" plan offers a defined cash payment at the point of retirement but does not guarantee the annual income that can be purchased with that amount.

There is ample evidence of an ongoing switch from DB to DC for occupational pension provision. Focusing on one recent UK survey, ACA (2007b) – based on responses from 330 pension schemes containing £127bn of assets and 2.1m members – finds that 81% of DB schemes are closed to new members and 14% are closed to new members and to future accrual by existing members. The 2005 survey had found that 68% of schemes were closed to new members. However, it is worth pointing out that DB schemes are more common at larger employers and so on a member-weighted basis the extent of closure is not so marked.

Employers frequently cite cost as the reason for closing DB schemes. The ACA survey reports the average employer contribution to DB schemes rising from 11.5% of employee earnings to 22.6% of employee earnings over the five years to 2007. The rise in cost and contributions reflects the impact of low investment returns, low long-term interest rates and increasing longevity on the funding levels of DB schemes.

Most companies that close DB schemes move to DC provision rather than some form of hybrid. For example, the ACA survey shows that over the past 5 years, 41% of respondents had closed a DB scheme to new members, 8% had closed a DB scheme to future accrual, and 22% had introduced a DC scheme for some or all employees, but only 3% had introduced a hybrid or career average pension scheme. It may be that employers are attracted to the relative simplicity – from their point of view – of DC schemes and the transfer of risk to employees. While hybrid schemes offer

employers less risk than pure DB, they still expose the employer to some risk and, arguably, are even more complex than pure DB schemes.

There is no reason why well-funded and well-managed DC schemes cannot deliver to employees similar levels of retirement income as recent generations of employees with DB schemes have enjoyed. However, evidence suggests that the DB to DC switch typically encompasses a reduction in contribution levels as well as a change in the nature of the scheme. The ACA survey (2007b) shows an average expected long-term contribution rate to DB schemes of 23.5% of employee salaries, split 17.0% from the employer and 6.5% from employees. The corresponding average total contribution rate for DC schemes is 12.4% of salary, split 7.4% from the employer and 5.0% from the employee. The actual 2007 total contribution figures are reported to be 28.7% for DB and 10.3% for DC. Given this differential in funding, it is difficult to argue that the average DC scheme will be able to deliver similar levels of benefits to those delivered by typical DB schemes.

Risk and decision-making

This thesis is largely about DC pension plans because in a DC plan the individual member bears risks that in a DB plan are borne collectively by the employer on behalf of its employees. The key risks are:

- Investment risk – in terms of the growth rate of the invested contributions
- Interest rate risk – which will affect the rate at which an accumulated lump sum can be converted into retirement income via an annuity
- Mortality risk – whereby assumptions about the likely life expectancy of the retiring scheme member will also affect the rate at which accumulated capital can be converted into retirement income

In conjunction with accepting these risks, members of DC schemes typically get responsibility for making key decisions about how to save.

Employees will have to decide:

- Whether to join the scheme
- When to join the scheme

If an employee does decide to join then there are further decisions to be made:

- How much to contribute
- How to invest the contributions
- How to take the benefits at retirement

The decisions on contribution rates, investment and the means of taking the benefits are typically constrained by legislation, e.g. maximum allowable contribution rates, and by the design and rules of the scheme, e.g. the range of funds available to choose from. Nonetheless, the plan member has important decisions to make and the focus in this thesis is an analysis of how well placed the average scheme member is to make these decisions, and what can be done to support them in this important task.

It is important to stress that DB schemes are not riskless for members, nor do they completely absolve members of decisions. For example, if the sponsoring employer of a scheme fails and the scheme is not fully funded, the member may receive less pension than they were expecting. In the UK and US pension protection funds exist (UK: Pension Protection Fund; US: Pension Benefit Guaranty Corporation) to underwrite part of the benefits owed to members of failed schemes, but the insurance only covers benefits up to a statutory limit. In terms of decision-making, employees often still have to decide to join a DB scheme (and some decide not too despite the seemingly attractive nature of benefits on offer). They may also have decisions to make at retirement in terms of how to take the benefits, for example entirely as income or 25% as a tax-free lump sum. The important contrast with DC is that members do not have to decide how much to save in the scheme or how to invest the contributions. These are decisions taken by some combination of the trustees

overseeing the scheme and the employer sponsoring the scheme, and typically with the benefit of expert advice from actuaries and investment consultants.

Pension scheme governance

It is worth discussing briefly different types of governance in pillar two and three pension schemes, given the scope for governance arrangements to affect the outcomes received by members. DB schemes and many occupational DC schemes are governed on a trust basis, where a board of trustees is charged with looking after the best (financial) interests of the scheme members. These trustees will be some combination of employer nominated trustees, member nominated trustees, and independent or professional trustees. In a DB scheme the trustees will, in conjunction with the sponsoring employer, determine the contribution rate and investment strategy for the fund. They will typically engage actuarial and investment advisers to advise them in these decisions. In a DC scheme, the trustees will choose the range of investment options to make available to members, oversee the administration of the scheme and, often, determine the nature of information communicated to members.

DC schemes can also be governed on a contract basis, with the employer facilitating the arrangement between the scheme provider and the employee / member. Here, there is no board of trustees and the pension arrangement exists as a contract between the individual member and the provider, typically an insurance company or asset manager. The relationship will be governed by applicable financial regulation and legislation. An important point is that there is no body with explicit responsibility for looking out for the members' best interests. In the UK, the provider will, under Financial Services Authority rules, have responsibility to "*Treat Customers Fairly*" (see www.fsa.gov.uk), but that requirement is weaker than the fiduciary responsibility taken by trustees. Examples of contract based occupational schemes include Group Personal Pension Schemes and Stakeholder pension schemes. Stakeholder schemes are discussed in more detail in chapter eight of this thesis.

There is evidence that use of contract-based schemes in the occupational context is increasing relative to use of trust-based schemes as employers become uncomfortable with the increased administrative burden and apparent legal responsibility of running trust based schemes (for example, Harrison et al., 2004, 2005.) Some employers offering contract based schemes provide for their employees to receive individual advice from an independent financial adviser (IFA). However, in many cases this is not provided (generally on grounds of cost) and members receive only generic information and guidance, for example group seminars or brochures and leaflets. The requirements of scheme members for advice and guidance on pension saving are discussed in chapters four and five of this thesis.

Pillar three private pension arrangements are typically contract based, with the individual choosing the provider either on their own or based on advice from a financial adviser.

Market size and shape

Describing the size and shape of the UK pensions market is not as straightforward as one might think or like. There is a substantial amount of data available from competing sources, but there are overlaps and gaps that cause problems in aggregate analysis.

The Pensions Commission – discussed below – had as part of its terms of reference a requirement to comment on the adequacy of available data for making evidence-based policy decisions. The Commission's first report (2004, Appendix A, p1) notes that its "*overall conclusion is that present data sources are significantly deficient as a basis for some aspects of evidence-based policy making.*"

The Report continues,

> *"There is an almost total lack of quantitative data at the individual level on stocks of existing pension rights/fund assets or on flows of new pension savings. Most data on pensions is of a "yes/no" type, telling us whether people are members of different schemes, and in some cases which type of schemes, but with no data on the accumulated value of existing pension rights, and little on the level of contributions being made."* (p3)

It is possible, however, to get an approximate indication of the aggregate size of the pensions market and the types of schemes in use. UBS (2007) provides an estimate of the value of assets contained in the various types of pension vehicles:

Occupational DB schemes	£835bn
Occupational DC schemes	£210bn
Insurance-based DB schemes	£200bn
Personal and Stakeholder schemes	£335bn

(Source: UBS, 2007, p6)

HM Revenue and Customs provides data on membership of, and contributions to personal pensions, including those such as group personal pensions and stakeholder schemes that are used in an employment context. This is shown in Table 1 below.

Table 1 – Membership of and Contributions to Personal Pensions		
	Members	Contributions
Employer sponsored personal pensions	1,930,000	£5,020m
Employer sponsored stakeholder pensions	950,000	£1,700m
Non-employer sponsored personal pensions	6,120,000	£9,630m
Non-employer sponsored stakeholder pensions	850,000	£1,740m
Total	9,850,000	£18,090m
Source: Tables 7.4 and 7.5 at http://www.hmrc.gov.uk/stats/pensions/menu.htm Data is for the year to 5 April 2007. It is possible for an individual to be a member of, and contributing to, more than one scheme. All of these schemes operate on a DC basis.		

The Government Actuary's Department has conducted a number of comprehensive surveys of the occupational pension market (i.e. trust based schemes). The 2005 survey puts total scheme membership at 4.7m active members and 6.4m members with deferred benefits. Table 2 below shows the distribution of schemes, by benefit types and broken down by scheme size.

Table 2 – Number of Occupational Pension Schemes				
	<12 members	12 to 999 members	1000+ members	All Schemes
Defined Benefit	5,060	5,923	1,017	12,000
Defined Contribution	48,300	4,951	249	53,500
Source: GAD (2006) © Crown Copyright 2006.				

Regulation

Any analysis of the pension system requires some appreciation of the nature and impact of regulation, which constrains scheme design and can affect the outcomes received by scheme members.

In the UK, work-based pension provision is regulated by The Pensions Regulator (TPR, formerly The Occupational Pension Regulatory Authority.) TPR is a pro-active, risk-based regulator allocated certain powers by the Pensions Act 2004.

Investment products and services in the UK fall under the remit of the Financial Services Authority, set up by the Financial Services and Markets Act 2000. Personal pension contracts fall under the responsibility of the FSA. Contract-based group pension schemes used in the workplace, e.g. Group Personal Pension schemes, and Stakeholder pension schemes, also fall under FSA regulation although TPR has some jurisdiction on account of their use as occupational schemes. The main implications of financial services regulation are restrictions on who can give members investment advice and on the nature of the advice given.

The actions of trustees are governed by various statutory and common law duties. The main one of interest in relation to the analysis in this thesis is the requirement to manage the trust in the best financial interests of members.

Regulation can produce unintended consequences. For example, there is evidence of employers and trustees being reluctant to give DC scheme members guidance on savings and investment measures for fear of falling foul of FSA rules on the provision of financial advice (e.g. Byrne et al. 2007). Some commentators also ascribe some blame for ongoing closure of DB pension schemes to new rules designed to ensure that schemes are well funded to meet pension liabilities as they fall due. (Byrne et al. 2006)

In November 2006, The Pensions Regulator (TPR) published a consultation paper setting out how it intends to regulate DC pensions. Chapter 3 of the paper deals with investment and raises a number of important issues.

The paper notes four issues that TPR believes could contribute to poor investment practices:

- Inadequate processes for the selection and ongoing review of performance of investment managers and funds
- Provision of an inappropriate fund or range of funds
- Inappropriate design of the default fund
- Lack of member understanding

In terms of fund choice, the paper notes that the investment range must allow members to make choices that suit their circumstances, but that providing too wide a range increases complexity and may increase the risk of administrative errors being made.

TPR says that it intends to offer guidance on good practice in the following areas:

- Effective processes for selecting and reviewing investment managers
- Effective processes for the review of investment funds
- How to offer a well designed fund or range of funds to suit member demographics
- Examples of different approaches to the design of default funds
- Examples of investment options including diversification
- Examples of clear and simple information that can be provided to members

Perhaps the most important part of the consultation paper is the section covering the Regulator's "expectations", which can be viewed as a description of the standards that need to be met. In the context of the trend – at least amongst smaller schemes – to move from trust to contract, it is notable that the expectation is addressed to

"trustees, and where appropriate managers, providers and employers". This may suggest intent to take a wider view of responsibility in contract-based schemes used in an occupational setting.

The stated requirements are:

- There is a robust selection process for investment managers and funds, and regular performance reviews
- A suitable fund or range of well-managed funds is offered, especially in respect of the default fund
- Steps are taken to help raise members' understanding of investment decisions, level or risk and potential impact on benefits

The Regulator's guidance on DC investment issues is likely to play a key role in helping employers and trustees to design their DC arrangements in a manner that is helpful for members.

The Turner Report and Personal Accounts

The Government has recently proposed and legislated for (via the Pensions Act 2007) a new national scheme of DC Personal Accounts to come into operation in 2012. The scheme is designed to provide a retirement saving vehicle for employees who do not have access to an employer-sponsored pension scheme. The proposal has its basis in the reports and suggestions of the Pensions Commission, led by Lord Turner.

The Pensions Commission was set up by Government in 2002 to make recommendations to the Secretary of State for Work and Pensions on whether there was a case for moving beyond the existing voluntarist approach to pensions, i.e. should individuals be compelled to save for their retirement. The Commission produced an initial analysis of the pension situation in the UK (2004), followed by a set of proposals in a second report (2005).

The first report concluded that there was not yet a crisis in terms of under-provision of retirement income, but that there would be in the future (2050 onwards) if policy and current trends were not changed. Key issues included increasing longevity, the switch from DB to DC schemes, and the indexation of the basic state pension to prices rather than average earnings. The Commission estimated that up to nine million people were currently "undersaving" – many of them significantly. The first report suggested that a "muddle through" approach was unlikely to be successful. The report also noted that behaviour was a potential barrier to a voluntarist approach – "*Most people do not make rational decisions about long-term savings without encouragement and advice*". (Pensions Commission, 2004, p. xii) However, the cost of that advice, and of regulating it to ensure quality, has a significant impact on returns especially for low-to-moderate earners.

The Commission's second report (2005) contained its recommendations for change. The main proposal was to introduce a national system of personal accounts that would have scope to deliver retirement saving to lower income employees at lower cost than the existing forms of private provision. Furthermore, the scheme would use automatic enrolment to counter the effect of inertia in preventing retirement saving. The latter provision draws heavily on behavioural economics research cited in the first report, and which is discussed in detail in chapters two and three of this thesis. The national scheme would be designed to deliver a "base load" pension provision, providing most of the needs of moderate earners and an initial level of income for higher earners that would need to be supplemented by additional private savings. This would be approximately 15% of median earnings for a full (40-year) period of participation, based on a proposed contribution rate of 8% of earnings (4% employee; 3% employer; 1% tax relief). These replacement rates are over and above any amount of state pension an individual is eligible to receive.

Other proposals in the report include simplification of the state pension arrangements, and progressively raising the state pension age (to age 68 by 2050).

The Government announced in 2005 that it supported the conclusions of the Commission and intended to implement them. The Pensions Act 2007 provides for the Personal Accounts scheme to be set up, for the details to be determined by a Personal Accounts Delivery Authority, and for the scheme in operation from 2012 to be overseen by a Personal Accounts Board. As envisaged by the Commission, the scheme will use automatic enrolment, with employees automatically made members of the scheme while retaining the right to opt-out. Employers will be compelled to automatically enrol their employees in the scheme unless they automatically enrol them in a qualifying occupational scheme.

Where employees are automatically enrolled in Personal Accounts and do not opt-out, they will make a minimum contribution of 4% of 'band earnings', which will receive an additional 1% contribution via tax relief and a 3% employer contribution. Band earnings covers a range from approximately £5,000 to £34,000 per annum. Employees will be allowed to make contributions of up to £3,600 per annum in total.

The investment arrangements for Personal Accounts have not been specified and will be determined by the proposed Personal Accounts Delivery Authority. The scheme will, though, have a default fund and offer members at least a limited range of investment funds to choose from, which is likely to include options to deal with common religious or ethical preferences. Some suggestions on the design of the investment arrangements for Personal Accounts are made in the concluding chapter of this thesis.

Under the legislation, employers will be exempt from offering Personal Accounts where they automatically enrol employees aged 22 or over in a qualifying occupational scheme. A qualifying scheme is a DB scheme with an accrual rate of at least 120ths or a DC scheme with a minimum 3% employer contribution. A qualifying DC scheme must also have a default fund so that the employee does not have to make an active investment decision.

Automatic enrolment has been suggested for the Personal Accounts scheme on the basis of evidence that it will boost take-up rates. One implication of this for employers is the potential for increased pension costs via employer contributions. Employers using personal accounts for their employees will have to make the specified employer contribution (3% of 'band earnings') for any employee who doesn't opt-out of the scheme. For employers wishing to be exempt from the requirement to enrol employees in personal accounts by virtue of enrolling employees in a qualifying occupational scheme, the employer will have to make standard employer contribution for the enrolled employees. To the extent that the take-up rate under automatic enrolment exceeds that which the employer has been used to under 'opt-in', there are fears that some employers will respond by reducing the level of employer contribution – so called 'levelling down'. The ACA survey (2007a) reports 68% of employers saying that the Personal Accounts scheme will result in levelling down of contributions and 76% saying that it will accelerate the rate of closure of better quality occupational schemes.

Personal Accounts are relevant to this thesis in that the scheme will extend DC participation to millions of employees who have no previous experience of the types of financial decisions involved. Many of the issues investigated in this thesis are issues that the designers of the Personal Accounts scheme will have to take into account. Some suggestions on this are included in the concluding chapter.

Overview

This section provides an overview of the chapters included in this thesis, describing in outline the approach taken and the main conclusions.

The chapters in this thesis are linked in that they all investigate aspects of member decision-making in DC pension plans. They consider evidence on the manner in which members make decisions against traditional and behavioural economic and financial theories. In particular, the role of inertia is an important theme running through the chapters, as an explanation of why traditional theories such as lifecycle

saving appear not to hold in many cases. Another key theme that recurs in the thesis is that of limited knowledge and understanding amongst employees of long-term savings issues.

Chapter two, *Investment decision-making in defined contribution pension plans,* provides a review of behavioural finance and economics research applicable to retirement saving. It provides analysis from both a US and UK institutional perspective. It also reviews suggestions that have been made for using behavioural finance and economics to improve retirement saving.

On balance, the evidence suggests that many individuals struggle to understand and deal with the issues they face in saving for retirement. The problems relate to self-control (in being able to defer consumption) as well as to issues of understanding. Mullainathan and Thaler (2001) note that in retirement saving the standard economic idea of 'bounded rationality' is joined by the additional problem of 'bounded self-control'.

The specific issues discussed in the review chapter include:

- Lack of well-defined investment preferences amongst members
- Inertia and status quo bias
- Myopic loss aversion and framing effects
- Use of naïve (1/n) diversification approaches
- Confusion generated by high levels of investment choice
- Arguably excessive levels of investment in own employer stock

An important point raised in the review is that education of employees about retirement planning only gets you so far. To the extent that 'problems' result from deep seated behavioural biases such as inertia, this may not be overcome by information and education alone. The response to this has been to consider 'autopilot' devices that turn behavioural biases to positive effect.

It is notable that since this review was written in 2004, these behavioural interventions have become more popular. For example, the proposed national scheme of Personal Accounts will use automatic enrolment to boost participation rates amongst low-to-middle income employees. Chapter three – the main literature review – expands and develops the ideas discussed in the chapter two review.

Chapter four - *Employee attitudes to pensions: Evidence from focus groups* - is a short paper that discusses a series of focus group discussions on pensions held with employees of a UK-based mid-sized (listed) distribution company. The points made in the paper are vivid because they are presented in the words of the employees and pension scheme members themselves.

One of the key issues that emerges is that the employees have limited knowledge about pension arrangements, but are not averse to saving and realise that they will have to take some responsibility for providing their own retirement income. It is notable that several members say that they paid little attention to pension issues until about the age of 40, but they now wish they had paid attention earlier. Chapter seven in this thesis picks up on this issue by quantifying the cost of starting a pension later in your career.

The employees and scheme members note that they would like more information about retirement saving and the pension arrangements on offer to them. In particular, they desire more face-to-face information and do not feel that written materials help them make the decisions they face. Obviously, the expense of face-to-face communication is a key reason why relatively few pension schemes provide members with direct individual advice.

The inertia discussed throughout this thesis is evident in the comments made by employees, for example "*It is something I've been meaning to do since I was 20.*" This kind of inertia suggests there is a role for autopilot devices such as automatic enrolment and automatically increasing contribution rates.

Chapter five - *Employee saving and investment decisions in defined contribution pension plans: Survey evidence from the UK* - uses data from a postal survey of the members of one mid-sized DC scheme to analyse the members' decision-making against the background of key traditional and behavioural theories, and to examine the impact of financial advice on behaviour. It builds on the focus group material of the previous paper by using a more comprehensive examination of the approach scheme members have to saving and investment decisions.

The plan is an occupational DC scheme, with three main investment fund choices. The average member has a combined (employer plus employee) contribution rate of 10.5% of salary. At the point of survey, the scheme had 1118 members and the survey achieved a response rate of 14.4%.

The key results include the finding that members have limited interest in retirement planning, with 53% not having calculated how much they need to save for a comfortable retirement. Some members have received advice about retirement saving and those that have are more likely to have a realistic view of how much they need to save and to take an active approach to reviewing their pension investments. The members are aware of the potential adverse impact of not saving enough and many would welcome the support that an automatically escalating contribution scheme (known as Save More Tomorrow) would give to help them save more.

Tests of investment knowledge reveal that the members' understanding of investment concepts is quite low. A relatively high proportion of scheme assets is invested in the default balanced fund, although approximately 50% of members say they made an active choice of which fund to invest in. In terms of asset class preferences, members who report having received advice appear more favourable to equities, while older members give a higher score to gilts than do younger members – a result consistent with lifecycle investment theory. Importantly, members see little attraction in investing in the shares of their employer, something that has been documented in the US. The strongest theme to emerge is the support for property as

an effective asset for saving for retirement. This may reflect the familiarity people have with property and an extrapolation of recent high returns.

The main caveat to this analysis is that the data is self-reported and drawn from a small sample from one firm. The results are, though, largely consistent with evidence elsewhere, such as the focus groups in chapter four and the administrative data in chapter six.

Chapter six - *Contribution rate and investment choices in a large defined contribution pension plan* - like the two previous papers, examines the saving and investment decisions made by scheme members. However, unlike the previous chapters, which rely on what scheme members *say they do,* it does so by examining the decisions members have actually made, using administrative data. Again, the data allows a test of key traditional and behavioural theories of saving and investment behaviour. In the realm of saving, lifecycle theory is the traditional version, while behavioural theory indicates the role of inertia in holding back saving. In terms of investment decision-making, traditional theory would call for lifecycle asset allocation and mean-variance portfolio optimisation, while behavioural theory would point to excessive reliance on default funds, use of 1/n naïve diversification rules and a tendency for excess trading to destroy returns.

The scheme used in the analysis is sponsored by a FTSE 100 company and has over 3600 members. The analysis indicates that contribution rates are a positive function of age and salary – a result broadly consistent with lifecycle theory. Savings rates are higher amongst members who have made an active investment choice and amongst those with higher equity allocations, which may indicate some link in terms of financial sophistication.

The probability of a member making an active investment choice rather than accepting the default fund is positively related to scheme tenure (suggesting inertia is eventually overcome) and to salary, which again may proxy for financial sophistication. Older scheme members are less likely to make an active investment

choice, but given the default fund is mainly fixed interest, this may be a manifestation of lifecycle asset allocation, with older members deciding the fixed income strategy is appropriate for them.

Equity allocations appear to be positively related to salary and negatively related to age, the former arguably a proxy for financial sophistication and the latter consistent with lifecycle asset allocation. Males invest more in equity than females.

There is little evidence that scheme members follow a strict 1/n naïve diversification approach, whereby they allocate their contributions evenly across the available fund choices, but some evidence of a conditional 1/n approach whereby members allocate equally across the small subset of funds they have selected.

In the analysis of returns it is evident that members who make trades earn a lower return than more passive scheme members.

Chapter seven, *There's no time like the present: The cost of delaying retirement saving,* picks up on behavioural evidence of procrastination and inertia in retirement saving to examine the impact of delays in joining a pension scheme on the retirement income enjoyed by individual employees. An alternative way to express this is in terms of the 'catch up' contributions a scheme member has to make to compensate for a relatively late start. The paper uses the stochastic simulation model of Blake et al. (2001) to project the outcomes of various saving and investment scenarios that are representative of member behaviour.

The analysis looks at scenarios involving delays in joining the pension scheme, as well as scenarios with interrupted labour market participation and decisions to defer retirement in order to boost pension income. As noted in chapter four discussing the focus group results, there is a tendency for many employees to give little thought to pension saving until relatively late in their career, for example after age 40. While there may be competing demands on income at various points in the employee's career, the nature of compound returns means there is benefit to starting saving early.

The scenarios investigated in the paper involve a 10% contribution rate throughout membership and a variety of investment strategies ranging from 100% bonds to 100% equities. The base case is 40 years scheme membership from age 25, but various lengths of 'delay' and alternative profiles are investigated.

To give a sense of the results, median replacement rates (i.e. the ratio of pension to final salary) range from 0.29 to 0.39 depending on investment strategy, for the full period of membership. The risk in the strategies is evident in 5% value-at-risk levels of 0.12 to 0.18. Where pension saving does not start until age 45, median replacement rates fall to 0.19 to 0.21. Another way of looking at this is to say that the level of contributions from age 45 required to replicate the results of saving 10% of salary from age 25 are 15-17% of salary. The results are, of course, sensitive to the investment return assumptions used. The analysis in the paper gives a quantification of the sensitivities.

The final empirical chapter in the thesis, chapter eight, *Default funds in UK defined contribution pension plans,* examines the fund structures that UK financial institutions offer to members of 'Stakeholder' DC pension plans. It uses the Blake et al (2001) PensionsMetrics model to project the likely outcomes of these strategies over a number of representative scheme membership profiles. The paper also includes an analysis of the charges levied by the schemes and of the past performance of a subset of default funds. Evidence suggests that typically over 80% of scheme members accept the default fund if one is available, meaning the nature of the fund has important implications for the welfare of members. The assumption under behavioural economics would be that most members accept the default fund passively, rather than after an analysis where they conclude its profile is the most appropriate for them.

Stakeholder pension schemes were introduced to be a simple, low-cost product that could be used to increase pension saving amongst low-to-middle earners. One feature

designed to make the product easy for novice investors to use is that all schemes must have a default fund.

The analysis in the paper shows that the default funds are typically risky, with 80% to 100% equity, and that there is variation in approach across providers. The default funds are required by regulation to have 'lifestyle' age-dependent asset allocation that switches from risky assets to less volatile assets as retirement approaches. Here too there is variation across providers in terms of switch period and the low risk asset mix to which the switch moves.

The pension implications of the different asset mixes are investigated in the paper using the same stochastic simulation model as discussed in the previous chapter. We run simulations where investment returns are based on historic returns and alternative simulations where returns are based on forward looking models that generate lower equity risk premiums than the historical data.

We also document that charges vary substantially across the default funds, which is important given evidence (e.g. Carhart, 1997) that fees have a near 1-1 negative impact on net performance. The government's initial 1% cap on fees appears to act as an anchor with many funds charging at that level. Active funds typically cost more than passive funds, and balanced funds more than equity funds, but there is some overlap in fee levels.

Finally, an analysis of achieved performance for a subset of funds confirms the results of the simulations in terms of the possible variation of performance outcomes. Default fund annualised returns over a five year period range from 5.0% to 9.5%.

Overall, the evidence in this thesis allows an evaluation of traditional theories on saving and investment behaviour, such as lifecycle saving theory, lifecycle asset allocation, and of behavioural theories where inertia, default bias and naïve diversification strategies have more of a role to play.

The analysis in this thesis uses different approaches – focus groups, postal surveys, and administrative data, to investigate the approaches DC scheme members take and its consistency with traditional and behavioural theory. On balance the behavioural theories appear better representations of what members do.

We are then able to use a simulation model to investigate the effects of inertia (in terms of joining decisions) and default bias (in terms of investment choice) on the pension outcomes DC scheme members are likely to enjoy. We discuss possible policy suggestions and directions for further research in the concluding chapter.

The remainder of this thesis is organised as follows: Chapter two provides a review of the pensions environment and key behavioural theories relevant to long-term saving. Chapter three is a literature review that extends the analysis of the previous chapter. Chapters four to six provide evidence on the approaches employees and pension scheme members take to decision-making in relation to pensions. Chapter four uses evidence from focus groups, while chapter five uses survey data and chapter six uses administrative data. Chapters seven and eight present simulation analysis of key aspects of pension scheme design that are relevant to member decision-making. Chapter seven illustrates the implications of a late start to pension saving, while chapter eight analyses pension scheme providers' choices of default funds for DC schemes and the implications of those choices for members' retirement income outcomes. Chapter nine concludes. Notes and references for each chapter are found at the end of the relevant chapter.

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Chapter Two: Investment Decision-making in Defined Contribution Pension Plans

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Abstract:

In recent years there has been a significant shift in pension provision in the US and the UK from the situation where employers offer defined benefit pensions to employees, to a 'self-directed' defined contribution basis where the individual employee bears the risk the pension contributions – and the investment returns they earn – are sufficient to fund a comfortable retirement. This paper discusses some of the behavioural economics research relevant to assessing how well placed most employees are to deal with this greater responsibility. It also discusses some of the suggestions that have been made for using these behavioural findings to improve the design of defined contribution pension plans.

1. Introduction*

> *"Consumers face two challenges: making good decisions and sticking to them. Economists have adopted optimistic assumptions on both counts. The consumers in mainstream economic models are assumed to be both exceptionally good decision makers and to be able to carry out their plans. These economic assumptions are dubious, particularly in regards to saving for retirement." Laibson et al.*[1]

Most occupational pension plans are either of a defined benefit ("DB") or defined contribution ("DC") nature. In a DB plan, an employee who qualifies for the pension will receive an income flow from the employer-sponsored pension scheme from retirement until death. The annual benefit is typically a proportion of the employee's final, or average, salary, with the proportion depending on length of tenure in the pension scheme. In contrast, in a DC scheme contributions are paid into the plan and the employee can usually choose from a range of investment options. The funds, with accumulated investment returns, are then available to provide a retirement income, either directly or by purchasing an annuity.

In recent years there has been a significant shift in retirement income provision in the US from the situation where employers offer these DB promises[2] to individuals, to a self-directed DC basis where the individual bears the risk the pension contributions – and the investment returns they earn – are sufficient to fund a comfortable retirement.[3] Surveys by the National Association of Pension Funds (NAPF) show similar trends in place in the UK.[4]

The growing literature of 'behavioural economics'[5] raises interesting questions about whether most individuals are well placed to make the strategic investment decisions this greater responsibility entails. There is evidence individual investors do not always make good decisions. For example, Barber and Odean document a variety of behavioural traits displayed by investors with retail brokerage accounts, including

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* References in this chapter appear as endnotes.

excessive trading and a tendency to sell winning stocks too early, which tend to depress the returns they enjoy.[6] In terms of pensions, a Watson Wyatt study found the returns of pension plans with employee-directed investments lagged professionally managed funds by some 2% per year on average.[7] Bodie argues risk is being transferred *"to those least able to manage it."*[8]

This review provides a summary of the main US literature on individual investment decision-making in defined contribution pension plans, including proposals that have been made for using the insights of behavioural economics to improve pension plan design. The trend towards DC pensions is also evident in the UK, but relatively little research has been done looking at the situation here in the light of the US research. This paper also provides a brief overview of the available UK evidence, against the background of the Department of Work and Pensions recent proposals for promoting 'informed choice' in retirement saving.[9]

2. Participant knowledge, confidence and investment choice

Saving for retirement is a complex task and the stakes – ensuring an adequate income in retirement - are high. The move from DB to DC pensions puts much more responsibility into the hands of the individual participants, particularly in terms of how much to save and how to invest the resulting funds. This does not appear to be something that comes easily to most people. The 2003 US Retirement Confidence Survey reports only 37% of respondents had tried to calculate how much money they should save for retirement.[10] Of those reporting they had tried to calculate their retirement income needs, 36% could not provide the results of the calculation and 3% stated they had been unable to do it.

The John Hancock insurance company has conducted a regular survey of the attitudes and knowledge of investors in DC pension plans over the past ten years.[11] Only 20% of the respondents to the 2002 survey regarded themselves as knowledgeable investors, while a further 38% regarded stated they were "somewhat knowledgeable". Forty two percent said they had little or no investment knowledge.

While plan participants on average claimed to be "somewhat familiar" with the main asset types typically available in retirement plans, there is evidence this claim is overstated. For example, 45% of respondents correctly identified that money market funds contain short-term investments, but 40% thought (or also thought) they contained stocks. Only 8% of respondents correctly identified that the funds *only* contain short-term investments. Less than one participant in five was able to identify the correct relationship between long-term interest rates and bond fund returns.

The survey also asked plan participants for their expectations of future returns. The results – shown in the Table 1 below – look optimistic in the current environment of low inflation and low interest rates.

Table 1 – 401(k) Participant Return Expectations		
	5 Year Annual Return	20 Year Annual Return
Stocks	10.9%	15.8%
Bonds	8.1%	10.3%
Money Market	7.7%	9.8%
Stable Value	7.6%	9.9%
Source: John Hancock 2003		

Survey evidence that many individuals struggle to understand and deal with the choices they face when saving for retirement sits readily with the field of behavioural economics, which suggests most individuals do not make decisions in the rational, well-informed and unbiased manner assumed by standard economic theory. Mullainathan and Thaler argue the notion that individuals are calculating, unemotional maximisers ("*homo economicus*") is incorrect and that more accurate descriptions of actual behaviour can yield better predictions of economic systems.[5] They claim there are 'bounds' to human rationality, self-control and self-interest.

Simon coined the term 'bounded rationality' to describe human problem solving abilities.[12] Limits on intelligence and time mean individuals cannot be expected to solve problems optimally. Experimental evidence suggests most people use rules of

thumb (or "heuristics") to cope with the limits of their abilities and these heuristics can – in certain contexts – lead to systematic errors in decision-making.[13] Mullainathan and Thaler also argue many individuals have "bounded self control". Standard theory assumes once someone has worked out the optimal choice they will follow through with that course of action. Behavioural economics suggests even when the 'right thing to do' is apparent, people may fail to do it for reasons of self-control - *"Most of us at some point have eaten, drank or spent too much, and exercised, saved and worked too little."* Finally, most individuals are "boundedly selfish" – and fail to pursue their own self-interest to the extent normally assumed of *homo economicus.*

These behavioural limitations have implications for the study of economic decision-making and are relevant to the question of saving for retirement. Mitchell and Utkus note "being good at retirement saving" requires accurate estimates of uncertain quantities such as lifetime earnings, asset returns, tax rates, health status and longevity.[14] Casual inspection of models designed to help with this problem such as those proposed by Blake et al.[15] and Hibbert and Mowbray[16] shows the calculations are far from trivial and many of the parameters highly uncertain. As Bodie puts it:

> *"No one would imagine that you or I could perform surgery to remove our own appendix after reading an explanation in a brochure published by a surgical equipment company. Yet, we seem to expect people to choose an appropriate mix of stocks, bonds and cash after reading a brochure published by an investment company. Some people are likely to make serious mistakes."*[8]

Benartzi and Thaler cite a 1999 Hewitt survey showing that 401(k) plans on average offer 11 investment choices and question whether this expanded investment choice provides net benefits.[17] Their own research found that when investors were shown the range of likely retirement income consequences of their own portfolio and that of the median investor's portfolio, most expressed a preference for the median portfolio.

They argue the results suggest investor autonomy is "not worth much" and that most investors do not have well-defined preferences.

Samuelson and Zeckhauser discuss what they call the "status quo bias" in decision-making.[18] They note the standard rational choice model holds that only "preference-relevant" features should affect decisions, but real world choices often have influential labels attached to them, such as the notion of the "status quo" - i.e. the option to do nothing, or to endorse a previous choice. They find that despite an average tenure of 12 years, only 28% of participants in the 850,000-member TIAA/CREF retirement scheme had *ever* changed their asset allocation. An important aspect of these findings is that new entrants to the plan tended to choose a somewhat different asset allocation to similar-aged incumbents who had 'grown up' within the scheme. Samuelson and Zeckhauser attribute the status quo bias to a number of well-document behavioural traits including framing, loss aversion, anchoring, and regret avoidance.

The trend towards DC rather than DB pension provision gives individual employees increased choice in how they save for retirement. The conventional view in economics is that this increased choice is likely to enhance welfare. However, this is arguable if lack of interest or knowledge raises the risk of a significant number of investors making costly mistakes. The following section discusses some of the retirement planning 'mistakes' that have been documented in the US.

3. Portfolio diversification and investor perceptions of risk

There is significant evidence that investors in DC pension plans often display attitudes to risk and portfolio construction that are at odds with accepted investment principles. For example, Benartzi and Thaler document that DC pension plan investors seem to suffer from 'myopic loss aversion', seeking to avoid short-term losses, despite the long time horizon usually involved in planning for retirement.[19] Plan participants shown annual return data for equity and bond funds are found to adopt much more conservative – i.e. low equity – asset allocations than other

participants shown 30-year compound returns. The 30-year data appear to draw attention to the low probability of making a loss over that period – a relevant period for retirement planning for many people – while the annual data highlight the prospect of short-term loss, even though short-term volatility should not matter much to these investors.

There is also evidence that the balance of funds on offer unduly influences individuals' choice of asset allocation in DC plans. Benartzi and Thaler find that where there is a high ratio of equity funds relative to bond funds, plan participants tend to have higher than average allocations to equities.[20] In an experimental setting they also find support for the existence of a '*1/n* diversification heuristic' which leads participants to split their contributions equally amongst the '*n*' funds on offer, with little regard to the underlying asset composition of the funds.

One possible explanation for the shift in asset allocation as fund choice changes is that employees take the range on offer as implicit guidance from the employer as to the appropriate asset allocation strategy – a so-called "endorsement effect". However, there is little evidence most employers have this outcome in mind when structuring the fund offering. Watson Wyatt argue that in expanding investment choice, many sponsors are reacting to a "vocal minority" demanding the option of investment in 'hot' specialist areas, and that these more "speculative" funds have no place in a DC plan's basic investment structure.[7] Iyengar et al. provide evidence of another possible cost of offering 401(k) investors "too much choice".[21] They show there is a negative relationship between the level of employee participation in the pension plan and the number of funds on offer suggesting complexity can dissuade employees from joining.

Perhaps one of the most worrying aspects of the US DC market is the high level of investment in own company stock amongst employees in larger plans. Portfolio theory teaches the benefits of diversification, but a significant number of employees have plans with unduly high concentrations in a single stock – that of their employer. Benartzi notes about a third of assets in large DC retirement savings plans - and

about a quarter of employees' discretionary contributions - are invested in company stock.[22] He describes the strategy as "dubious", particularly because the stock is correlated with the employees' labour income and future employment prospects. The tendency to invest in own company stock is found to be strongest where the past returns on that stock are high, but Benartzi finds no evidence that the future returns of these "winner" stocks are strong enough to justify the high level of investment.

Employers' enthusiasm for company stock ownership in retirement plans may stem from a more general desire to promote shareholding amongst the workforce, believing this will raise productivity and morale and boost the value of the firm. However, this has to be balanced against potential detriments to the employees and US law gives rather mixed messages on the desirability of 'self-investment'. The 1974 Employee Retirement Income Security Act ("ERISA") sets a limit of 10% on the extent to which a plan can invest in the stock of the sponsoring employer. At the time of ERISA's development, however, DB plans were the prominent form of retirement provision and Congress did not extend the provisions of the act to DC plans, allowing company stock allocations in DC plans to continue growing. Subsequent attempts to extend the provisions on company stock to DC plans have run into opposition from employers. Current legislation prevents employers from compelling workers to invest more than 10% of their own contributions in company stock, but does not prohibit employees from choosing to do so.[23]

Holden and VanDerhei show the proportion of overall 401(k) assets invested in company stock at the end of 2002 was 16%.[24] Some 35% of participants in plans that offered company stock had more than 30% of their assets invested in that option, and 23% had over 50% of their assets invested in company stock. VanDerhei[25] notes that the percentages invested in company stock are partly explained by the requirement in some schemes for employer contributions to be invested in company stock, but Benartzi[22], Liang and Weisbenner[26], and Mitchell and Utkus[23] all find significant numbers of employees voluntarily holding high proportions of company stock in their 401(k) accounts.

It appears that employees do not view their employer's stock as risky. The John Hancock survey shows that DC plan participants perceive company stock to be less risky than diversified stock funds.[11] On a risk scale of 1-5, where 5 is "very high risk", company stock 3.1 compared to 3.6 for diversified stock funds. This result has been remarkably consistent through time, based on the evidence of previous surveys. Benartzi finds that only 16% of plan participants realise that company stock is riskier than the overall stock market.[22]

The collapse of Enron provides a high profile example of the possible pitfalls of investing retirement plan assets in your employer's stock. Almost 58% of the employees' 401(k) assets were invested in Enron stock, which subsequently lost almost all of its value as the company was put into bankruptcy. A survey by VanDerhei[25] found 74% of respondents thought most employees were aware of what had happened at Enron, but 43% did not think the Enron example was relevant to their own situation. Only about a quarter of respondents thought the Enron example had caused employees to review their asset allocation or to question the right of employers to offer company stock as an investment option.

It may be that investors prefer to "invest in the familiar" while ignoring the principles of portfolio theory. Huberman finds that the shareholders of US regional telephone companies tend to live in the area served by the company and argues a similar effect is at play when investors display 'home country bias' in their asset allocation and when employees invest large amounts in their employer's stock.[27] Benartzi argues the observed tendency to invest more employee contributions in company stock where employer contributions must be invested in company stock is consistent with an "endorsement effect" whereby employees take the allocation of the employer's contributions as an implicit form of investment advice.[22]

The studies discussed above provide significant evidence that the investment strategies employed in self-directed retirement plans are often at odds with standard investment theory and suggest much of this can be explained by well-documented behavioural biases. While most of the evidence is based on experimental work,

survey data, or relatively small samples, the consistency of the findings provides power in excess of the reliability of any single study. The question of what can be done to mitigate any harmful effects of these biases is discussed below.

4. Participant education and pension scheme design

The obvious solution to dealing with significant behavioural barriers to the effective use of DC plans for retirement provision is to offer some form of education to participants. Indeed, this is already takes place with EBRI noting that nearly half of US workers with an employment-related pension plan have been provided with educational material or seminars about retirement planning and saving.[10] However, education will only work if it has an impact on behaviour, meaning issues of self-control need to be considered as well as issues of understanding.

MacFarland et al. note that while about half of the US adult population have the attitudinal characteristics to be "planners" and take an active interest in providing for their own retirement, over a third are "avoiders" who are either intimidated by financial matters or simply uninterested.[28] This has important implications for the provision of education on retirement planning, suggesting less attention can be given to the planners who will likely seek out the information they require. In order to have an impact on avoiders, investment education materials need to be short and simple, and emphasise present day benefits – such as employer contributions and tax deductions - rather than long-term goals. Equally, the avoider group is more likely to respond to explicit and direct advice than to conceptual financial education.

However, there are limits to what education can achieve if a significant portion of the population is apathetic to the idea of planning for retirement. Choi et al. note that after attending pension seminars many participants say they plan to use the information to make changes to their pension arrangements, but very few actually do.[29] In the cases the authors study, all of the employees who were not already members of the pension plan and who attended education seminars stated they intended to join the plan, but only 14% of them actually did so. EBRI data shows

only 18% of those receiving educational material about their pension reported some change in their behaviour as a result.[10] These findings suggest scheme design may also need to be used to ensure participants in DC pensions adopt the savings rates and investment strategies most likely to ensure adequate income in retirement.

Thaler and Benartzi argue employees who fail to join their employer's pension plan, or who contribute at very low levels, appear to be saving less than would be predicted by rational life-cycle theories.[30] They suggest at least some of these low-saving households can be regarded as making a mistake and would benefit from help to increase their saving rate. To the extent these mistakes stem from consistent behavioural biases, it may be possible to use knowledge of these biases to improve the design of pension schemes and mitigate the effects of the biases.

The typical 401(k) plan requires an active decision to enrol and Choi et al. report that a move to automatic enrolment tends to increase participation rates.[31] Very few participants subsequently decide to opt out of the plan, suggesting the employees do not object to saving for retirement, but left to their own devices tend to delay taking action. The potential downside of automatic enrolment is that many of those who are enrolled stick with the low default contribution rate and cautious default asset allocation. Choi et al. note that 76% of plans with automatic enrolment have a default contribution rate of 2% or 3% and 66% have a stable value fund as the default investment option.[32] They show that under automatic enrolment 65%-to-87% of new employees in the companies studied adopt the default fund and the default contribution rate. These percentages decline with tenure, but remain at about 45% after three years of employment. The authors question whether the net effect of automatic enrolment makes employees better off, given that earlier participation may be offset by lower contribution rates and more conservative investment choices. Employers may be reluctant to tackle this problem by offering riskier default funds, given the danger of lawsuits if a fund sustains significant losses. Equally, a move to higher default contribution rates may simply cause more employees to opt out of the scheme.

Thaler and Benartzi propose a prescriptive savings plan called "Save More Tomorrow" - or "SMartT" – where employees commit in advance to allocate a portion of future salary rises towards retirement saving.[30] Laibson et al. discuss the "hyperbolic discount rates" that can explain why future commitments are more effective than trying to secure immediate change.[1] They note a systematic conflict between long-term and short-term preferences. When rewards are far away in time, most individuals are relatively patient, for example preferring two apples in 101 days to one apple in 100 days. However, moving the reward closer to the present time produces a significant reversal in preferences: one apple today is generally preferred to two apples tomorrow. This structure of discount rates can explain why employees are willing to make future commitments to save more even when they refuse immediate action. Furthermore, the status quo bias identified by Samuelson and Zeckhauser means once the initial commitment is made, few people make the effort to change it.[18]

Thaler and Benartzi's implementation of the SMarT plan at a mid-sized manufacturing firm showed considerable success. The company's employees were offered the chance to see an investment consultant and discuss their retirement provision and most agreed to do so. In many cases the employees were told their current savings rate was inadequate, but only 28% were willing to accept the advice and make an immediate increase in contributions. The rest of the participants were offered the chance to join the "SMarT" plan, which would increase their saving rate by 3% a year starting from their next pay rise. Of the participants who were unwilling to accept the contribution rate advice of the investment consultant, 78% agreed to join SMarT, with 80% of these participants remaining in the plan through four pay rises. The average savings rate for these participants rose from 3.5% to 13.6% over the course of 40 months.

In addition to evidence that scheme design can affect pension plan participation and contribution rates, the evidence reviewed in section 3 suggests plan design can have a significant impact on investment choice. Whether investors are using simple *1/n* heuristics to allocate between funds, or taking implicit guidance from the range of

funds on offer, the simple process of the employer choosing the range of funds can significantly influence the asset allocation chosen by many plan participants. Employers with paternalistic instincts may choose to structure their pension plan to maximise the chances of employees choosing what the employer regards as the most appropriate options.[33] The main issues relate to the arrangements for joining the plan (opt-in or opt-out), default contribution rates, default fund options and the range and nature of the fund choice on offer. There are also issues about the nature of the information and advice that is provided to employees.

5. UK comparisons

The UK, like the US, is seeing a move from employer provision of DB pensions to a situation where DC is more common. A number of different types of DC pension are available in the UK, all of which are relevant to consideration of increased individual responsibility for investment choice.[34] Occupational money purchase (OMP) schemes are the main form of DC scheme where the employer provides sponsorship. Alternatively, an employer may offer a Group Personal Pension (GPP) which is essentially a collection of individual pensions grouped together to provide savings on marketing and administration costs. Finally, a stakeholder pension is a relatively new, low-cost version of a personal pension scheme, governed by detailed rules, including a requirement that total charges do not exceed 1% per annum.[35] It is worth noting that in the case of an OMP scheme, the trustees have responsibility for the investment choice offered within the plan – and are charged with acting in members' best interests – while the choice in a GPP or stakeholder plan will be determined by the product provider (an insurance company) in consultation with the employer.[36]

An NAPF survey[37] shows DC has become the most common form of occupational pension provision in the private sector with 62% of employers offering money purchase, 14% offering GPP and 24% stakeholder. This compares to 46% of companies that have DB schemes. The survey shows that 41% of companies have closed their DB pension scheme to new members. For new employees, 51% of employers offer money purchase schemes, while 18% offer stakeholder, and 13%

GPP. Only 19% offer a final salary scheme and 2% offer no pension provision. It is worth noting that final salary schemes still tend to be the more common at larger employers, so the split by number of employees rather than number of schemes is less dramatic. The trend towards DC schemes may in part be explained by the proposed implementation of the FRS 17 accounting standard - 86% of respondents to the NAPF 2002 survey thought the standard made offering a DB pension scheme less attractive to employers.[38]

There is little to suggest UK employees are much better placed to manage their DC retirement investments than their counterparts in the US. The Office of Fair Trading's Inquiry into Pensions[39] commissioned a large-scale survey of consumer attitudes to pensions. The changing landscape for pensions was evident with 72% of respondents agreeing or strongly agreeing with the statement "*the responsibility for ensuring that my income in retirement is adequate for the lifestyle I wish to live is mainly mine*". However, the challenge of this responsibility is evident in that half of the respondents agreed or strongly agreed that "*I have found all the information I have seen, and the advice I have received, on pensions very confusing.*' Only 44% of respondents had sought advice about retirement planning, mostly from financial services firms and most commonly by those who had personal rather than occupational pensions.

More recent research by the Association of British Insurers[40] provides little more cause for comfort – 44% of the population say they understand pensions "very well" or "fairly well", while 56% understand them "fairly badly" or "very badly". Some 66% have never tried to calculate how much they need to save to fund a comfortable retirement. A total of 61% of respondents were either "not particularly" or "not at all" confident that they would have enough money to live comfortably in retirement.

The recent weakness in the stock market – together with limited investment knowledge – appears to have coloured views on the appropriate assets for retirement savings. Sixty-six percent of respondents state that property is the best long-term investment. Only 10% favoured equities, less than the 14% who thought a savings

account was best. It is not clear whether the preference for property reflects use of property as a portfolio asset or whether it reflects an expectation of drawing income from the equity value of the respondents' own homes. A recent report from the Pensions Policy Institute[41] highlights potential problems with the latter approach, including the relatively limited proportion of the accumulated capital that can be accessed through equity release schemes.

While high levels of investment in own company stock are a significant feature of large US DC plans, this issue has little relevance in the context of UK pensions. The 1990 Social Security Act placed a 5% limit on 'self investment' by pension funds and unlike the US these rules apply to DC as well as DB pensions.[42] Investment consultants[43] note they have encountered few examples of companies offering their own stock as an option in UK DC plans. It remains to be seen whether UK plan participants would be interested in this option if it was available or be prepared to use it to the extent evident in the US.

The 2001 NAPF survey[44] gives a good overview of the investment choice available in occupational DC plans in the UK showing that 41% of schemes offer one-to-three investment options, while 38% offer between four and ten options, and 21% offer more than ten options. Some 70% of schemes have a default option, of which 50% are passively managed and 71% are lifestyle-type funds with age dependent asset allocation. While it does not appear the investment choice offered by UK DC plans is as wide as that offered in the US, many schemes offer enough choice to cause potential difficulties to members lacking in investment knowledge. On the other hand, a Watson Wyatt study cited in the Myners Report[36] shows 23% of plans only offer one fund and it is possible to argue this might be restricting choice too much, with the single fund unlikely to meet the needs of different groups of employees.

One of the most significant examinations of pension provision in the UK in recent years came in the form of the HM Treasury-sponsored review of institutional investment by Paul Myners.[36] The review dwells mostly on the issues faced by trustees of DB pension schemes, but also identifies issues relevant to the trustees of

occupational DC schemes. It notes it is unclear how trustees should decide which and how many investment options to offer to members. If too few choices are offered members could argue that investment choice has been restricted, but more options may make the choice too complex and thus not in the members' best interests. Myners notes the danger trustees will fall back on standard industry practice in terms of the types of funds and defaults offered. In particular, he argues this will mean continued use of balanced managed funds where the asset allocation is set on the basis of an industry consensus which may not be consistent with the strategic asset allocation requirements of any particular group of employees.

Myners' outlines a set of principles he thinks the trustees of DC pension schemes should follow. In particular, he argues that trustees should have sufficient investment knowledge for effective decision-making and that the funds offered to members should have clear investment objectives and be chosen to take members' strategic asset allocation requirements into account. He also argues there should be a wide enough choice to satisfy the risk/return combinations appropriate for most members.

In a similar vane, Altmann suggests the UK could benefit from introducing measures based on US 'safe harbour' guidelines, which specify schemes must offer a minimum of three investment choices, that the investment choices must allow for creation of an appropriate, diversified portfolio, that members must be able to change their investment choices, and that they must receive good information on which to base their decisions.[45]

Richards notes that in most cases literature provided to DC plan members has been supplied by insurance companies, investment firms or actuaries as the trustees are concerned not to breach the restrictions under the Financial Services and Markets Act 2000 on them giving investment advice or issuing investment advertisements.[46] There is obviously a need for good information for members to base their decisions on, but a key group with an interest and potential to provide this – the trustees – is hampered by current financial services legislation.

Overall, it appears the growing use of DC pensions in the UK presents many of the same issues as in the US, particularly in relation to low levels of investment knowledge and interest. There is probably less of an issue with giving participants too much choice – although this may be the case for some schemes – and more risk that some schemes offer too little choice to take account of the differing needs of different sections of the workforce. The UK has no problem with inadequate diversification due to excessive investment in own company stock, but potentially faces a similar problem stemming from conviction that residential property provides the most attractive investment prospects. DC pensions in the UK have also been criticised for low levels of contributions and high charges, with questions raised about whether participants are aware of the effects of these factors.[34,47] Against this background it is encouraging to note the recently-published Department for Work and Pensions agenda for promoting informed choice in retirement saving.[9] The proposals call for enhanced financial education and the review of regulatory barriers to employers providing advice on retirement saving to their employees and suggest schemes consider automatic enrolment and future commitment devices along the lines of 'save more tomorrow' to raise savings rates. This represents an encouraging step towards practical measures based on our knowledge of retirement saving behaviour.

6. Conclusions

The trend shifting occupational pension provision from a DB to a DC basis looks well entrenched in both the US and the UK. There is nothing to suggest DC pensions are not an appropriate vehicle for providing employees with retirement income, but there remain significant questions about how to use them effectively. The results of the John Hancock survey[11] – amongst others - challenge the notion that individuals are well placed to manage their own retirement accounts and the limited UK evidence we have does not suggest a much better situation here. While any shortfall in retirement income under DC schemes will fall on the individual participants in the first instance, at the extreme it becomes a more general problem for the state, which will have to provide for retirees who lack adequate alternative sources of income.[45]

Improved financial education can benefit many DC plan participants, but intelligent plan design will also be required when many employees show little interest in financial matters and readily accept default options – taking the "path of least resistance". It is clear that employers are well placed to be able to improve both education and scheme design, but could probably receive more regulatory and tax incentives to encourage them to do so.[48]

It is not clear that current plan design in the UK and the US reflects the behavioural economics findings discussed in this paper and there is scope for research on this issue. Some of the work that has been done in the US reflects collaboration between academics and plan sponsors and consultants, raising the prospect that the insights from the research will find their way into concrete practical measures. In the UK, the government's 'informed choice' agenda raises a similar prospect. While this is at an early stage, it seems appropriate to end with a positive note acknowledging this movement towards providing employees with better support for their retirement saving decisions.

Endnotes

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Chapter Three: Literature Review

This chapter extends and updates the review and analysis in the previous chapter. It also highlights links to the empirical work in the following chapters.

Behavioural versus traditional theory

Traditional economics in broad terms relies on assumptions that individuals are rational utility maximisers. Traditional finance theory largely develops along similar lines, in terms of ideas like Markowitz (1952) mean-variance optimisation and the Capital Asset Pricing Model. (Sharpe, 1964, amongst others.) While these theories involve complex mathematics, their validity does not rely on individuals actually following though the prescribed calculations. Rather, for the theories to be valid and useful, individuals need only act "*as if*" they are following the theories' prescriptions. (Friedman, 1953) Hence the validity of a theory can be assessed by the quality of its predictions rather than by the realism of the assumptions.

Behavioural economics and behavioural finance, in contrast, contend that individuals are subject to behavioural biases and traits that can, in certain circumstances, lead them to make sub-optimal decisions ("mistakes"). Proponents of behavioural economics typically argue that the biases are sufficiently 'hard-wired' that they are unlikely to be overcome by learning from mistakes.

Behavioural economics can be argued to be relevant to retirement saving decisions made by individuals, particularly in a DC environment and especially where the individuals do not benefit from one-to-one advice. (See Mitchell and Utkus, 2004) The individuals are making high stakes decisions, generally without the ability to learn by doing through repeated trials. On the other hand, high stakes can be regarded as providing a clear incentive for individuals to overcome behavioural biases and work hard to make decisions that are in their best economic interests.

One criticism of behavioural finance in the context of asset pricing is that even in the presence of irrational investors, asset markets may be kept efficient by the operation of arbitrage by rational investors (although behavioural proponents argue arbitrage is limited in its effectiveness, see Schleifer, 2004) However, if our concern is with the outcome for the individual then arbitrage has little role to play: if I fail to save for my retirement because I suffer from some behavioural bias, I will be poor in retirement and there is little a rational investor can do to alter the outcome (save for charity.)

Life-cycle theories of saving behaviour

Standard economic theory offers an explanation for the pattern of saving and dis-saving an individual will have through their life. The life-cycle theory of Ando, Brumberg and Modigliani (Modigliani and Brumberg, 1954; Ando and Modigliani, 1957), and Friedman's permanent income hypothesis (1957) imply that individuals smooth consumption over their lifetime. In essence, in each period an individual can consume up to the annuity value of his or her expected wealth, and saving will take place only when current income exceeds this annuity value. From this perspective, a decision to defer retirement saving could represents a view that income will be higher in future.

In addition to standard life-cycle theory, a number of institutional features could explain why rational individuals do not participate in retirement saving arrangements or contribute to them in only modest amounts. Pension plans are by design relatively illiquid saving vehicles. For example, in the UK benefits may not be taken until age 55 and at age 75 the accumulated pension fund must be converted to a life annuity. Individuals, therefore, may choose to save in a non-pension vehicle to maximise the flexibility of their savings. In the UK, individual savings accounts (ISAs) provide one possible alternative vehicle, with comparable tax benefits. In an ISA, contributions are made from taxed income, but investment returns are not taxed and there is no tax on the proceeds and no restrictions on use of the proceeds. These considerations of flexibility do not contradict life-cycle saving theory, but do have implications for the balance between pension and non-pension saving vehicles.

Individuals may also decide not to save while working because they expect income in retirement from sources other than their savings. The most common version of this is for relatively low earners who can expect a reasonable replacement rate (i.e. one that will maintain their living standard) from the state pension and other state benefits. To the extent that state benefits are means-tested, there is a particular risk that retirement income generated from saving while working will merely act to displace means-tested state benefits that otherwise would have been received. In this case, the individual will have foregone consumption while working for no net benefit. Many commentators see this as a particular concern in the new scheme of Personal Accounts discussed in chapter one.

A more general point in relation to retirement saving is that the arrangements in place and the outcomes from them are driven significantly by legislation and regulation. This means that while a certain course of action may appear rational given current legislative arrangements, government could change the legislation in future to favour alternative courses or to increase or decrease the returns earned, e.g. through changes in tax rules. Scepticism on the likely longevity of particular pension arrangements could lead individuals to choose alternative saving vehicles. As before, this may not undermine the prescriptions of life-cycle saving theory, but could have implications for the balance between formal retirement saving vehicles and other more flexible vehicles.

Leaving aside the issue of pension versus non-pension saving, life-cycle theories have been troubled by evidence that many households fail to maintain their pre-retirement level of consumption in retirement, which suggests they might not have saved enough to properly smooth their lifetime spending. For instance, Banks et al. (1998) find a drop in consumption at retirement that cannot be explained fully by standard consumption smoothing models. Some of the reduction in consumption expenditure is a natural consequence of withdrawal from the labour market: e.g. travel costs to work are no longer incurred. However, another possible explanation

for this drop in consumption is that members of these households are surprised by how low their income is and are forced to adjust their consumption accordingly.

Behavioural economics provides an alternative view that suggests that savings behaviour can be driven by behavioural biases and thus may not be optimal. For example, Thaler (1994) argues life-cycle theory fails to consider bounded rationality, which suggests individuals cannot do the multi-period optimisation calculations that are required for life-cycle saving, and bounded self-control, which implies individuals are unable to follow through with previously identified plans to save rather than consume - "*Real people have trouble both in figuring out how much to save and in implementing any given goal*" (Thaler, 1994, p.189). Laibson et al. (1998, p. 93) suggest that individuals have a "*systematic tendency to err... in the direction of instant gratification*" which they explain in terms of personal long-term discount rates being lower than short-term ones.

Bernheim et al. (2001) found, using the Panel Study of Income Dynamics and the Consumer Expenditure Survey, that the average replacement ratio in retirement in the US is around 64%. But there is considerable variation around this figure, even among households with similar socioeconomic characteristics. Life-cycle theory explains this variation in terms of differences in time preference rates, risk tolerance, exposure to uncertainty, and relative tastes for work and leisure at advanced ages. These factors have testable implications concerning the relation between accumulated wealth and the shape of the consumption profile. Bernheim et al. found argue that the data are instead consistent with "rule of thumb," "mental accounting," or hyperbolic discounting theories of wealth accumulation.

The impact of inertia, in particular, on retirement saving decisions is evident in the focus group evidence presented in chapter four of this thesis and in the survey evidence presented in chapter five. An analysis of the implications of delaying retirement saving is presented in chapter seven.

Portfolio choice and life-cycle investing

Modern finance theory (referred to from here as "traditional" theory) has a number of prescriptions for portfolio choice in long-term savings. Markowitz's (1952) portfolio theory implies investors should calculate the optimal risky portfolio based on the expected returns, volatilities, and correlations of the available risky assets. The result is that investors end up with diversified portfolios where they bear market risk – which should be rewarded with higher expected returns – but not unrewarded specific risk, which will have been diversified away. Tobin's (1958) two fund 'separation theorem' implies investors should mix this optimal risky portfolio with long or short positions in the risk-free asset in order to maximise utility given their level of risk aversion. Samuelson (1969) argues that this portfolio choice process is not affected by time horizon and thus asset allocation should not vary with age.

This last point is at odds with the common practice of advising that allocations to risky assets should be reduced as retirement approaches. (See for example, Bodie, 2003.) The default investment funds investigated in chapter eight of this thesis are required by law to have this feature. Various academic papers look at the merit of age dependent asset allocation, i.e. investing heavily in equities during the early stages of your career and then switching to fixed income as retirement approaches. Bodie et al. (1992) argue that the presence of human capital can justify this approach. At younger ages human capital is a major part of an individual's wealth and, if bond-like in nature, may allow considerable risk to be taken with available financial assets. Later in life, financial assets are a greater proportion of total wealth and there is less scope to vary labour supply to make up for any losses in the financial portfolio. This suggests a more conservative financial portfolio is appropriate in later years. Furthermore, Campbell and Viceira (2005) present data on the term structure of risk and return for asset classes that can be taken to imply that equity investment is less risky at longer horizons than it is in the short-term. To the extent that this is true, it also supports the idea of life-cycle investing.

Inertia and default bias

Inertia is the tendency for individuals to avoid taking positive action. In the context of retirement saving, inertia may lead to low take up rates in pension plans where employees need to make a conscious decision to join. Default bias is the tendency for individuals to accept whatever appears to be the usual or officially endorsed choice. In the context of retirement planning, this may mean individuals who do join the pension plan stick at the default contribution rate and are inclined to remain invested in the default fund. In this thesis, chapter seven considers the implications of inertia on saving decisions, through delayed pension scheme participation, while chapter eight considers the implications of default bias in investment choice.

There is some evidence that points to relatively low take up rates in pension plans and low rates of saving. For example, Vanguard (2006) data show an overall DC participation rate of 64%. Participation rates rise with income and tenure. The mean employee contribution rate is 7.3% and the median 6.0%. In many schemes, employers are prepared to match contributions made by employees. The most common employer match is 50c / $ on the first 6.0% of employee contributions. Only 11% of participants contribute the maximum allowed. As noted above, rational explanations for this could include a desire for flexibility in access to savings, expectations of income from other sources, or scepticism about future changes to the retirement saving system. However, Benartzi and Thaler (2006) cite a statistic of 51% take up rate in a sample of 25 *non-contributory* DB plans in the UK and in this context it is harder to think of rational reasons why an individual would decide not to participate in such an arrangement, given the cost/benefit tradeoff.

Inertia may play a role in the explanation. For example, Choi et al. (2002; 2005) document the passive nature of 401(k) plan investors and argue that most follow the 'path of least resistance' in accepting default arrangements in their plan. In one survey employees are asked how much they think they should be saving for retirement and whether they are currently saving enough. The replies on whether they are saving enough correlate with plan administrative data on saving levels. 35%

of self-reported undersavers say they will raise their contributions in the next few months. After four months only 14% of these respondents have actually raised their contributions. (In raw numbers, for every 100 respondents; 68 say they are undersaving; 24 plan to raise contributions; but only 3 do so.)

Laibson et al. (1998) develop the idea of hyperbolic discount rates – that short term discount rates are much higher than long term ones. (For example, I prefer two apples in 101 days to one apple in 100 days; however, I would prefer an apple today rather than two tomorrow. This is contrary to standard assumptions about discounting and preferences.) This implication of this is that employees say *"I will join the pension plan tomorrow"*, but tomorrow – in this context - never comes. This idea is the basis for the Save More Tomorrow program discussed below. The illiquidity of a pension plan is a useful commitment device for consumers with problems of self control, equivalent to a 'Christmas Club' used to save for presents.

The inertia in retirement saving decisions has been shown to be strong enough to prevent some individuals from making choices that are unambiguously beneficial for them. Choi et al. (2006) show that roughly half of their sample of age 60+ 401(k) plan members contribute less than their plan match threshold. The point of interest is that these plan members can make penalty free withdrawals from their plans – hence they can contribute at the maximum match level and then withdraw any funds they don't want to remain in the plan. The average loss of these 'dollar bills on the sidewalk' is 1.3% of income.

Behavioural interventions in retirement saving

A number of approaches have been promoted for using behavioural biases to positive effect to promote increased saving, either in terms of boosting membership or raising savings rates of existing members.

Joining:

Standard pension plan design requires employees to opt-in. Opt-in plan design frames not joining as the usual choice; opt-out frames participation as the usual choice. Opt-out approaches have been shown to have a powerful affect on raising pension scheme participation. For example, Madrian and Shea (2001) show that auto-enrolment means that employees join the pension plan sooner and more eventually join. For the company they study, which changed its approach, under opt-in participation was 20% at three months tenure and 65% at 36 months; with opt-out, the figures were 90% at three months and 98% at 36 months.

A further study by Choi et al. (2005) shows the impact of auto-enrolment on participation rates:

	Opt-in	Opt-out
6 months tenure	25-43%	86-96%
36 months tenure	57-71%	20-34% higher than opt-out

The downside of auto-enrolment is that many of the participants stay with the default fund and the default contribution rate. In the US this may mean a low (2 or 3%) contribution rate and a conservative fund choice (cash or stable value). (See Madrian and Shee, 2001 or Choi et al., 2005)

Automatic enrolment was endorsed by the Pensions Commission (2004, 2005) and subsequently adopted by the UK government for the proposed new system of Personal Accounts due to be introduced in 2012. It is worth noting that such an approach can impose costs of individuals with rational reasons not to save. At present, a particular concern is the situation of low earners who would be eligible for means-tested state benefits and for whom the net return on saving may be zero or even negative on account of displaced state benefits. These individuals should take the decision to opt out of Personal Accounts, although it remains to be seen whether most individuals in that situation realise their position and act accordingly.

Savings Rates:

Many DC members appear to save at too low rates. Thaler and Benartzi (2004) propose Save More Tomorrow (SMT) as a solution. Employees with low saving rates were invited to raise their saving by up to 5%. The 75% of participants who refused were offered the SMT plan, where savings would go up 3% every time they got a pay rise. 78% of these members joined, their average savings rose from 3.5% to 13.6% after four years and most people (80%) remained in the SMT plan until its conclusion. The plan relies on hyperbolic discounting, money illusion and inertia.

Employees seem favourably disposed to behavioural interventions that will help them save for retirement. EBRI (2006) finds 69% of respondents favourable or somewhat favourable about automatic enrolment; 65% are favourable or somewhat favourable about an automatic escalating contributions device.

Such approaches are becoming more common in practice. For example, 8% of Vanguard (2006) plans now use automatic enrolment, and 40% of these have some form of contribution escalation. Most use a balanced or life-cycle fund as default. Low initial contribution rates may be used to avoid encouraging too many employees to opt-out. However, the escalating contribution device then needs to be used to generate economically worthwhile saving rates.

Naïve diversification strategies

Once employees have joined the pension plan and begun contributing at meaningful amounts, the next important decision relates to investment policy. As noted in chapter two, many members do not regard themselves as having much investment knowledge. Evidence points to some scheme members using simple rules of thumb to help them invest. In other cases, members take refuge in the default fund and do not make any active investment decision.

Benartzi and Thaler (2006) cite an interview with Harry Markowitz where he notes he selected a 50:50 allocation between stocks and bonds in his TIAA/CREF retirement account. He states that his intention was to minimise future regret from one asset class beating the other, as essentially behavioural explanation.

There is further evidence of investors using simple rules of thumb to allocate amongst available funds. Benartzi and Thaler (2001) cite evidence for plan members using a "1/n" naïve diversification strategy – dividing contributions equally amongst available funds irrespective of the underlying composition of the funds. In one experiment the choice is between a stock fund and a bond funds for one group and between a stock fund and a balanced (50:50) fund for another group. The average asset allocation to equities is higher in the latter case than the former. In each group a 50:50 allocation between the two funds is the modal choice. In a real plan with five stock funds and one bond fund, the average equity allocation is 75%; in another plan with one stock fund and four bond funds, the average equity allocation is 34%.[1]

However, Huberman and Jiang (2006) counter that most members choose between three and five funds, and that the number is not sensitive to the number of funds on offer (n). They do, though, find evidence of members following a *conditional* 1/n strategy, allocating equally amongst their chosen sub-set of funds. Evidence on use of this approach in a UK scheme is presented in chapter six. Benartzi and Thaler (2006) note that participants are anchored by the number of lines on the election form, e.g. they choose four funds because there are four lines on the page, even if is permissible to choose more funds by attaching an additional sheet.

This evidence shows the importance of menu design and the ability of structure and communications to affect outcomes, whether or not the provider or scheme sponsor anticipated the effect.

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[1] Interestingly, DeMiguel et al. (2007) show that 1/n strategies are often efficient and outperform optimised portfolios because of the measurement error in optimisation.

The impact of investment choice

Most DC pension plans give members investment choice. For example, Vanguard (2006) shows the average US plan offering 19 fund choices, while the average participant uses 3.6 funds and 25% of participants use only one fund. In most cases, the funds on offer are broadly diversified, meaning investors' portfolios follow the basic prescription of finance theory in terms of diversifying away specific risk and holding only market risk, which should be compensated with higher expected returns.

The Table below shows NAPF (2007) data on the degree of choice offered in UK DC schemes. The NAPF's analysis shows that one-in-ten schemes offer members more than 40 investment funds to choose from.

Fund Choice in UK DC Pensions Schemes

No. of funds on offer in DC scheme	% of schemes
1	6
2-5	14
6-10	35
11-20	21
20+	23

Source: NAPF (2007)

Is investment choice useful to DC scheme members? If so, how much choice should be provided? The key role of investment choice should be to allow individuals to construct a portfolio that matches their risk tolerance. For example, risk averse investors can skew their portfolio to fixed income investments, while more risk tolerant investors can hold higher weights in equities. One indication that members may not value choice comes from the high proportion that fail to exercise it and end up in the default fund nominated by the trustees or scheme provider. NAPF (2007) shows that, where a default fund exists, on average 94% of members accept it.

There is other evidence that too much choice may be counterproductive. Taking an example from outside the realm of retirement saving, Iyengar and Lepper (2000) looked at how supermarket customers respond to differing degrees of choice. They set up two jam displays in supermarkets: one with six flavours, the other with 24. With the wide choice, 60% of shoppers stopped to look and but only 3% of these made a purchase. In contrast, with the narrow range, 40% of shoppers stopped, but 30% of these make a purchase. Hence the argument it is possible to have too much choice or *choice overload.*

In the context of retirement saving, Iyengar, Jiang and Huberman (2004) document a negative relationship between the number of fund choices in a plan and the participation rate: the average take-up rate in schemes with two fund choices is 75%; in schemes with 20 fund choices it is 70%; and in schemes with 40 fund choices it is 65%. Fund choice appears to create complexity for members, which puts them off joining the scheme. Another relevant example is the Swedish premium pension system. The open nature of the scheme means that there are over 600 funds for members to choose from. Despite, or possibly because of, the vast range of choices, currently over 90% of members use the default fund. (Cronqvist and Thaler, 2004)

The choice offered in some plans may, in any case, be inadequate. Elton et al. (2006) show that only 53% of plans offer an adequate set of investment choices – i.e. they do not span the efficient frontier. Funds included in plans are riskier than the general universe of funds, but have slightly higher returns, which appears due to lower expenses. They present data on the number of funds offered and the main types on offer. Plans with larger numbers of funds are more likely to span the efficient frontier. Elton et al. (2007) extend the analysis to the types of funds added to or deleted from plans by plan administrators – generally funds added have positive past alpha and come from 'hot' sectors. Subsequent performance is no better than dropped funds.

Chapter five of this thesis presents survey data on member's attitudes to investment choice, while chapter six examines use of default funds using administrative data.

Company stock in DC pension plans

While it was noted above that most DC investment uses diversified mutual funds and hence is broadly consistent with traditional finance theory, there are some aspects of DC investment that are of more concern. A very graphic example of potentially inappropriate investment approaches in DC plans comes in the form of high levels of investment in the stock of the sponsoring company. Many US 401(k) plans offer the employer's stock as an investment option and many also make employer matching contributions in employer stock, in some cases with restrictions on subsequent sale.

Benartzi (2001) notes that one third of 401(k) assets are invested in own employer stock and in some plans the proportion is over 90%. In many cases the account balanced are accounted for in significant part by the employees' *discretionary* allocations. Vanguard (2006) notes that 12% of plans offer company stock as an option, but these are larger plans so 43% of participants have company stock as an option. One fifth of all participants had more than 20% of their account balance in company stock; 15% had more than 80% of their account balance in it. Balances in company stock remain high despite high profile disasters at Worldcom and Enron. Choi et al. (2005) note that at the end of 2000 62% of the $2bn of assets in the Enron 401(k) plan was invested in Enron stock.

Explanations given for investment in company stock include:

- Members underestimate risk through familiarity / overconfidence - John Hancock (2002) survey shows average risk score of 3.1 assigned to company stocks, in comparison to 3.6 for domestic stock funds and 4.1 for global stock funds. Huberman (2001) argues this own company investment springs from the same familiarity bias that leads to home bias in geographic allocations and that leads US investors to invest more in their local phone company than in other 'Bells'. It could be that employees do have an informational advantage that justifies their high holdings in their employer's stock, but evidence on returns (e.g. Benartzi, 2001) casts doubt on this and points more

to overconfidence as an explanation.

- Naïve extrapolation of past returns - Benartzi (2001) sorts firms into quintiles based on 10-year past performance of the firm's stock. Employees at the worst performing firms on average allocate 10% of contributions to company stock; for the best performing firms the figure is 40%. Subsequent stock performance does not validate this difference in allocation.

- Endorsement effect of matching contributions – Benartzi (2001) shows that employees who can choose where the employer match is invested allocate 18% of their own funds to company stock. Where the match is in company stock, employees allocate 29% of their *own* contributions. Employees may be taking the company's decision to contribute stock to their plan as *implicit advice.*

- Loyalty based arguments, including e.g. takeover defences.

Company stock has not been an issue in the UK because of post-Maxwell legislative restrictions. However, recent pensions tax simplification in the UK does raise the possibility of *in specie* transfers of company stock from Save As You Earn (SAYE) schemes, although a cap of 5% of scheme value will still apply. The survey data discussed in chapter five shows that respondents in that particular scheme are mostly uninterested in investing their pension assets in their employer's shares.

Many of the biases that explain company stock investment probably have a role to play in UK investors' enthusiasm for property, for example, familiarity with the asset class, and naïve extrapolation of high past returns.

Trading behaviour in DC pension plans

Investors in DC plans could trade for two main reasons. The first possibility is that investors rebalance their portfolios to take account of changes in their risk tolerance.

The most obvious reason for this is the effect of growing older, as in the life-cycle investment theory discussed above. The second possibility is that investors trade to take account of time-varying expected returns, i.e. they engage in market timing.

The evidence we have shows most DC members are not active investors. Samuelson and Zeckhauser (1988) and more recently Ameriks and Zeldes (2000) find the median number of fund switches made by TIAA/CREF members over ten year-plus periods was zero. This suggests many investors are not following the life-cycle investing approach. Other evidence includes Vanguard (2006) data which shows 19% of participants made a fund switch in 2005, often when investment options in their plan were changed, and Mitchell et al. (2006a) show that only 20% of plan members make any trades over a two year period. Traders are males, older, wealthier and more highly paid with longer plan tenure.

Choi et al. (2002) note that the introduction of web-based trading for two large 401(k) plans boosts trading frequency. The trades are typically small and there is no evidence that the increased frequency of trades boosts returns. Young, wealthy males are the most enthusiastic adopters. Mitchell et al. (2006a) also find that online trading channels make trading more (5x) frequent, but do not increase turnover by nearly as much, i.e. online deal sizes are small. Wider investment choice also stimulates trading and traders are more likely to hold active funds than passive funds or life-cycle funds. Mitchell et al. (2006b) look at the returns from trading in 401(k) plans. Traders who are rebalancing tend to do well while others do not. High turnover traders do less well than low turnover traders.

On balance, the DC trading evidence suggests many investors are passive and do not engage in market timing and are unlikely to rebalance portfolios through time to take account of changing risk tolerance. On the other hand, a small minority of members are active traders, more likely involved in market timing activities rather than portfolio rebalancing. There is little evidence this trading activity is beneficial in terms of returns.

The evidence on DC plans stands largely in contrast to evidence on individuals with retail investment accounts who, on average, appear more active, if inept, traders. Barber and Odean (1999) summarise evidence from their studies of investors with discount brokerage accounts. The main findings are that investors trade too much – damaging returns – and tend to sell winners and hold on to losers – the disposition effect.

A winning position is 1.5 times more likely to be sold in any month than a corresponding losing position. This may be driven by fear of regret. Winners sold subsequently outperform the losers that remain in the portfolio. Excess trading appears to be driven by overconfidence. The expectation that traders would be worse off to the extent of their transaction costs was not confirmed: in fact stocks sold do better than stocks bought, by c. 3.5% over one year. Performance is negatively related to turnover levels. Young males trade most and earn the lowest net returns.

The difference between the discount brokerage and the 401(k) results may stem from self-selection of individuals (keen traders) into brokerage accounts and the differing levels of investment choice (i.e. choice is somewhat restricted in 401(k) plans).

The annuitisation decision

The focus so far has been on the accumulation phase of retirement saving, i.e. building up funds during the individual's working life to enable payment of an income in retirement. However, there are also choices to be made relating to the decumulation phase, i.e. converting the accumulated assets to an income. In the UK, most individuals convert the accumulated savings to an annuity, usually after taking the 25% tax-free cash sum allowed by legislation. Legislation allows an income to be drawn directly from the fund in the early stages of retirement, but requires annuitisation by age 75 at the latest.

There is significant evidence of individuals underestimating their longevity, e.g. O'Brien et al. (2005) for the UK and Drinkwater and Sondergold (2004) for the US.

This may make them view annuities as poor value and thus be prepared to run the risk of exhausting their capital. In O'Brien et al., the average self assessed life expectancy is 79.5 years, the corresponding Government Actuary's Department (GAD) estimate is 81.3 years and the GAD forecast is 84.9 years.

Money illusion and poor understanding of inflation may also be responsible for preferences for level rather than inflation-indexed annuities, which industry contacts say is the most common form of annuity purchased.

The remainder of this thesis focuses mainly on the accumulation phase of retirement saving and has little to say about annuitisation, except where it is relevant to the analysis of pre-retirement saving and investment decisions.

Conclusion

This chapter has discussed traditional economic explanations of saving and investing behaviour alongside competing behavioural explanations. The former typically imply that individuals make decisions that are in their own best interests, for example someone who does not save for a pension will have a good (economic) reason for not doing so, while the latter allow for the possibility that individuals make mistakes, taking action, or failing to act, in ways that impose costs on them.

The notion of rational economic decision making has sound theoretical underpinnings and has been shown to be descriptively true in many settings. Hence, we should be careful in casting it aside. At the same time, this review has shown that there is some evidence that is difficult to reconcile with traditional theory. Behavioural explanations may have a role to play in allowing us to understand this evidence. In the remaining chapters, I present various forms of evidence on decision--making in DC pension plans that can be used to assess the respective roles of traditional economic and behavioural theory in explaining long-term saving behaviour. This assessment can then be used to make prescriptions about the effective design of DC pension plans. These are presented in chapter nine.

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Chapter Four: Employee Attitudes to Pensions: Evidence from Focus Groups

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Abstract:

In this article we present evidence from a series of focus groups where pensions issues were discussed with the employees of a listed distribution company. The focus group format allows us to explore the employees' views in detail and to present their thoughts in their own words. Perhaps unsurprisingly, we find the employees have quite limited knowledge about pensions in general and about their own scheme. They have a strong desire for more information and advice about pensions, ideally on a face-to-face basis. There were mixed views about the role of pensions in recruitment, especially for employees younger than 40, and concerns that managers were unable to promote the benefits on offer. As regards the changes introduced in the Pensions Act 2004, the employees view the Pension Protection Fund as a valuable measure, but see little point in increasing the proportion of member nominated trustees.

Introduction

We hear a lot from pensions professionals and journalists about the "pensions crisis" and the problems faced by the pension system. But what do employees think about these issues? How do they see the crisis and what would they like to see change? How much do they value the changes introduced by the 2004 Pensions Act? Surveys such as the ABI's '*State of the Nation's Saving*' report provide us with answers to some of these questions in a statistical format. The aim of this paper is to complement that perspective with evidence from focus groups, where we can bring more colour by presenting the employees' views in their own words.

We find that the employees in our focus groups have quite limited knowledge about pensions in general and about their own scheme. For example, few knew how much the company contributes to the scheme on their behalf. The employees suggested that interest in pensions tends to pick up from about the age of 40, with younger employees showing less interest. Despite the low level of knowledge, most employees valued having a company pension and were conscious of their need to save for retirement. Almost all of the employees were keen to know more about the pension scheme, but preferred to have the information "face-to-face", rather than in written form. Very few of the employees had any idea how the company pension scheme was run or about the role of the pension scheme trustees. Only a few knew who the trustees were and most could see little benefit in increasing the proportion of member nominated trustees. The new Pension Protection Fund (when explained) was generally viewed as a valuable protection that was worth paying for. There were mixed, but generally positive, views about the value of the company pension scheme as a tool in recruiting and retaining good employees. However, recruiting managers felt they lacked the knowledge to promote it as a benefit. Most employees viewed defined benefit (DB) pension provision as superior to defined contribution (DC), but a minority worried about DB funding levels and preferred having their own allocated DC savings.

Focus Groups

In order to gain an insight into their views on pension provision, we held a series of focus groups with the employees of Pendragon plc, a listed distribution company with a large number of relatively small branches located across the UK (hereafter "the company"). The company has grown significantly in recent years, undertaking several horizontal acquisitions of competing businesses. One implication of this growth by acquisition is that the company now manages a number of different pension schemes, with different terms and conditions attaching to them. The main (original) DB scheme was closed to new members in 2000 and new recruits are offered a DC scheme. Non-managerial employees have access to a stakeholder scheme with no employer contribution, while new managerial employees (and those promoted internally) are offered an occupational DC scheme where the 2.5% employee contribution is matched with an employer contribution of 2.5%. The occupational DC scheme is not contracted out of the second state pension.

We ran four focus groups, with each group comprising employees with similar pension arrangements. The first group comprised members of the main (closed) DB scheme, which operates on a 60^{ths} basis. The second group comprises members of one of the acquired DB schemes, now closed, which had recently been changed from accrual on a 60^{ths} basis to 80^{ths}. The third group comprised members of the occupational DC scheme, while the final group of employees were eligible to join the DC scheme, but had chosen not to. Table 1 sets out the characteristics of the groups.

Table 1: Focus Group Characteristics				
	Group 1 DB Members "60ths"	Group 2 DB Members "80ths"	Group 3 DC Members "DC"	Group 4 Non-members 'NM"
No. of people	9	9	9	9
Average age	49	54	37	36
Average tenure	17	22	5	5
Accrual rate	60ths	80ths	-	-
Employee contribution	4%	7.5%	2.5%	-
Employer contribution	13.5%	15.4%	2.5%	-
Source: Company records and authors' calculations				

It is worth noting that the average age of employees and length of employment with the company varies between the groups and this should be taken into account when comparing the comments made by employees in the different groups. The meetings lasted about one-and-a-half hours each and took the form of a group discussion of a series of prepared questions.

The following sections discuss the employees' views on the various issues relating to pensions that were discussed at the focus groups. Where quotes from an employee are provided, the type of pension arrangement held by the employee is noted at the end of the quote. ("60ths"; "80ths"; "DC"; "NM")

Pensions in general

Most employees in the focus groups noted that they found it difficult to deal with the complexity of pensions. To the extent that they had an overall perception about pension provision, it was typically a negative one.

"Pensions are a grey area – there's a big element of confusion."[60ths]

"There's a bad press generally about pensions."[60ths]

For some of the employees who were not members of the company pension scheme, this issue of lack of confidence in the pension system was noted as being a key factor in their decision not to join.

"Everyone is saying, "don't bother with pensions" – you'll come to regret it."[NM]

"The information in the public domain is such that you're advised not to do it."[NM]

Virtually all employees in the focus groups, whether members or non-members of the pension scheme, said they were aware of the need to save for their retirement. For several members, that awareness had only begun to build in recent years.

"Time goes so quick. It's not until you reach your 40s that you begin to pay attention."[60ths]

"When you're young, you don't see so far in front."[80ths]

"I came in very late. I didn't start until I was 40."[DC]

"For me, it's crept up."[DC]

A significant proportion of the DC scheme members said they wished they had started saving at an earlier stage in their careers.

"If you don't start making choices early on, you can have a big problem."[DC]

"At 40, it may be a bit too late."[DC]

On the other hand, they also noted that there were real difficulties in starting saving at an early age, with conflicting demands on available income.

"It's difficult when you're young, when you have to get on the property ladder as well."[DC]

Most of the DC scheme members had heard of Additional Voluntary Contributions (AVCs) and were broadly aware of what they were. Despite comments about their desire to make up for lost ground, none of the DC scheme members were making AVCs. In fact, few of them had given much thought to how much they would have to save to fund their retirement. The DC scheme involves a 2.5% basic employee contribution plus 2.5% employer contribution, which is low by comparison to typical DB funding costs and unlikely on its own to produce an adequate income replacement ratio.

Comments made by the employees who had not joined the DC scheme provided support to the idea that the other financial and non-financial priorities that exist early in your career provide a significant barrier to pension saving.

"The majority of people take the view "I'm only 30 – life is for living"."[NM]

"For me, it's lack of knowledge and lack of priority."[NM]

"It's something at the back of your mind, but there's a million other things going on."[NM]

There was relatively little evidence that employees were using non-pension investment vehicles to save for their retirement. Two of the non-members had invested in property as an alternative to a pension, but no one else mentioned doing so. Several of the non-members had personal pension arrangements. Typically, these had been taken out prior to joining the company and where either dormant or had quite small ongoing contributions. The reasons for taking out these schemes ranged from being advised to contract out of SERPS, through to a desire for investment options (specifically, ethical funds) not available within the company scheme.

"You've got control over the investments." [NM]

Employer-sponsored pensions

Most of the employees who were scheme members expected to rely on the company pension for their retirement income and said they would not trade the company pension scheme for other benefits or increased salary.

"The pension scheme is extremely important."[DC]

Despite the employees' comments about the importance to them of the company pension scheme, none of the DB scheme members were aware of the level of the employer's contribution to the scheme. When they were told the level of the employer contribution, most members were surprised by how high it was.

"The company contribution is very important. If people knew what it was, more people would join the scheme."[60ths]

"You don't stop and think about missing out on the employer contribution if you have a private pension."[60ths]

Many of the employees noted that they thought more could be done in terms of communicating the benefits of the pension scheme and helping them make decisions about retirement saving. They felt they had not been given enough information about the company pension scheme, or that it had been presented to them in a form that had not gained their attention. Many wanted personal, face-to-face communication.

"In my early 20s, if someone gave me a pamphlet on pensions it would be "where's the dustbin." Sitting round a table discussing it you pay more attention."[60ths]

"If you looked at the pension book and read through it, you'd fall asleep."[NM]

"People used to like the roadshows"[80ths]

"We'd like some kind of presentation every so often."[NM]

Lack of effective communication was suggested as a key reason why many people did not join the pension scheme. There was reported to be a mixture of "*scepticism*" and "*ignorance*" on the part of those who don't join. Most members understood that regulations prevented the company providing them with specific advice, but felt strongly the need for more information from a trusted source.

"If you're going to commit to something financially, you have to understand it."[DC]

"The main issue is the lack of trust in certain pension schemes."[DC]

"There has been a lot of bad press on pensions. Without information, you're trusting something you can't see."[DC]

Non-members, particularly, felt there was a need for the company to actively promote the pension scheme.

"People won't go out and seek the information."[NM]

The company has a share save scheme with a relatively high take up rate. Employees are able to make regular savings and at the end of either three or five years, depending on their preference, they can invest the proceeds in company stock at a pre-set price, or receive their money back with interest if the current share price is below the set purchase price. Employees in the focus groups discussed the similarities and differences between the share save arrangement and the company pension scheme. In general, they thought that share save had been communicated better than the pension scheme. Interestingly, the majority of employees who were not pension scheme members were in the share save arrangement. It was clear that the 'money back' guarantee was an important factor.

"The share save is more visible and more tangible."[60ths]

"You can't lose. You'll always get at least your money back."[60ths]

"You can't lose, can you?"[NM]

Some members thought the pension scheme and the share save weren't strictly comparable. The share save was for short-term saving, while the pension scheme was long-term. For many employees, this was the key attraction of the share save relative to the pension.

"It's more immediate for them – they see the benefit of it."[DC]

"It's not so long term."[DC]

"The pension seems so far off and, with all the bad press, there might not be anything there when we retire."[DC]

"The key advantage of share save is that it is for 3 or 5 years. With pensions, it is so far out you can't see the benefit."[NM]

Some employees noted the problem that they were only actively offered pension scheme membership at certain stages in their career, e.g. on joining the company, and if it didn't suit them at that point they were not prompted to revisit the decision.

"For me, at first the scheme wasn't available. When it did become available, I'd just moved house and started a family."[NM]

It is notable that the focus group meeting itself had sparked interest in pensions amongst the employees who were not already members of the company scheme and most expressed an intention to find out more and, perhaps, take action.

"There's a lot of interest around the table."[NM]

"I'd like a lot more information."[NM]

"The majority of people want a pension, they just haven't done anything about it."[NM]

"It's something I've been meaning to do since I was 20."[NM]

They had given little thought to how much they would need to save to fund their retirement and were surprised when given illustrative figures.

"It's frightened me to death, really."[NM]

"It's prompted me to go back and revisit this."[NM]

Most of the non-members said that a company pension contribution was more important to them than a comparable amount of salary, whilst acknowledging that at present they were foregoing that contribution.

Managing the pension scheme

Very few employees had any idea how the company pension scheme was governed. There was a desire to know about how the benefits are kept secure, with the Robert Maxwell pension fraud case mentioned a few times.

"We've never had a big book saying how it is managed."[60ths]

"People in the scheme need to know the safeguards in place."[60ths]

Most employees had no understanding of the trustee system or of the existence of member nominated trustees (MNTs). The level of awareness was slightly higher amongst the DB members than DC or non-members. Only one DB scheme member recalled having seen an invitation for nominations of MNTs. However, once the idea was mentioned, most scheme members could see the value in having MNTs, especially if they had personal contact with them.

"The value of having someone to represent me is to make sure the company doesn't run off with the silver."[60ths]

"With all the recent collapses of pension funds, you'd want to make sure it won't go belly up."[NM]

"I know [...] and I trust him. He knows what's what."[80ths]

"I think it is a positive, but I don't know who they are." [DC]

"It's better if you know them."[DC]

"It's an advantage. You can relate to the people and trust them."[NM]

Some employees suggested the main benefit of MNTs is as a communication channel – cascading information about the scheme. This confuses the role of trustee with what some companies have called *"Pensions Champions"* – workplace representatives who can provide pensions information to their peers.

"If you've got someone there who you can talk to about it..."[NM]

"It's important that individuals have someone they can talk to about what's the right advice."[NM]

For the DC members there was also some confusion about the distinction between trustees and the fund managers, and over the nature of trustees not nominated by members, who were assumed to be *"experts"* rather than company management. Most non-members also held the view that experts would dominate the trustee board and were not aware that virtually all of the trustees were either employees or company executives.

The Pensions Act 2004 contains powers for the Secretary of State to raise the required minimum proportion of MNTs to 50%. Most employees did not think this was a sensible proposal. There was a concern that *"people like us"* would lack the required expertise.

"I would have thought the best people to make these decisions are specialists in the field."[DC]

"I think 50% is too many. It's good to have representatives to hold people accountable, but the balance should be experts."[DC]

Most members felt they lacked the knowledge to become a MNT. The main barriers to being an MNT were noted as "*time, knowledge, and the tremendous responsibility."[60ths]*

"I know quite a lot of it, but I don't know it in enough depth."[80ths]

"You'll struggle getting people who can do it."[80ths]

There was also concern that the trustee role might put them in conflict with their employer.

"You've got to have a strong person in there. They have to be prepared to put their head above the parapet."[80ths]

"The company representative could be the employee representative's boss."[80ths]

Another key aspect of the Pensions Act 2004 is the creation of the Pension Protection Fund (PPF). The employees were not aware of this development, but when it was explained to them they thought it was a valuable protection and one they would, within reason, pay for.

"It wouldn't be a bad thing, knowing that what I have saved is protected."[60ths]

'It's a belt and braces approach."[60ths]

"It does give you confidence."[80ths]

"But, only in the short-term, if too many companies end up claiming on it."[80ths]

Trend from final salary to defined contribution pensions

Most scheme members thought a final salary DB scheme was better than DC, and were aware that it was now uncommon to offer final salary pension schemes to new recruits. Most non-members had little understanding of the differences between the various types of schemes. Those who did understand the distinction viewed final salary as better.

"People's perception is that final salary is better."[DC]

"The negative press is because companies won't offer a final salary scheme. The other options are less favourable." [NM]

However, the view that final salary pensions are best was not universal. Some scheme members were concerned about DB scheme deficits and the risks to promised benefits as a result.

"Initially, I was disappointed to be in the money purchase scheme, but now given all the bad press on final salary, I'm more happy in the money purchase scheme."[DC]

"Because of all the deficits, there is a question mark over [final salary schemes]."[DC]

In one case the negative view on DB was as a result of losing accrued benefits from previous schemes.

"Three times bitten."[80ths]

Some DB scheme members noted that they knew they would no longer be covered by DB for future accrual if they moved job and thus the DB scheme effectively prevented them leaving the company.

"It is a retention factor for those over a certain age."[80ths]

"It keeps us stuck in like glue."[80ths]

Most DB scheme members suggested a good pension scheme could be an advantage for the company in recruitment.

"Good team members are hard to find. A final salary pension scheme could swing it."[60ths]

"Making final salary pensions available for new recruits would be an incredible honey pot."[60ths]

However, others noted that pensions weren't usually discussed in the recruitment process and that younger interviewees, in particular, weren't interested. None of the DC members had personally considered pension benefits in their decision to move to the company.

"One of the very last things to come up in a second interview."[NM]

Another problem was that recruiting managers did not feel they were able to explain the company pension scheme and the benefits on offer.

"I'm not qualified to talk on pensions."[80ths]

"I would provide the leaflet, but I wouldn't go into it in detail."[DC]

"If the [manager] can't explain it..."[60ths]

"I haven't had the question [about pensions] asked and, to be honest, I wouldn't know what to say if I was."[NM]

"I've never sold it as a benefit."[NM]

"When I joined, [the pension] wasn't explained to me at the time."[DC]

These comments suggest that employers could consider training managers about the nature of the pension scheme and the benefit it provides to employees as a means to ensuring that they get value for the investment they are making in pension provision. Otherwise, the benefit goes unmentioned and unnoticed in recruitment activity.

Conclusion

We have presented one group of employees' views about pension provision, using their own words in order to make the ideas vivid. What conclusions can we draw from their comments? One clear message is the employees' desire for more information and advice about pensions, ideally on a face-to-face basis. There are serious cost implications for any employer providing employees with professional financial advice, but the evidence here suggests it will be highly valued by the employees who otherwise struggle with the complexity of the subject. The government's recent introduction of a limited tax credit on workplace financial advice may go some way to encouraging employers to provide more support.

Another strong theme in the comments is the lack of importance attached to pensions by younger employees, with age 40 being noted by many as the turning point. There are several commonsense reasons for not saving towards a pension while you are young, such as paying off student loans or buying a first home, but the arithmetic of compound interest means it pays to start saving as soon as possible thereafter. The key question is how to create an interest in pension saving amongst younger employees so that non-saving inertia does not take hold. Perhaps we should be in the habit of writing to employees at 'landmark' birthdays, asking them what they have done to provide for their retirement needs. Another possibility is compulsory pension scheme membership, the pros and cons of which have been discussed at length by the Pensions Commission.

The Pensions Act 2004 brings some significant changes to pension scheme governance in the UK. The focus groups suggest the PPF is a valuable source of reassurance for pension scheme members and that they are prepared to pay something for that protection. However, there were more mixed views on the value of MNTs. Many employees expressed the down to earth view that they would like their pension fund run by experts, rather than people like themselves.

Finally, we have one important caveat. The comments and views in this article are from the employees of one company, with its own particular culture and history. We hope they are representative of the views of employees more generally, but we have no direct means of assessing whether they are or not. Readers with experience of other companies will be able to make up their own minds on that.

Chapter Five: Employee Saving and Investment Decisions in Defined Contribution Pension Plans: Survey Evidence from the UK

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Abstract:

This paper uses data from a survey of the members of a UK defined contribution pension plan to explore the attitudes and knowledge of employees faced with pension saving and investment decisions. The results are consistent with behavioural economics in that many employees show limited interest in their pension arrangements. Not all members have received advice about their pension, but those who have are more likely to have calculated their savings needs, to have higher levels of investment knowledge, and to actively review their investments than those who have not. The members' investment preferences appear broadly consistent with traditional finance theory, although the popularity of property may reflect familiarity bias.

1. Introduction

Most occupational pension plans operate on either a defined benefit ("DB") or a defined contribution ("DC") basis.[1] In recent years there has been a significant shift in retirement income provision in the UK from the situation where employers typically offer DB plans, to a situation where DC plans are more common (e.g. NAPF, 2003). This follows a similar trend in the US (e.g. Friedberg and Owyang, 2002).

Saving for retirement is a complex task and the stakes – ensuring an adequate income in retirement - are high. The move from DB to DC pensions puts much more responsibility into the hands of the individual participants, principally in terms of how much to save and how to invest the resulting funds. There is evidence that many people struggle to deal with this greater responsibility. For example, the US Retirement Confidence Survey (EBRI, 2006) reports only 42% of respondents had tried to calculate how much money they should save for retirement, while 42% of the respondents in a survey of US DC participants conducted by the John Hancock insurance company (John Hancock, 2003) said they had little or no investment knowledge. Volpe et al. (2006) find that US pension plan administrators think that their plan members lack knowledge on important personal financial issues, including investment and retirement planning.

This paper uses data from a survey of the members of a mid-sized UK DC pension plan to explore the attitudes and knowledge of individual employees faced with saving and investment choices in their pension plan. The data are used to assess the plan members' behaviour against key theories from both traditional and behavioural economics and finance, and to assess the impact of advice on behaviour. The results show that many plan members have little interest in or knowledge about their pension arrangements, including the investment decisions that they face. This is consistent with behavioural economics ideas such as default and status quo bias, and with previous US survey evidence. Where members have received some form of advice about their pension, they are more likely to have calculated how much they need to save for their retirement, to

report higher levels of investment knowledge and to be active in reviewing their investments. The members' investment preferences are broadly consistent with traditional finance theory. They do not report much interest in investing in own company stock – a poorly diversified strategy – but they do show a strong preference for investing in property, which may be an alternative manifestation of Huberman's (2001) familiarity bias.

The remainder of the paper is organised as follows. Section 2 reviews the previous literature on employee decision making in DC pension plans. Section 3 describes the objectives for the study and Section 4 discusses the data and method. Section 5 presents the results, with the discussion in Section 6 and limitations and directions for future research in Section 7. Section 8 concludes.

2. Previous literature on decision making by DC plan members

Standard economic theory holds that individuals save to smooth consumption over their lifetime, while standard finance theory implies they will choose investments to maximise expected utility taking account of their level of risk aversion. However, evidence indicates that many people struggle to understand and deal with the choices they face when saving for retirement. This is consistent with the principles of behavioural economics, which suggest individuals often do not make decisions in the rational, well-informed and unbiased manner assumed by standard theory. For example, Mullainathan and Thaler (2000) claim there are 'bounds' to human rationality and self-control and these bounds can have a significant effect on decision-making, including in saving for retirement. Baker and Nofsinger (2002) provide a comprehensive review of the various biases documented in investor behaviour more generally.

A wide range of behavioural traits has been documented in the context of DC pension plans. For example, Benartzi and Thaler (2002) argue that most members have weakly-defined investment preferences and that, as a result, investment choice in DC plans is of

limited value. Samuelson and Zeckhauser (1988) discuss "status quo bias", whereby individuals stick with their initial choices even where they have cause to make a change.

There is also evidence that investors with DC pension plans display attitudes to risk and portfolio construction that are at odds with accepted investment principles. Some plan members appear to suffer from myopic loss aversion, seeking to avoid short-term losses, despite the long time horizon usually involved in planning for retirement (Benartzi and Thaler, 1999). Other findings include the use of '1/n heuristics' whereby investors divide their contributions equally amongst the 'n' funds on offer, with little regard to the underlying asset composition of the funds. (Benartzi and Thaler, 2001).

Perhaps most worryingly, several studies, e.g. Benartzi (2001), find DC plan members in the US investing high proportions of their pension assets in the stock of their employer, despite the risk implications this has. VanDerhei (2002) notes that the percentages invested in company stock are partly explained by the requirement in some plans for employer contributions to be invested in company stock. On the other hand, Benartzi finds significant numbers of employees voluntarily holding high proportions of company stock in their 401(k) accounts. This may be explained by an endorsement effect, with members following company matching contributions made in stock, naïve extrapolation of past performance, or a desire to 'invest in the familiar' (Huberman, 2001).

The studies discussed above provide significant evidence that the investment strategies employed in self-directed retirement plans are often at odds with standard investment theory and suggest this can be explained, at least in part, by well-documented behavioural biases. The remainder of this paper seeks to add to the picture by considering case study evidence from the UK.

3. Study objectives

The objective of the study was to gather data on the attitudes and knowledge of UK DC plan members with respect to pensions and saving for retirement, which can be used to assess the extent to which their behaviour is consistent with theories from both traditional and behavioural economics and finance. The data allows assessment of the members' approach to investment in terms of issues such as asset allocation, lifecycle investment theory, and portfolio diversification. It also allows assessment of the extent to which members are subject to behavioural biases such as naïve acceptance of default arrangements, status quo bias, and familiarity bias.

4. Data and method

4.1 The plan surveyed

Data was collected by sending a questionnaire to the members of a mid-sized occupational pension plan. The plan that participated in the survey (hereafter "the plan") is sponsored by a long-established professional services company based in the South-East of England, which is now a subsidiary of a US-listed company.

The plan operates on an occupational money purchase basis, with a board of trustees overseeing the affairs on behalf of members. At the date of survey it had a total of 1118 members, of which 484 were "active" members still employed by the company and the remaining 634 were "deferred" members no longer employed by the company, but with preserved pension rights. The total assets of the plan amounted to £17.5m.

The minimum employee contribution to the plan is 4.5% of salary, with the employer contributing an additional 6.0%. Employees have a choice of three main investment options, graded according to risk. The "Aggressive" option (Fund A) is approximately 90% equity and 10% fixed interest, while the "Balanced" option (Fund B) is 80% equity

and 20% fixed interest, and the "Conservative" option (Fund C) is 65% equity and 35% fixed interest. Fund B is the default option, which is adopted if the employee does not make a choice. The same fund manager manages all three funds. Additionally, members over the age of 50 have the option of investing all or part of their assets in a fund that is 100% government bonds. However, there is no automatic 'lifecycle' option that will switch risky assets to bonds as the member approaches retirement. Approximately 77% of plan assets are invested in the default Balanced fund. The Aggressive fund accounts for a further 10% and the Cautious fund 2%. The gilt fund holds 7% of the assets and the remaining 4% is invested in externally-managed funds used for additional voluntary contributions from members.

4.2 Survey details

The survey questionnaire was sent out along with each member's annual benefit statement (known as the statutory money purchase illustration). A covering letter from the plan's senior trustee asked for the member's help in completing the questionnaire, but no inducement was offered and no deadline set for return.

The questionnaire asked about various issues in relation to pension saving and investment, as well as collecting basic demographic information. The questionnaire is reproduced in the appendix. Table 1 lists the question numbers alongside the corresponding research objectives.[2]

A total of 161 useable responses were received, representing a response rate of 14.4%. The response rate for active members was higher at 19.0%. In the context of a consumer survey using a lengthy questionnaire (6 pages) this can be argued to be a reasonable response rate. Nonetheless, with a small sample drawn from one company, care needs to be taken in generalising the results.

Table 1 – Questionnaire research objectives by category

Category	Research objectives	Question numbers
Pension Knowledge	Assess members' knowledge and engagement with retirement planning.	1-12
Saving Adequacy	Assess members' views on required savings levels and test response to Thaler and Benartzi's (2004) Save More Tomorrow.	8-13
Investment Knowledge	Assess members' knowledge and engagement with investment decision making.	14-16; 21-25
Default Behaviour	Assess degree to which members make active decisions or accept scheme defaults. Test for status quo bias (Samuelson and Zeckhauser, 1988), and default bias (Choi et al., 2002)	17-20
Life-cycle Theory	Assess the extent to which members follow lifecycle investment theory (Bodie, 2003), reducing exposure to risky assets as retirement approaches.	22 & 26
Asset Allocation	Assess the rationality of members' asset class preferences	26-28
Familiarity Bias	Assess the extent to which members are attracted to investing in their employer's stock, for example through Huberman's (2001) familiarity bias.	27-28
Demographic	To enable analysis and cross-tabulation of results.	29-40

Question numbers refer to the questionnaire reproduced in the appendix.

A breakdown of the characteristics of the membership of the plan and the corresponding figures for the respondents are shown in Table 2. The nature of the sponsoring company means the membership of the pension plan has certain biases relative to the general working population. In particular, it is predominantly male (78%), older (average age 43.5 years) and more highly paid (average salary of active members of £35,079) than the UK working population at large.[3] In turn, the respondent group has certain biases relative to the overall membership of the plan. The respondents are mainly males (89%) who on average are 2.2 years older and earn £4,300 per annum more than the typical plan member. It may be the case that older and higher paid employees have more interest in, and knowledge about, pensions than their younger and lower paid colleagues. Worthington (2006) finds that general financial literacy is positively related to age, education and income and that males are generally more financially literate than females. This should be borne in mind when interpreting the survey results.

Table 2 - Scheme and respondent demographic information

		Active Members	Deferred Members	All Members
Plan:	Members	484	634	1118
	% Male	76.9%	78.7%	77.9%
	% Female	23.1%	21.3%	22.1%
	Average Age	43.4	43.5	43.5
	Average Tenure	5.9	8.8	7.6
	Average Salary	£35,079	N/A	N/A
Respondents:	Members	92	66	161
	% Male	87.0%	90.9%	88.8%
	% Female	13.0%	7.6%	10.6%
	Average Age	47.2	46.2	45.7
	Average Tenure	7.2	7.4	7.3
	Average Salary	£39,348	N/A	N/A
	Total Response Rate	19.0%	10.4%	14.4%
	Male Response Rate	21.5%	12.0%	16.4%
	Female Response Rate	10.7%	3.7%	6.9%

Active members are still employed by the company that sponsors the plan. Deferred members have left the company's employment, but retain accrued pension benefits. Salary figures for deferred members are not available because the individuals no longer work for the company and there is no way of tracking their current actual earnings. Three respondents failed to indicate whether they were still employed by the company and one deferred member returned the form complete except for the indication of sex.

5. Survey results

5.1 Pension knowledge

This section covers the respondents' general attitudes to and knowledge about pensions focusing particularly on the extent to which they have benefited from advice about retirement savings.

Most respondents expect to retire at either 60 or 65 and to rely mainly on their occupational pension(s) to provide a retirement income of between 50% and 74% of their current income. (Data not reported) However, there are also a significant number of

respondents who expect a retirement income of less than half the amount they currently earn. Few respondents expect to defer retirement beyond age 65, despite media commentary about the effects of longevity and the need for many employees to work later in life to ensure an adequate retirement income.

Only 59% of respondents to the survey report having received advice about their pension. It is more common for older and higher earning respondents to report having received advice. The proportion of respondents over age 50 who have had advice is 69%, compared to 52% of those under 50. The chi-square statistic for the difference is 4.90, which is significant at the 5% level. (DF=1; P=0.027) Similarly, the proportion of respondents earning over £40,000 who report having had advice at 72% significantly exceeds the proportion (45%) of those earning less than £40,000 (chi-square 11.15; DF=1; P=0.001).

Of those who have received advice, the most common source relied on was an independent financial adviser – 73% had relied on advice from an IFA at least "moderately". (Data not reported) The next most common source of advice was the member's employer, with 55% of those having received advice relying on this source at least moderately. Relatively few respondents report having relied on other sources of advice.

There is some evidence that advice influences members' opinions about retirement saving.[4] In a number of questions responses differ significantly between the group that has received advice and the group that has not. Those who have had advice are more likely to have calculated the amount they need to save for retirement and to report the corresponding figure as being above 10% of salary. There are fewer significant differences in terms of responses to the investment questions, although respondents who have received advice tend to report a more active stance on reviewing their investments. Differences in savings and investment behaviour contingent on having received advice

are consistent with existing evidence that some plan members change their behaviour after having received education and advice (e.g. Dolvin and Templeton, 2006).

5.2 Saving adequacy

The move from DB to DC raises important questions about whether employees are saving enough for retirement. However, more than half of respondents report they have never tried to work out how much they need to save for retirement or that they have tried, but were unable to work it out (45% and 8% respectively). (Table 3) The balance of responses varies significantly between those who have received advice and those who have not: 25% of the former group have not tried to calculate how much they need to save, while the corresponding figure for the latter group is 74%. The difference in responses is significant at the 1% level using the chi-square test.

Despite the limited proportion of respondents who have done a formal calculation, most respondents appear to have a realistic view of how much they will need to save for retirement. Three quarters of respondents state they should be saving 10% or more of their income, with 38% opting for a savings rate in excess of 15%. On the other hand, 16% of respondents think a savings rate below 9% will be adequate, while 8% say they do not know what the correct savings rate is. Again, there is significant variation between those who have received advice and those who have not. A required savings rate in excess of 10% is cited by 88% of respondents who have had advice, but this drops to 57% for those who have not had advice. It appears that many of the respondents who have not had advice underestimate the amount they need to save. By way of comparison, DB plans designed to produce pensions of between half and two-thirds of final salary after 40 years service tend to have total (i.e. employee and employer) contribution rates of 15-18% of salary. (Blake, 2003)

Table 3 – Savings adequacy: respondents' views on savings rates

a. Have you ever tried to calculate how much you need to save for retirement?

	All	Advice	No Advice
Yes - I have done this on my own	25.2%	30.9%	16.9%
Yes - with the help of an adviser	20.1%	33.0%	1.5%
Yes - using an online resource	2.5%	2.1%	3.1%
Yes - but I was unable to work it out	7.6%	9.6%	4.6%
No - I have not tried to do this	44.7%	24.5%	73.8%
		chi-square 44.21; DF=4; P=0.000	

b. What percentage of your income do you think you should be saving for retirement (including any contribution your employer makes)?

	All	Advice	No Advice
Up to 5%	1.3%	0.0%	3.1%
5%-to-9%	15.1%	8.5%	24.6%
10%-to-14%	37.1%	40.4%	32.3%
More than 15%	38.4%	47.9%	24.6%
Don't know	8.2%	3.2%	15.4%
		chi-square 22.20; DF=3; P=0.000	

c. Given your desired level of income in retirement, do you think:

	All	Advice	No Advice
You are saving too much	0.6%	1.1%	0.0%
You are saving the correct amount	24.5%	30.9%	15.4%
You are saving too little	56.6%	57.5%	55.4%
You don't know if you are saving enough	18.2%	10.6%	29.2%
		chi-square 11.49; DF=2; P=0.003	

d. Would you be prepared to commit a portion of any future wage rises to increasing the amount you save – e.g. if you got a £100 rise, you would pay an extra £50 to your pension?

	All	Advice	No Advice
Yes	59.6%	66.0%	50.0%
No	28.1%	24.5%	33.3%
Don't know	12.4%	9.4%	16.7%
		chi-square 2.43; DF=2; P=0.297	

In panels a, b, and c the "Advice" column reflects responses from those plan members who reported having received advice on their pension (N=94), while the "No Advice" column reflects responses from members who report never having had advice about their pension (N=65). The question in panel d was answered only by respondents who answered "You are saving too little" to the question in panel c. ("Advice" N=53; "No Advice" N=36). The chi-square test in panel b groups the "up to 5%" and "5% to 9%" categories together to avoid having cells with a low expected count. The chi-square test in panel c groups the "too much" and "correct amount" categories together.

Most respondents (57%) note they are currently saving too little for retirement. A further 18% state they "don't know" if they are currently saving enough for retirement, while 25% of respondents think they are saving the correct amount. The proportion saying they are saving too little does not vary by much depending on whether the respondent reports having received advice. However, the proportion of those who have had advice who say they are saving the correct amount (31%) is more than twice as high as the proportion of those who haven't had advice (15%) and respondents who haven't had advice are more likely to state they are unsure if they are saving enough (29% vs. 11%). The difference in the distribution of responses is significant at the 1% level using the chi-square test.

Thaler and Benartzi (2004) propose a prescriptive savings plan called "Save More Tomorrow" - or "SMartT" – where employees with low saving rates commit in advance to allocate a portion of future salary increases towards retirement saving.[5] This approach plays to the common desire to avoid reductions in nominal take home pay – driven by loss aversion and money illusion – and the systematic conflict between long-term and short-term preferences, whereby individuals often assume they will be willing to do something in future they are reluctant to do today. (Laibson et al., 1998) Furthermore, the status quo bias identified by Samuelson and Zeckhauser (1988) means once the initial commitment is made, few people make the effort to change it.

Implementation of the SMarT plan in some US plans had considerable success in raising savings rates amongst employees who rejected immediate action to raise their pension contributions. The survey results also suggests the approach could be effective, with almost 60% of the respondents who say they are not saving enough prepared to make a commitment to allocate a proportion of future salary rises to increasing their saving rate. (Table 3, panel d.) This includes 43% of those who state they plan to make no change in their contributions in the next year and 60% of those who are unsure whether they will change their contributions in the next year.

5.3 Investment knowledge

The John Hancock (2003) survey of US DC plan members finds that many of them report their investment knowledge as being quite limited. In the UK plan surveyed here, the most common response –reported in Table 4 - is for members to state they are "moderately knowledgeable" (42%). For the remainder, slightly more respondents (33%) say they are "not very" or "not at all" knowledgeable than say they are "fairly" or "very knowledgeable" (25%). Respondents who say they have not received advice typically report a lower level of investment knowledge than those who have had advice. The difference in the distribution of responses is significant at the 1% level using the chi-square test.

Questions designed to test understanding of basic features of investment present a mixed picture. Almost 70% of respondents were able to answer correctly a question relating to the effects of compound interest – an important aspect of long-term saving. However, far fewer (29%) were able to identify that the value of fixed income securities would be likely to fall if long-term interest rates rise. A key part of the investment choice available to members is to choose between funds that differ in terms of their asset allocation between equities and bonds – a choice that may be difficult for members unfamiliar with the basic characteristics of these types of investments. Those who have had advice perform slightly better than those who have not, but still only 33% of them identify the correct answer to the fixed interest question and the difference is not significant.

In both of the test questions, respondents who report high levels of investment knowledge are more likely to get the question correct than those who report moderate knowledge, who in turn perform better than those with low self-reported knowledge. This gives some validity to the self-reported knowledge levels, although the differences between categories are not statistically significant.

Table 4 – Investment knowledge: respondents' self reported and actual investment knowledge

a. How knowledgeable are you about investment matters?

	All	Advice	No Advice
Not at all knowledgeable	1.9%	1.1%	3.0%
Not very knowledgeable	31.1%	22.3%	43.3%
Moderately knowledgeable	41.6%	42.6%	40.3%
Fairly knowledgeable	23.6%	30.9%	13.4%
Very knowledgeable	1.9%	3.2%	0.0%
		chi-square 13.51; DF=4; P=0.009	

b. If long-term interest rates were to rise, what effect do you think this would have on the value of a fund invested in fixed income securities ("Bonds")?

(i)	All	Advice	No Advice
Correct answer (fall)	28.8%	33.3%	22.4%
Wrong Answer	46.2%	48.4%	43.3%
Don't know	25.0%	18.3%	34.3%
		chi-square 2.78; DF=1; P=0.131	

(ii) Investment knowledge:	High	Moderate	Low
Correct answer (fall)	39.0%	27.3%	22.6%
Wrong answer	53.7%	40.9%	47.2%
Don't know	7.3%	31.8%	30.2%
		chi-square 3.149; DF=2; P=0.207	

c. If an investment earns a return of 7% per year, roughly how long do you think it will take for the value of that investment to double?

(i)	All	Advice	No Advice
Correct answer (10 years)	68.6%	75.3%	59.1%
Wrong answer	21.3%	18.2%	25.7%
Don't know	10.1%	6.5%	15.2%
		chi-square 4.69; DF=1; P=0.030	

(ii) Investment knowledge:	High	Moderate	Low
Correct answer (10 years)	75.6%	69.2%	62.3%
Wrong answer	22.0%	23.1%	18.9%
Don't know	2.4%	7.7%	18.9%
		chi-square 1.93; DF=2; P=0.380	

Questions b and c gave respondents three options to choose from plus a "don't know" option. The "Advice" column reflects responses from members who reported having received advice on their pension (N=94), while the "No Advice" column reflects responses from members who report never having had advice (N=67). The chi-square tests group "don't know" responses with "wrong answer" responses. In panels b (ii) and c (ii) the "high" investment knowledge category reflects respondents who said they were "very" or "fairly" knowledgeable in answer to the question in panel a, "moderate" those who answered "moderately" knowledgeable, and "low" the remainder. (N=41, 66 and 53, respectively.)

5.4 Default bias

Choi et al. (2002) discuss how members of US retirement plans tend to take the "path of least resistance" – accepting default options and making few active choices. In this plan, 54% of respondents note they prefer to make the decisions about which funds to invest in themselves, whereas 46% would prefer someone else to make the decisions for them. Furthermore, 48% of respondents describe the investment funds in their pension account as being the result of an active choice they made, while 52% of respondents say they accepted the plan default option. (Table 5) Respondents who have had advice are more likely to say they prefer making decisions themselves and that the investments they hold are the result of an active decision. However, the difference in the distribution of responses is not statistically significant.

The survey results indicate that a significantly higher proportion of respondents are prepared to make an active choice than is typically the case in UK pension plans. For example, consultancy Hewitt Bacon and Woodrow reports that about 80% of members of group personal pension plans in the UK tend to accept the default option. (Bridgeland 2002) However, it is also the case that almost 80% of the plan assets are in the default 'Balanced' fund, meaning many of those who exercised active choice still decided this fund was the most appropriate for them. It is worth noting that the structure of the plan – with three funds labelled "A - Aggressive", "B - Balanced", and "C - Conservative" - may lead investors to choose the balanced fund – i.e. the middle option - on the basis of the "extremeness aversion" discussed by Benartzi and Thaler (2002).

Table 5 – Default bias: respondents' attitudes to investment choice

a. As regards the investment choices in your pension scheme, do you prefer to:

	All	Advice	No Advice
Make the decisions yourself	53.8%	58.1%	47.8%
Have someone else make the decisions	46.3%	41.9%	52.2%
		chi-square 1.63; DF=1; P=0.197	

b. Are the investment funds in your pension the result of:

	All	Advice	No Advice
An active choice you made	47.5%	53.8%	38.8%
A default option set by the scheme	52.5%	46.2%	61.2%
		chi-square 3.49; DF=1; P=0.060	

c. How often do you review the investments in your pension fund?

	All	Advice	No Advice
More than once a year	5.0%	6.5%	3.0%
Every year	43.1%	48.4%	35.8%
Every two-to-three years	18.1%	22.6%	11.9%
Every five years	0.6%	0.0%	1.5%
Less than every 5 years	16.3%	12.9%	20.9%
Never	16.9%	9.7%	26.9%
		chi-square 13.69; DF=4; P=0.008	

d. How often do you change the investments in your pension fund?

	All	Advice	No Advice
More than once a year	0.6%	0.0%	1.5%
Every year	1.3%	1.1%	1.5%
Every two-to-three years	18.1%	25.8%	7.5%
Every five years	1.3%	1.1%	1.5%
Less than every 5 years	36.3%	37.6%	34.3%
Never	42.5%	34.4%	53.7%
		chi-square 8.77; DF=2; P=0.012	

The "Advice" column reflects responses from those plan members who reported having received advice on their pension (N=93), while the "No Advice" column reflects responses from members who report never having had advice about their pension (N=67). The chi-square tests in panels c and d group the "5 years" and "less than every 5 years" categories together to avoid having cells with a low expected count. The chi-square test in panel d additionally combines the first three categories.

In terms of managing the investment choices they have made, two thirds of respondents state they review the investments in their pension plan at least every three years, with 48% doing so at least annually. However, at the other end of the scale, the remaining third review their choices less than once every five years, or not at all. Those who do review their choice regularly make few changes as a result – 36% make changes less than once every five years and a further 43% never make any changes, consistent with the status quo bias noted by Samuelson and Zeckhauser (1988). Members who have had advice are more likely to review and change their investments on a regular basis, with the difference in the distribution of responses significant at the 5% level in both cases.

5.5 Asset allocation

Respondents were asked to state the extent to which they thought particular asset classes were appropriate for saving for their retirement. The results of the question -- reflecting the average score on a 1-to-5 scale where 1 is "not at all appropriate" and 5 is "very appropriate" are shown in Table 6. The table also shows the percentage of respondents who state each asset class is either "fairly" or "very" appropriate. Investment in property attracts the highest scores, with 83% of respondents saying they think owning their own home is either a fairly or very appropriate way of saving for retirement and 77% saying the same about other investments in property. This compares to 52% for UK equity funds and 50% for UK Gilts.

Table 6 – Asset allocation: respondents' views on appropriateness of asset classes for retirement saving

	Average Score	All	Advice	No Advice	<50 years	>50 years
Cash	2.5	22.2%	22.2%	22.2%	20.9%	24.6%
			chi-square 0.00; P=1.000		chi-square 0.29; P=0.590	
Government Bonds	3.5	49.7%	49.2%	50.0%	41.4%	60.7%
			chi-square 0.01; P=0.919		chi-square 5.33; P=0.021	
Corporate Bonds	3.1	32.4%	30.5%	33.7%	30.7%	33.9%
			chi-square 0.17; P=0.685		chi-square 0.17; P=0.684	
UK Equities	3.5	51.7%	38.3%	60.4%	47.8%	56.7%
			chi-square 7.08; P=0.008		chi-square 1.14; P=0.286	
Overseas Equities	3.0	30.0%	21.7%	35.6%	28.9%	30.5%
			chi-square 3.31; P=0.069		chi-square 0.05; P=0.832	
Individual Shares	2.8	24.8%	22.0%	26.7%	21.6%	30.0%
			chi-square 0.41; P=0.522		chi-square 1.35; P=0.246	
Employer's Stock	2.4	11.7%	12.7%	11.0%	9.9%	14.5%
			chi-square 0.11; P=0.745		chi-square 0.76; P=0.383	
Property	4.1	76.8%	77.4%	76.3%	78.0%	76.2%
			chi-square 0.02; P= 0.877		chi-square 0.07; P=0.790	
Own Home	4.3	82.8%	87.5%	79.6%	87.1%	77.8%
			chi-square 1.67; P=0.196		chi-square 2.35; P=0.125	

Responses to the question "How appropriate do you think the following asset classes for saving for your retirement?" Average score is based on scale 1 = "not all appropriate" through to 5 "very appropriate". Percentage figures are % of respondents saying asset class is either a "fairly" or "very" appropriate. The "Advice" column reflects responses from those plan members who reported having received advice on their pension (N=94), while the "No Advice" column reflects responses from members who report never having had advice about their pension (N=67). The "<50 years" column reflects responses from those plan members who are aged less than 50 years (N=94), while the ">50 years" column reflects responses from members who are aged greater than 50 years (N=66). Chi-square tests are all DF=1.

Several aspects of the respondents' investment preferences appear consistent with traditional finance theory. For example, an understanding of the benefits of diversification is evident in the relatively low scores assigned to individual shares and particularly own-company stock. Equally, cash is given one of the lowest scores, contrary to the view that individual pension fund investors often show 'myopic loss aversion' by favouring stable, but low return, assets. (Benartzi and Thaler, 1999) For most asset classes there is relatively little difference between the views of the respondents who have had advice and views of those who have not. The group that has had advice is, however, more disposed towards equity investment: 60% state UK equity funds are a fairly or very appropriate way of saving for retirement, compared to 38% of the group who haven't had advice. The difference is significant at the 1% level. For overseas equities the corresponding figures are 37.3% and 20.4%, although the difference is only significant at a 10% level. These results are broadly consistent with Dolvin and Templeton's (2006) findings that some plan participants change their asset allocation decisions after attending investment education seminars.

5.6 Lifecycle theory

The 'lifecycle' approach to investment (e.g. Bodie, 2003) argues that asset allocation should vary with age, with higher weightings in risky assets (i.e. equities) at younger ages, and lower risk strategies (bonds) as retirement approaches. This has the objective of reducing the risk of losses close to retirement when there is little scope to recover from them.[6] When asked directly, 45% of respondents state they plan to reduce the proportion of equities in their account as retirement approaches, while 16% say they do not, and 39% don't know if they will. (Data not reported.) The plan offers a fixed income fund for the use of members over the age of 50 years to enable them to adopt this approach. The older plan members do appear to have a more favourable view of bond investment with 61% of respondents over the age of 50 saying gilts are either a fairly or very appropriate way of saving for their retirement, compared to 42% of respondents under 50 years of age. The difference is significant at the 5% level.

However, there are no other significant differences in asset class preferences between those aged under 50 and those aged over 50. Notably, the higher score assigned to gilts by older respondents is not mirrored in a lower score being assigned to equities.

5.7 Familiarity bias

In the US many DC plan members have high levels of investment in the shares of their employer in their pension accounts. The 1990 Social Security Act limits self-investment by UK pension funds to 5% of assets, meaning the issue has not become significant in the UK. The survey results show that relatively few respondents view the idea of investing their pension assets in the stock of the plan sponsor as attractive. (Table 7) Only 12% stated it was either fairly or very attractive, while 30% stated it was not very attractive and a further 34% stated it was not at all attractive. If the option to invest in the employer's stock were available, 51% of respondents indicated they would not put any part of their fund into it. A further 23% would allocate 5% or less. However, it is still notable that 18% of respondents would be prepared to put more than 10% of their pension fund assets into their employer's stock. For these investors, limited diversification appears to be outweighed by the attraction of investing in the familiar.

Table 7 – Familiarity bias: respondents' views on investment in own company stock

a. If you were given the option of investing some of your pension fund in [your employer's] shares – that is those of your employer - how attractive would this be to you?

	All	Advice	No Advice
Not at all attractive	34.2%	34.4%	33.9%
Not very attractive	29.7%	30.0%	29.2%
Moderately attractive	24.5%	23.3%	26.2%
Fairly attractive	6.5%	6.7%	6.2%
Very attractive	5.2%	5.6%	4.6%

chi-square 0.21; DF=4; P=0.995

b. If the option of investing in [your employer's] shares were available, what percentage of your fund would you allocate to this option?

	All	Advice	No Advice
0% of my fund	50.7%	47.6%	55.2%
1 - 5% of my fund	22.5%	22.6%	22.4%
6 - 10% of my fund	9.2%	9.5%	8.6%
11-20% of my fund	9.9%	10.7%	8.6%
>20 % of my fund	7.8%	9.5%	5.2%

chi-square 1.41; DF=4; P=0.843

The questions gave the name of the ultimate parent company, which is a US listed company, but it is omitted here for confidentiality reasons. Question b required respondents to write in a figure, but the responses are shown in ranges for ease of reference. The "Advice" column reflects responses from those plan members who reported having received advice on their pension (N=90 in panel a; N=84 in panel b), while the "No Advice" column reflects responses from members who report never having had advice about their pension (N=65 in panel a; N=58 in panel b).

6. Discussion

Overall, the survey depicts a situation where most of the employees are relying on their DC occupational pension for a retirement income that they expect to be comparable with what the best quality DB plans have achieved. Most of them have realistic expectations about how much they will need to save to achieve this, but also note that their current saving level falls short of this. While many have received advice about their pension, a significant minority have not and this has to be viewed against the fact that the respondents do not regard themselves as particularly knowledgeable about investment matters and that many struggle to answer questions on basic aspects of investment.

Despite the limited investment knowledge, several aspects of the respondents' investment preferences appear rational in the context of retirement planning and consistent with standard theory, e.g. a desire to avoid investment in individual stocks and, particularly, investment in their employer's stock.

Financial advice appears to make a difference to the member's attitudes and choices. Those who have had advice are more likely to state they know what they are required to do and more likely to take active decisions in managing their pension accounts (or at least to state that they do.) It is therefore easy to come to the view that advice is a beneficial in the context of DC pensions and that more of it should be available. This obvious counterpoint is that advice has a cost which employers and employees may be unwilling to bear.

It is interesting that the respondents lack enthusiasm for investing in their employer's stock, given that self-investment is a significant characteristic of many US DC plans. Benartzi (2001) has argued that payment of employer contributions in the form of stock creates an endorsement effect and it may be that the absence of this endorsement – i.e. stock is not even offered as an option – has an influence on the employees' preferences.

The strong views expressed about the attractiveness of property may be of more concern. Most employees will already have significant exposure to property through home ownership and additions to this are likely to result in poor diversification. It may be that this preference is an alternative manifestation of the familiarity bias that leads US DC plan members to invest in own company stock.

7. Limitations and directions for future research

While the survey provides evidence to consider in relation to behavioural and traditional finance theory, there are – of course – limitations to the conclusions that can be drawn. The data are drawn from only one plan where the members have particular characteristics and face particular choices and circumstances. Furthermore, like any survey it relies on self-reported information, with no way of knowing how accurate it is. The survey must also be interpreted without knowing about the broader financial circumstances and investment holdings of the respondents.

As noted earlier, the membership of the plan has certain biases relative to the working population at large and the self-selection of the respondents exacerbates these biases. It could be argued that older and more highly-paid (and more highly-educated) employees are more likely to be interested in, and knowledgeable about, their pension arrangements than the average employee. To the extent that this is true, the results of the survey should be taken as an upwardly biased view of the level of knowledge and interest in pensions and investment amongst employees with DC pensions.

Future research can improve our understanding by considering evidence from a wider range of plans, spanning different industries, regions, and plan designs. Furthermore, survey evidence can be complemented by more qualitative work, e.g. using focus groups, and use of plan level administrative data. This information should ultimately help us answer the key question of what can best be done to support employees in retirement saving.

8. Conclusions

This paper provides a case study view of the attitudes and beliefs of investors within a UK DC pension plan. The results are broadly consistent with behavioural economic theory in that many employees show limited knowledge and interest in their pension arrangements. They support the case for broader provision of investment advice in the workplace and for ongoing care in choosing pension plan default options in the knowledge that many employees will accept them. There is also some support for the effectiveness of programs with behavioural underpinnings – such as 'Save More Tomorrow'. Plan members appear to have a rational view on the attractiveness of investing their assets in own company stock, but also show a preference for property investment that may be driven by behavioural bias. But the results are drawn from one set of employees in one particular plan and care needs to be taken in generalising them. There is clear scope to extend the work to other plans in the UK and beyond. As DC pensions become more common it will be important that we know how to structure them and how to support the plan members in order to maximise their chances of enjoying comfortable retirement incomes.

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Appendix – Survey Questionnaire

SECTION A – QUESTIONS ABOUT YOUR PENSION

1. At what age do you expect to retire? [ ] years of age

2. How long have you been a member of the [Company Name] Retirement Benefit Plan?

Less than one year	[ ]	(Tick one)
One-to-five years	[ ]	
Six-to-ten years	[ ]	
More than ten years	[ ]	
Don't know	[ ]	

3. Do you think all employees should be required to join their employer's pension scheme?

Yes [ ] No [ ] Don't know [ ]

4. What do you expect to be your <u>main</u> source of income in retirement?

Pension from employer(s)	[ ]	(Tick one)
Personal pension	[ ]	
State pension	[ ]	
Earnings from employment	[ ]	
Income from investments	[ ]	
Income from property	[ ]	
Other	[ ] (Please specify.....)	
Don't know	[ ]	

5. What proportion of your current income do you expect to maintain in retirement?

All of it (100%+)	[ ]	(Tick one)
Three quarters or more (75%-99%)	[ ]	
Half or more (50%-74%)	[ ]	
Quarter or more (25%-49%)	[ ]	
Less than a quarter (0%-25%)	[ ]	
Don't know	[ ]	

6. Have you ever received advice about your pension?

Yes [ ] No [ ] Don't know [ ]

If you answered "yes" to question 6, please go to question 7 – otherwise, please move on to question 8.

7. To what extent did you rely on advice about your pension from:

	Not at all	Not much	Moderately	Quite a lot	Very much
Employer	[ ]	[ ]	[ ]	[ ]	[ ]
Independent Financial Adviser	[ ]	[ ]	[ ]	[ ]	[ ]
Other Professional Adviser	[ ]	[ ]	[ ]	[ ]	[ ]
Bank / Building Society	[ ]	[ ]	[ ]	[ ]	[ ]
Insurance / Investment Company	[ ]	[ ]	[ ]	[ ]	[ ]
Friend or Family member	[ ]	[ ]	[ ]	[ ]	[ ]
Internet / Online resource	[ ]	[ ]	[ ]	[ ]	[ ]
TV / Newspaper feature	[ ]	[ ]	[ ]	[ ]	[ ]

8. Have you ever tried to calculate how much you need to save for retirement?

Yes - I have done this on my own	[ ]	(Tick one)
Yes - with the help of an adviser	[ ]	
Yes - using an online resource / the internet	[ ]	
Yes - but I was unable to work it out	[ ]	
No - I have not tried to do this	[ ]	

9. What percentage of your income do you think you should be saving for retirement (including any contribution your employer makes)?

Up to 5%	[ ]	(Tick one)
5%-to-9%	[ ]	
10%-to-14%	[ ]	
More than 15%	[ ]	
Don't know	[ ]	

10. Given your desired level of income in retirement, do you think:

You are saving too much	[ ]	(Tick one)
You are saving the correct amount	[ ]	
You are saving too little	[ ]	
You don't know if you are saving enough	[ ]	

If you answered "too little" to question 10, please go to question 11 - otherwise, please move on to Section B.

11. What is the <u>main</u> barrier to you saving enough?

Don't earn enough	[ ]	(Tick one)
Have other financial priorities	[ ]	
Plan to save more in future	[ ]	
Don't trust pensions	[ ]	
Lack of interest in financial matters	[ ]	
Other (Please specify.....)	[ ]	

12. Over the next year, do you plan to:

Increase what you pay into your pension	[ ]	(Tick one)
Keep the contributions you make unchanged	[ ]	
Decrease what you pay into your pension	[ ]	
Don't know	[ ]	

13. Would you be prepared to commit a portion of any future wage rises to increasing the amount you save – eg if you got a £100 raise, you would pay an extra £50 to your pension?

Yes [ ] No [ ] Don't know [ ]

SECTION B – QUESTIONS ABOUT INVESTMENTS IN YOUR [COMPANY NAME] PENSION

14. Do you agree with the statement:
"I am a cautious person who generally avoids risks"

Disagree strongly	Tend to Disagree	No strong opinion	Tend to Agree	Agree strongly
[ ]	[ ]	[ ]	[ ]	[ ]

15. How knowledgeable are you about investment matters?

Not at all knowledgeable	Not very knowledgeable	Moderately knowledgeable	Fairly knowledgeable	Very knowledgeable
[ ]	[ ]	[ ]	[ ]	[ ]

16. Do you have any savings or investments apart from your pension?

Yes [ ] No [ ] Don't know [ ]

17. As regards the investment choices in your pension scheme, do you prefer to:

Make the decisions yourself	[ ]	(Tick one)
Have someone else make the decisions for you	[ ]	

18. Are the investment funds in your pension the result of:

An active choice you made	[ ]	(Tick one)
A default option set by the scheme	[ ]	

19. How often do you <u>review</u> the investments in your pension fund?

More than once a year	[ ]	(Tick one)
Every year	[ ]	
Every two-to-three years	[ ]	
Every five years	[ ]	
Very occasionally (less than once every 5 years)	[ ]	
Never	[ ]	

20. How often do you change the investments in your pension fund?

More than once a year	[ ]	(Tick one)
Every year	[ ]	
Every two-to-three years	[ ]	
Every five years	[ ]	
Very occasionally (less than once every 5 years)	[ ]	
Never	[ ]	

21. Is the range of investment options in your pension scheme:

Too narrow – there are not enough options	[ ]	(Tick one)
About right	[ ]	
Too broad – there are too many options	[ ]	
I don't know what the options are	[ ]	

22. Do you plan to reduce the proportion of your pension invested in equities ("shares") as you get nearer to your planned retirement date?

Yes [ ] No [ ] Don't know [ ]

23. If long-term interest rates were to rise, what effect do you think this would have on the value of a fund invested in fixed income securities ("Bonds")?

Value of fund would rise	[ ]	(Tick one)
Value of fund would fall	[ ]	
Value of fund would stay the same	[ ]	
Don't know	[ ]	

24. Which factor most influences your choice of investments for your pension fund?

Level of charges and fees	[ ]	(Tick one)
Performance record of the investment	[ ]	
Recommendation of my adviser	[ ]	
Brochure / marketing information	[ ]	
Other (Please Specify.....)	[ ]	

25. If an investment earns a return of 7% per year, roughly how long do you think it will take for the value of that investment to double?

Five years	[ ]	(Tick one)
Ten years	[ ]	
Fifteen years	[ ]	
Twenty years	[ ]	
Don't know	[ ]	

26. How appropriate do you think the following investments are for saving for your retirement?

	Not at all appropriate	Not very appropriate	Moderately appropriate	Fairly appropriate	Very appropriate
Cash deposits	[ ]	[ ]	[ ]	[ ]	[ ]
Government bonds (Gilts)	[ ]	[ ]	[ ]	[ ]	[ ]
Corporate Bonds	[ ]	[ ]	[ ]	[ ]	[ ]
UK Equity Funds	[ ]	[ ]	[ ]	[ ]	[ ]
Overseas Equity Funds	[ ]	[ ]	[ ]	[ ]	[ ]
Individual Company shares	[ ]	[ ]	[ ]	[ ]	[ ]
Shares in your employer	[ ]	[ ]	[ ]	[ ]	[ ]
Investment in property	[ ]	[ ]	[ ]	[ ]	[ ]
Owning your own home	[ ]	[ ]	[ ]	[ ]	[ ]

27. If you were given the option of investing some of your pension fund in [Company Name] shares – that is those of your employer - how attractive would this be to you?

Not at all attractive	Not very attractive	Moderately attractive	Fairly attractive	Very attractive
[ ]	[ ]	[ ]	[ ]	[ ]

28. If the option of investing in [Company Name] shares was available, what percentage of your fund would you allocate to this option?

[ ] % of my fund

SECTION C – DETAILS ABOUT YOUR [COMPANY NAME] PENSION

29. Are you still employed by [Company Name]?

Yes [ ] No [ ]

30. Do you know the details of your pension, or have them to hand?

Yes [ ] No [ ]

If you answered "yes" to question 30, please go to question 31 – otherwise, please move on to Section D.

31. How much do you contribute to your pension? [£] per month

32. How much does your employer contribute to your pension? [£] per month

33. What percentage of your pension is invested in each of the plan options:

"A" Fund (Aggressive)	[	] %
"B" Fund (Balanced)	[	] %
"C" Fund (Conservative)	[	] %
Gilts Fund	[	] %
External AVCs	[	] %

Section D of the questionnaire asked questions on standard demographic variables (Sex; Age; Marital Status; Education; Occupation; Income). In the interests of conserving space, the questions are not reproduced here.

Endnotes

[1] In a DB plan, an employee who qualifies for a pension will receive an income from the pension plan from retirement until death. The annual benefit is typically a proportion of the employee's final salary, with the proportion depending on length of tenure in the pension plan. In contrast, in a DC plan contributions are paid into the plan and the employee can usually choose from a range of investment options. The contributions, with accumulated investment returns, are then available to provide a retirement income, either directly or by purchasing an annuity.

[2] To conserve space, and in some cases because of low response rates, the results of questions 3, 14, 16, 31-33 are not discussed in this paper.

[3] Data from the Office of National Statistics show that in Q4 2003 56% of people in employment were male, that the mean age in the labour force in 2001 was 39, and that average gross annual pay for full time employees in the 2002/03 tax year was £25,170. (www.statistics.gov.uk)

[4] Alternatively, it may be that respondents with these particular characteristics are more likely to have sought advice. It is not possible to determine the direction of causality.

[5] "Save More Tomorrow" is a registered trade mark.

[6] Bodie (2003) argues that higher risk strategies are appropriate at younger ages 1) because young people have more of their wealth in 'bond-like' human capital and can afford to take more financial risk, and 2) because younger people have greater flexibility to increase their labour supply to make up for any shortfall created by losses in financial assets.

Chapter Six: Contribution Rate and Investment Choices in a Large Defined Contribution Pension Plan

Joint work with David Blake and Graham Mannion

Abstract:

In this paper we use a unique administrative dataset to examine the contribution and investment decisions made by members of a large UK-based defined contribution pension plan. We find that the members' contribution rates are positively related to their age and level of income, which is broadly consistent with lifecycle saving theory. We also find that male plan members save more than females, and that individuals who have made an active choice of investment fund save more than those who have accepted the default fund. Investors choosing equity-dominated investment funds save more than investors choosing fixed-income-dominated-funds. We find that use of the default fund declines with both employment tenure and income, and increases with age. After controlling for whether or not the plan member has made an active choice of investment fund, we find that equity allocation decreases with age, is higher for males than females and increases with income. There is some evidence of home bias in members' asset allocation, but this is less marked than documented elsewhere. Members do not appear to allocate their contributions equally across all investment options (the naïve 1/n diversification strategy), but a sizeable minority do appear to allocate evenly across the funds they have chosen (the *conditional* 1/n diversification strategy). We provide tentative evidence on the link between member decision making and investment return. After controlling for the decision about how much equity to hold, we find weak evidence that male plan members outperform female members and that higher paid plan members *underperform* lower paid members. A notable finding is that the members who make fund switches earn lower returns than more passive investors, by approximately 100 basis points.

1. Introduction

Defined contribution (DC) pension plans are becoming increasingly common in many countries including the US and the UK. DC plans typically give individual plan members responsibility for deciding how much to contribute to the plan and how to invest these contributions. The growing literature on behavioural economics examines how members make these decisions. Byrne (2004) and Mitchell and Utkus (2004) provide reviews of this literature. The evidence to date indicates that there are wide divergences from the behaviour expected if plan members were fully rational and made optimal savings and investment decisions over their life cycle (see, e.g., Campbell and Viceira, 2002, and Gomes and Michaelides, 2005).

In this paper we use a unique administrative dataset to examine the contribution and investment decisions made by members of one large UK-based DC plan which is sponsored by a FTSE-100 company.[1] The company is committed to providing good pension benefits for its employees and actively communicates with its workforce on pension issues. The data allow us to test key rational and behavioural economic theories that relate to retirement saving.

We find that the members' contribution rates are positively related to their age and level of income, which, contrary to much of the recent evidence from behavioural studies, is broadly consistent with lifecycle saving theory. We also find that male plan members save more than females, and that individuals who have made an active choice of investment fund save more than those who have accepted the default fund. The latter finding might be consistent with the idea that more financially sophisticated members save at higher rates, since they are more aware of the consequences of inadequate pension savings for consumption in old age. Contrary to the proposition that conservative investors who adopt lower risk / lower expected return investment strategies need to save more to reach a given level of retirement income, we find that investors choosing equity-dominated investment funds actually save *more* than investors choosing fixed-income-dominated-funds. This might be

because equity-dominated investors are more financially sophisticated investors and hence have a better understanding of their lifecycle needs.

In terms of investment choice, one particular contribution we are able to make is to assess member decision making in the absence of the complication of members being able to invest their contributions in the employer's own stock (see Agnew, 2006), as this is not an option in this plan. This is important because own employer stock is not a common investment choice in DC pension plans outside of the US. We find that use of the default fund declines with both employment tenure and income. Default fund use increases with age, which may be because the default in this case comprises largely fixed-income investments. After controlling for whether or not the plan member has made an active choice of investment fund, we find that equity allocation decreases with age (by 8 percentage points for every 10-year increase in age), is higher for males than females (by approximately 5 percentage points) and increases with income (by approximately 0.6 percentage points for every 10% increase in income). There is some evidence of home bias in members' asset allocation, but this is less marked than documented elsewhere and is lower amongst investors with complex portfolios. Very few plan members appear to follow the naïve 1/n diversification approach documented by Benartzi and Thaler (2001) whereby members invest equally across all available investment funds. However, there is evidence of members following a *conditional* 1/n diversification strategy (Huberman and Jiang, 2006) whereby contributions are invested equally across the subset of funds chosen by the member.

We provide tentative evidence on the link between member decision making and investment return. The return data we have relates to the period of 12 months ending in May 2006, which is too short a period to fully assess a long-term investment such as a pension fund. This particular period was characterised by strong equity market performance and hence the highest returns were earned by those investors with high allocations to equities. Investors in the fixed-income–based default fund did relatively poorly. After controlling for the decision about how much equity to hold, we find weak evidence that male plan members outperform female members and that

higher paid plan members actually *underperform* lower paid members. One notable finding is that the members who make fund switches earn lower returns than more passive investors, by approximately 100 basis points, consistent with the idea of an overconfidence bias leading some investors to trade too much (Barber and Odean, 1999). This provides some evidence against the efficient management of investment portfolios.

The remainder of this paper is organised as follows. Section 2 discusses the previous academic literature on contribution and investment decisions in DC pension plans, including relevant literature from the field of behavioural economics. Section 3 describes the dataset we use in our analysis, while Section 4 outlines the method of analysis. Section 5 presents our results, and Section 6 concludes.

2. Literature

2.1 Contribution Decisions

Standard economic theory provides an explanation for the savings rates that individuals should choose throughout their working life if they were behaving optimally. The lifecycle saving theory of Ando, Brumberg and Modigliani (Modigliani and Brumberg, 1954; Ando and Modigliani, 1957), and Friedman's permanent income hypothesis (1957) both imply that individuals attempt to smooth consumption over their lifetime in order to maximise expected lifetime utility. In essence, in each period an individual can consume up to the annuity value of his or her expected total (i.e., financial and human) wealth, and saving will take place only when current income exceeds this annuity value.

Behavioural economics provides an alternative view that suggests saving decisions may be driven by behavioural biases and thus may not be consistent with optimal behaviour. Previous research shows that a large proportion, and often the majority, of employees are inclined to take the 'path of least resistance' and passively adopt the default arrangements that exist in their pension plan. For example, Choi et al. (2002)

review US evidence on the tendency for members to accept plan defaults for key features such as the contribution rate and the investment fund. Even though employees are free to opt out of default arrangements, relatively few actually do. In the plans Choi et al. studied, between 42% and 71% of participants accept the default contribution rate, even though it is typically too low to generate a reasonable replacement rate for retirement income.

2.2 Investment Decisions

A similar analysis applies for members' investment choices: standard theory offers rational optimising explanations of choice, while behavioural finance offers alternative explanations driven by the existence of behavioural biases. Standard theory suggests that members choose an investment strategy to maximise their expected lifetime utility. This, in essence, involves maximising expected risk-adjusted portfolio returns, where the risk adjustment factor is the ratio of the volatility (i.e., standard deviation) of the portfolio returns to the investor's degree of risk tolerance.[2] While risk tolerance is essentially unobservable, psychometric questionnaires have been designed to attempt to measure it. Hallahan et al. (2004) use one such measure and find that risk tolerance is higher amongst males than females and generally increases with income and decreases with age. These results would suggest that portfolio allocations, e.g. to equities rather than bonds, should similarly be linked to these demographic and income variables.

Lifecycle investment theory (e.g. Bodie, 2003) holds that asset allocation should change through the individual's lifetime, with high weightings in risky assets during the earlier years and lower risk assets used as retirement approaches. Various justifications have been given for this based on the (possibly erroneous) notion that equities are less risky over long periods of time than over short periods, and hence that the equity weighting should decline in the period leading up to retirement. However, a more satisfactory justification is that younger investors have a substantial amount of their wealth tied up in human capital and generally a low weight in

financial capital. If this human capital is relatively low risk it can allow greater risk to be taken in the individual's financial portfolio.

Choi et al.'s (2002) finding of default bias applies to investment choice as well as to choices of contribution rates. In the US plans Choi et al. studied, between 48% and 81% of plan assets are invested in the default fund, which is typically a money market fund. Cronqvist and Thaler (2004) also document widespread acceptance of the default fund in the Swedish state-wide Premium Pension System. Use of the default fund was relatively low at the initial launch of the plan when members were encouraged to make an active choice, but increases markedly for subsequent waves of new entrants. Cronqvist and Thaler find that the average initial entrant who made an active choice of investment portfolio earns lower returns than the average investor in the default fund over the period from October 2000 to October 2003.

A number of other studies document potentially non-rational approaches to portfolio strategy amongst DC pension plan members. For example, Benartzi and Thaler (2001) find DC members use a 1/n naïve diversification heuristic, whereby they split their pension contributions equally amongst the funds on offer. Huberman and Jiang (2006) counter argue that many members equally weight across the subset of funds they have chosen, but do not necessarily equally weight over all available choices, especially where 'n' is large.

In the context of retail rather than pension investment, some studies of investor behaviour show evidence of overconfidence leading to excessive trading and low investment returns. Barber and Odean (1999) analyse the trading behaviour of investors with discount retail brokerage accounts and find that trading activity typically subtracts from portfolio return, with stocks bought performing less well than stocks sold. The most active traders earn the lowest returns.

3. Data

The dataset we use is generated from the records of the DC pension plan of a FTSE-100 listed company. The data relate to the period of 12 months up to May 2006 and include information on 3629 plan members. This represents all of the DC plan members with more than one year's service and who are not in addition accruing benefits under the company's defined benefit pension plan.

The dataset contains details on the contribution and investment decisions made by the pension plan members, including their chosen contribution rate, investment fund choice, and any fund switches they have made. The company runs a flexible benefits ("flex") plan whereby employees can choose the benefits most appropriate to them. The flex plan allows members to choose pension contributions of between 4% and 12% of salary that will be made out of the member's flex allowance. The amount of allowance not spent on pension contributions can be used to purchase non-pension benefits or be taken as additional cash salary. Plan members allocating 12% from their flex allowance to pension contributions can contribute up to an additional 6% of pre-tax salary to the plan and this attracts one-for-one matching from the company.

In terms of investment, members have a choice of 11 funds (four active equity funds; four passive equity funds; two bond funds; one cash fund). The plan operates a default fund for members who are reluctant to make their own choice of investment fund. The default asset allocation for members contributing 10% of salary or less to the plan is 100% index-linked bonds. Where a member is contributing more than 10% of salary to the plan, the default allocation is 100% index-linked bonds for the first 10% of salary and 100% equities for the remainder.[3] We have data on both the allocation of contributions chosen by members and the asset allocation of the portfolio, with the latter being the result of the allocation of contributions and the relative performance of the various funds over the period of investment.

One particularly attractive feature of the dataset is the inclusion of the investment return for each member's account. While this is only available for a short period (12

months ending May 2006), it provides indicative information on the impact of the members' investment choices on portfolio performance.

In addition, the dataset includes demographic variables (age and sex) and employment variables (tenure and salary). These variables allow us to analyse cross-sectional differences in contribution and investment decisions across plan members. Table 1 provides the definitions of the variables used in this study.

Table 2 provides descriptive statistics for the data. The average member is contributing 9.3% of salary, which includes the contributions made on behalf of the member by the employer. Sixty-nine percent of members have made an active choice of how to invest their contributions, which is relatively high by comparison to evidence available on other plans (e.g. Choi et al., 2002). However, members are relatively inactive, with the average number of fund switches made in the 12-month period being 0.37. In fact, only 4.7% of members made any switches during the period. The average member has chosen a contribution asset allocation of approximately 60% equities and 40% bonds, although there is a wide range and some members have an allocation of 100% bonds, while others have an allocation of 100% equities. The average 12 month portfolio return is 16.1% reflecting a period when equity markets did well. The average member is 35 years old, is paid £33,000 per annum and has been in the DC plan for 3.6 years. Forty six percent of plan members are males.

Table 1 – Variable definitions

Variable	Definition
ContribRate	Combined employer and employer pension contribution as a % of member's salary
ChoiceDummy	Dummy variable that takes the value of one if the member has made an active fund choice and zero if the member is invested only in the default fund.
Switches	Number of fund switches made by the member in the 12 months ending May 2006.
SwitchDummy	Dummy variable that takes the value one if the member has made switches in the 12 month period and zero otherwise.
BondFlow	Member's chosen allocation of contributions to bond funds (as a % of total).
BondStock	Asset allocation of the member's portfolio to bond funds (as a % of total).
CashFlow	Member's chosen allocation of contributions to cash funds (as a % of total).
CashStock	Asset allocation of the member's portfolio to cash funds (as a % of total).
EquitiesFlow	Member's chosen allocation of contributions to equity funds (as a % of total).
EquitiesStock	Asset allocation of the member's portfolio to equity funds (as a % of total).
12Rtn	12 month total return on the member's pension account.
Age	Member's age in years
MaleDummy	Dummy variable that takes the value one if the member is a male and zero if the member is a female.
Tenure	Member's tenure in employment with the company in years.
Pay	Member's annual salary in £.

Table 2 – Descriptive statistics

Variable	Mean	Standard Deviation	First Quartile	Median	Third Quartile
ContribRate	9.3%	5.0%	4.7%	9.8%	12.0%
ChoiceDummy	0.689	0.463	0.000	1.000	1.000
Switches	0.372	1.949	0.000	0.000	0.000
SwitchDummy	0.047	0.212	0.000	0.000	0.000
BondFlow	38.0%	40.0%	0.0%	20.0%	83.3%
BondStock	26.3%	27.0%	4.3%	17.9%	40.1%
CashFlow	1.6%	8.3%	0.0%	0.0%	0.0%
CashStock	1.5%	7.4%	0.0%	0.0%	0.0%
EquitiesFlow	58.5%	40.8%	16.7%	80.0%	100.0%
EquitiesStock	72.2%	27.9%	57.2%	81.5%	93.3%
12Rtn	16.1%	5.2%	13.2%	15.6%	18.8%
Age	35.2	7.8	29.0	34.0	40.0
MaleDummy	0.461	0.499	0.000	0.000	1.000
Tenure	3.6	2.1	2.0	3.0	5.0
Pay	33720	17091	22321	29909	39883

N=3629 for all variables. Variable descriptions are given in Table 1.

4. Method

4.1 Hypotheses concerning contribution rates

Older employees will likely have paid off (mortgage) debt and face reducing costs of bringing up their families, implying increased income available for saving for retirement. Equally, higher-paid members should have greater amounts available for saving. We thus hypothesise, in line with lifecycle theory, that the saving rate of plan members will be a positive function of both age and income. The main weakness in our ability to test this is that we know only what the member is contributing to their pension plan and cannot track non-pension saving. However, given the tax advantages of pension saving and the presence of employer matching it makes sense for employees who have already built up some precautionary savings to take full advantage of pension saving before saving more through other channels.

The likely relationship between the member's sex and pension contribution rate is somewhat ambiguous. Females typically have longer life expectancy than males and often also have interrupted labour market participation patterns. These factors would suggest the need for females to save more than males. However, to the extent that males occupy 'breadwinner' roles in households, males may feel a greater need to provide for their family in retirement.

Choi et al. (2002) document a default bias in the choices of DC pension plan members as regards contribution levels and investment choice. It is likely that engaged, active members who take an interest in their retirement savings will choose an optimal contribution rate – rather than default or minimal levels – *and* choose an optimal investment strategy rather than accept the default fund. It follows from this that there should be a positive relationship between the contribution rate and making an active fund choice.

Finally, the amount each member saves should be related to their desired level of pension in retirement. Plan members vary in the asset allocation chosen for their

contributions. Given that equities have a higher expected return than bonds, it follows that, other things being equal, equity investors need to save less, on average, than bond investors. We thus expect a negative relationship between the contribution rate and the allocation of contributions to equities.

Putting these conjectures together leads to us to test the following regression:

$$(1)\ ContribRate = Constant + b_A Age + b_{MD} MaleDummy + b_{LP} Log(Pay) + b_{CD} ChoiceDummy + b_{EF} EquitiesFlow$$

The variable definitions are as given in Table 1. We estimate the regression by using Ordinary Least Squares.[4]

4.2 Hypotheses concerning investment choice

Choi et al.'s (2002) default bias implies that many members will passively accept the plan's default investment fund rather than make an active investment choice of their own. Some members will make an active choice and it seems plausible that default fund use should be negatively related to tenure (as people eventually make a positive choice), income (as a proxy for education) and age (as a proxy for engagement, with older employees typically more interested in pensions than younger employees). Active fund choice may also be related to sex, e.g. due to higher levels of overconfidence amongst males (Barber and Odean, 1999).

To test this we run the following Logit regression:

$$(2)\ ChoiceDummy = Constant + b_A Age + b_{MD} MaleDummy + b_T Tenure + b_{LP} Log(Pay)$$

For members who make an active choice of investment, the asset allocation chosen should reflect the member's attitude to risk. Hallahan et al. (2004) find subjective risk tolerance to be higher amongst males, positively related to income and

negatively related to age. This implies that members' equity allocations should be similarly related. Furthermore, the lifecycle investment approach of Bodie (2003) implies lower allocations to equities at older ages.

To test this we run the following regression:

$$(3)\ EquitiesFlow = Constant + b_A\, Age + b_{MD} MaleDummy + b_{LP} Log(Pay)$$

We estimate this model in two forms. In Model A we estimate for all members in our sample, but include ***ChoiceDummy*** as a control variable because for most members the default fund is 100% fixed income. Model B is estimated for only those members who have made an active choice of investment fund and hence there is no need for the ***ChoiceDummy*** control variable. There are a total of 2499 plan members who have made an active investment choice. We use the allocation of contributions (i.e. "Flow") rather than allocations of account balances because, as Huberman and Jiang note (2006, p769), account balances reflect cumulative returns as well as past choices and there is evidence that few members rebalance portfolios to achieve target allocations.

Portfolio diversification represents another dimension on which members must make a choice. Members can diversify internationally as well as across asset classes. The funds on offer in the plan are diversified equity portfolios mostly with a regional focus, together with domestic fixed income and cash funds. A large literature exists showing that many investors display a home bias and maintain a surprising high proportion – often 80% or more - of their investments in securities listed in their own country, e.g. French and Poterba (1991) and Kang and Stultz (1997). There have been attempts at rational explanations of this bias, for example due to information costs, but there are also behavioural explanations, such as familiarity bias (Huberman, 2001). We examine the degree of home bias in both the plan members' equity allocations and in their total portfolio allocations. The latter is a somewhat imperfect measure, because members seeking cash or fixed income exposure only have access to UK-domiciled investments. We further seek to understand whether

certain groups of employees are more or less prone to home bias than others, for example because of their degree of financial sophistication.

We test the following regression:

$$(4)\ HomeEquity = Constant + b_A Age + b_{MD} MaleDummy + b_{LP} Log(Pay)$$

HomeEquity is defined as the percentage of the member's equity exposure accounted for by domestic equity. We also estimate the equation for HomeAssets, which is defined as the percentage of the overall portfolio comprised domestic assets (equities, bonds and cash.) Again, we estimate this only for those scheme members who have made an active choice of funds.

An additional consideration in terms of investment choice is that while members of the plan can choose their own asset allocation, they must do so from a set of 11 funds offered in the plan. An important question is how members diversify across the key asset classes (especially equities and bonds) using the funds offered and the influence the fund menu has on their decisions. Our data allow us to test for plan members using the naïve 1/n or conditional 1/n approaches to diversification. Testing for 1/n is simply a matter of examining what proportion of members invest in all 11 funds and how many of those do so in equal proportions.

To test for the conditional 1/n approach, we follow the approach of Huberman and Jiang (2006). They sort plan members by the number of funds they have chosen and then assess what proportion of members in each category is following a conditional 1/n strategy. To do so, they calculate the Herfindahl concentration index for each member's portfolio allocation, which is defined as the sum of the squared fractions of contributions to each fund. For example, the Herfindahl index for an investor who chooses two funds and puts 50% in each is 0.5 (i.e., $0.5^2 + 0.5^2$). The Herfindahl index can range from 1/n through to 1. Huberman and Jiang argue that an investor is "close" to following a 1/n strategy if the total deviation of their fund allocation from a pure 1/n strategy is no more than 20%. (In the two fund case this equates to a 55:45

allocation.) This allows them to calculate an upper bound for the Herfindahl index than can be interpreted as being consistent with the plan member following a conditional 1/n strategy. We adopt this approach in our analysis.

Our final test on investment choice is to examine the number of funds chosen by plan members. We have already sought to understand the determinants of equity allocation and home bias and there are likely to be interrelations between those decisions and decisions on the number of funds to hold. We run a regression that seeks to explain fund choice in terms of the demographic variables used previously: age, sex, and pay. Given that the number of funds is a count variable, we use Poisson regression to estimate the equation.

$$(5)\ No.\ of\ funds = Constant + b_A Age + b_{MD} MaleDummy + b_{LP} Log(Pay)$$

4.3 Hypotheses concerning investment return

We wish to test the relationship between portfolio return and age, sex and income to see if any particular group does better than the others. Again financial sophistication is the most likely underlying reason for the difference. In addition, following Barber and Odean (1999), we wish to test the hypothesis that switchers will earn lower returns than other members. Most plan members in our database do not switch their fund choice through the course of the year, but a minority are fairly frequent switchers.

These hypotheses can be tested using the following regression:

$$(6)\ 12Rtn = Constant + b_{ES} EquitiesStock + b_A Age + b_{MD} MaleDummy + b_{LP} Log\ (Pay) + b_{SD} SwitchDummy$$

EquitiesStock serves as a control variable given that over the period the main determinant of portfolio return is the allocation to equities and we have already sought to explain that via equation (3). ***SwitchDummy*** is a 0/1 variable that flags

members who have made any switches in the period. We also run an alternative specification of the model where we use the number of switches ("*Switches*") instead of *SwitchDummy*. We estimate this equation using OLS and use only data on members who have made an active choice of investment fund.

5. Results

5.1 Results concerning contribution rates

Table 3 shows the regression models that we use to attempt to explain members' contribution rates. It is clear from both specifications of the model that contributions are positively related to age and income, which is broadly consistent with lifecycle saving theory. Other things being equal, the contribution rate is 1% higher for every ten year increase in member age and rises by 0.1% for every 10% increase in salary. On average, males have a 1% higher contribution rate than females, controlling for age and income.

There is evidence that higher contribution rates are chosen by more 'engaged' members who also make an active choice of investment fund. These members save an additional two percentage points of salary compared with members who have not made an active investment choice. Our final contribution rate hypothesis was that members who take a conservative, fixed-income–based investment strategy would save more to compensate for the lower expected return on their portfolio. Panel B of Table 3 shows that the opposite appears to be the case, with fixed-income investors saving less than equity investors.[5] Other things being equal, a member 100% invested in equities saves an additional 3% of salary relative to a member 100% invested in bonds. This might imply that both contribution rate and equity allocation are related to some measure of financial sophistication.

Table 3 – OLS regression of the contribution rate on demographic, choice and income variables

	Model A		Model B	
	Coefficient	T-statistic	Coefficient	T-statistic
Constant	-0.122	-4.682	-0.111	-4.311
Age	0.001	9.843	0.001	11.001
MaleDummy	0.011	7.212	0.010	6.377
Log (Pay)	0.015	5.990	0.014	5.322
ChoiceDummy	0.022	13.961	-	-
EquitiesFlow	-	-	0.031	17.999
	N=3629		N=3629	
	R-Sq(adj) = 12.1%		R-Sq(adj) = 14.3%	

Dependent variable is ContribRate, which is the combined employer and employee pension contribution rate as a % of salary. Independent variables as defined in Table 1. See equation (1) in the text. T-statistics based on White adjusted standard errors.

5.2 Results concerning investment choice

Our first analysis of investment choice seeks to understand the characteristics of members who make an active choice of investment strategy rather than accept the default fund. Table 4 shows the results of a Logit regression where the dependent variable is ***ChoiceDummy***, which takes the value one if the member has made an active fund choice and zero otherwise.

The results show that higher-paid members are more likely to make an investment choice, which may mean pay is acting as a proxy for education and financial sophistication. The probability of making a choice also increases with employment tenure, suggesting that some members initially accept the default but eventually get around to making an active choice. This is consistent with the findings of Choi et al. (2002). Older members are more likely to use the default than younger members. Given that for most members (contributing less than 10% of salary), the default is 100% bonds, it may be that older members are more likely to regard this asset allocation as suitable for their needs than younger members who may desire higher return investments. The sex variable in the equation is insignificant. We re-estimate the equation excluding the sex variable and find that the coefficients for the other variables are largely unchanged.

Table 4 – Logit regression of ChoiceDummy on demographic and employment variables

	Model A			Model B		
	Coefficient	Z	P-value	Coefficient	Z	P-value
Constant	-4.624	-5.005	0.000	-4.434	-4.909	0.000
Age	-0.018	-3.712	0.000	-0.017	-3.676	0.000
MaleDummy	-0.095	-1.264	0.206	-	-	-
Tenure	0.179	7.789	0.000	0.177	7.720	0.000
Log (Pay)	0.529	5.731	0.000	0.506	5.651	0.000
		N=3629			N=3629	
		% concordant = 61.5			% concordant = 61.5	

Dependent variable is ChoiceDummy, a zero-one dummy variable that takes the value one if the member has made an active choice of investment fund and zero if the member is invested only in the default fund. Independent variables as described in Table 1. See equation (2) in the text.

The most significant investment choice plan members have to make is the proportion of their contributions to invest in equity funds. Table 5 shows the analysis of this decision. Model A shows the results for the full sample using ***ChoiceDummy*** as a control to account for the default fund being 100% fixed income for most members. Model B is estimated for only those members who have made an active choice of investment fund.

Table 5 – OLS regression of equity allocation on demographic and income variables

	Model A		Model B	
	Coefficient	T-statistic	Coefficient	T-statistic
Constant	-0.342	-3.881	0.391	3.259
ChoiceDummy	0.743	119.395	-	-
Age	-0.004	-6.372	-0.008	-9.110
MaleDummy	0.044	6.696	0.049	5.491
Log (Pay)	0.053	5.701	0.067	5.418
	N=3629		N=2499	
	R-Sq(adj)= 75.1%		R-Sq(adj)= 8.0%	

Dependent variable is EquitiesFlow which is the member's choice of the % of contributions to be allocated to equity funds. The independent variables are as defined in Table 1. Model A is estimated for all members in our sample and includes ChoiceDummy as a control because the default fund for most members is 100% fixed income. Model B is estimated using only those members who have made an active choice of investment fund. See equation (3) in the text. T-statistics based on White adjusted standard errors.

The coefficients for both models are qualitatively similar. Both models show that older members invest less in equities than younger members, consistent with lifecycle asset allocation. Taking Model B, for every ten year increase in member

age, the equity allocation is 8 percentage points lower. The coefficient is lower for Model A. Other things being equal, equity allocation is higher for males than females (by 5 percentage points) and higher for those on higher incomes. The equity allocation is approximately 0.6 percentage points higher for every 10% increase in salary. These results are consistent with Hallahan et al.'s (2004) analysis of subjective risk tolerance scores.

In addition to choosing an allocation to equity, members may choose the international diversification of their portfolio. Across the whole sample, members allocate an average of 63% of their portfolios to domestic assets, and an average of 40% of their equity portfolios to domestic equity funds. While this is an indication of home bias, it appears to be less extreme than found in many previous studies. Taking only those members who have made an active choice of investment funds, the corresponding domestic weights are 48% of total assets and 38% of equity assets.

Table 6 shows the results of a regression equation attempting to explain which members are most prone to home bias. Panel A examines the domestic share of the equity portfolio, while Panel B examines the share of total assets. The main point to note is that in both cases the explanatory power of the model is low. However, both specifications show that older members are inclined to hold more home biased portfolios (for example two percentage points more domestic equity for every 10 years of age), while males hold less home biased portfolios. Care should be taken in interpreting the model in Panel B in that the only fixed income and cash funds in the plan are domestic funds. Hence, any investor desiring a conservative portfolio allocation must, by default, accept a degree of home bias.

Table 6 – OLS regression of the domestic content of portfolio on demographic and income variables

	Model A HomeEquity		Model B HomeAssets	
	Coefficient	T-statistic	Coefficient	T-statistic
Constant	0.316	2.666	0.665	5.292
Age	0.002	2.263	0.006	7.867
MaleDummy	-0.037	-3.929	-0.061	-6.243
Log (Pay)	0.003	0.221	-0.035	-2.750
	N=2419		N=2499	
	R-Sq(adj) = 0.8%		R-Sq(adj) = 4.7%	

The dependent variable in Panel A is HomeEquity, which is the percentage of the members equity portfolio invested in domestic equity funds. The dependent variable in Panel B is HomeAssets, which is the percentage of the members portfolio invested in all domestic assets. Independent variables as defined in Table 1. See equation (9) in the text. The equation is estimated using only those members of the plan who have made an active choice of funds. T-statistics based on White adjusted standard errors.

One question that arises from the foregoing analysis of equity allocation and home bias is the extent to which both are determined by the level of financial sophistication of the investor. The data shown in Table 7 suggest this is the case. The table shows data ranked into quintiles by number of funds held in each member's portfolio. High numbers of funds are more likely to be complex portfolios held by relatively sophisticated investors. The Table provides some support for this by showing that the more complex portfolios have higher equity weightings (by approximately 5%, taking quintile 5 vs. quintile 1) and lower home bias (by approximately 13% on the same basis.)

Table 7 – Equity allocation and home bias by portfolio complexity

	Number of Funds Held	Mean Equity Allocation	Mean HomeEquity	Mean HomeAssets
Q1	2.4	80.6%	44.9%	55.1%
Q2	3.7	82.2%	42.3%	51.9%
Q3	4.6	81.9%	37.8%	48.0%
Q4	5.8	84.4%	34.6%	44.5%
Q5	8.1	85.5%	32.0%	41.8%
Q5-Q1	5.7	4.9%*	-12.9%*	-13.3%*

Data is sorted and ranked into quintiles using number of funds held. Corresponding figures show mean equity allocation, domestic equity share, and domestic asset allocation for those quintiles. Q5-Q1 is the difference between the extreme quintiles. * denotes statistical significance at the 5% level.

To continue the analysis of diversification, Table 8 shows the distribution of number of fund choices. The table shows a maximum of 10 funds. Members have 11 funds to choose from, but in our data the index-linked bond fund and corporate bond fund holdings are aggregated. The mean number of funds chosen is 4.2, while the median is 4. Panel A shows that over 60% of members choose 3, 4 or 5 funds. These figures are broadly consistent with Huberman and Jiang's findings. The table also shows that only 0.5% of members (or 12 in number) are invested across all 10 funds, suggesting that Benartzi and Thaler's 1/n rule is not a valid description of the members' behaviour.

Table 8 – Fund allocation decisions

Panel A: Number of funds chosen and Herfindahl indexes

Number of Funds Chosen	Percentage of Members (N=2499)	H	H_U	Percentage of Members in Category Between H and H_U
1	4.3%	-	-	-
2	10.5%	0.5000	0.5050	53%
3	23.3%	0.3333	0.3356	7%
4	23.8%	0.2500	0.2513	15%
5	17.3%	0.2000	0.2008	16%
6	9.4%	0.1667	0.1672	5%
7	5.3%	0.1429	0.1433	2%
8	3.3%	0.1250	0.1253	6%
9	2.4%	0.1111	0.1114	2%
10	0.5%	0.1000	0.1002	8%

Panel B: Allocation choices of members with two funds

Fund Allocation	Percentage of Members (N=262)
50:50	50.8%
60:40	8.4%
70:30	7.6%
75:25	16.0%
80:20	7.3%
90:10	4.2%
Other Splits	5.7%
All	100%

In Panel A Number of Funds Chosen is the number of funds to which the member has a non-zero allocation of contributions. The Percentage of Members is based only on those members who have made an active choice of investment funds. H is the value of the Herfindahl index that is consistent with an allocation of contributions of 1/n, where n is the number of funds chosen. H_U is the upper bound of the Herfindahl index that is consistent with an allocation of contributions that deviates by no more than 20% from a conditional 1/n strategy. In Panel B, the analysis considers only members who have chosen just two funds. Other Splits contains all members who chose splits other than the 'round' numbers shown in the Table. No other individual split accounts for more than 0.8% of members.

Panel A shows the percentage of members with allocations to a particular number of funds and the percentage in each category whose allocations are consistent with them following a conditional 1/n strategy. For example, members choosing two funds are following a conditional 1/n approach if they invest 50% in each of the two funds. The Herfindahl index measures the degree of dispersion in the allocations. Following Huberman and Jiang we allow 20% deviation from the pure conditional 1/n strategy while still classifying the member as following that approach. The table shows the 1/n Herfindahl index values (H) and the conditional 1/n upper bound Herfindahl index values (H_U). The final column of the table shows the percentage of members in that category of fund choice who have a Herfindahl index value within the range from H to H_U. The table shows that more than half of members who choose two funds opt for a 50:50 allocation, or something close to it. A conditional 1/n strategy is less common amongst members who have chosen more than two funds, although there is an interesting spike in the proportion of members who follow the conditional 1/n approach amongst those who have chosen 4 or 5 funds. The conditional 1/n approach appears to be most popular where the "n" is a number that is easy to divide by! In total, just over 14% of plan members follow a strategy that is close to the conditional 1/n approach using Huberman and Jiang's definition.

It is important to note, as Huberman and Jiang do in their analysis, that these results say nothing of the rationality of the individual fund choices. A 50:50 allocation between two of the funds on offer in this plan might well be an optimal choice for a member with a particular attitude to risk.

Panel B of Table 8 expands the analysis of the allocation choice made by members who invest in two funds. A total of 50.8% of these members adopt an exact 50:50 allocation of their contributions. For the remaining members, allocations cluster on other 'round' numbers. A 75:25 allocation is chosen by 16% of members and only 5.7% of members in the two funds category choose allocations other than in units of ten percentage points. Again, there is nothing to say these allocations are not rational,

but they are also consistent with members using simple heuristics when deciding on the contribution allocation.

We turn now to an attempt to explain the number of funds chosen by members to create their portfolio. Taking the number of funds held as a proxy for portfolio complexity, the results in Table 9 show that older members choose simpler portfolios, while higher paid members choose more complex ones. There is no significant relationship between portfolio complexity and sex. A key point is that the model has very low explanatory power.

Table 9 – Poisson regression of number of funds used on demographic and income variables

	Coefficient	Z	p-value
Constant	0.712	3.140	0.001
Age	-0.007	-5.278	0.000
MaleDummy	0.028	1.488	0.137
Log (Pay)	0.106	4.643	0.000

N=2499

R-Sq(adj) = 1.9%

Dependent variable is No. of funds – the number of separate funds the member uses to create his or her portfolio. Independent variables are as defined in Table 1. The equation is estimated using only those members who have made an active choice of investment fund.

5.3 Results concerning investment return

Table 10 shows our tentative analysis of the determinants of portfolio return. Given that the short period for which we have data was characterised by strong equity market performance, we first control for the proportion of the portfolio invested in equities. On average, a member 100% invested in equities earned a return over 16 percentage points higher than a member invested 100% in bonds.

Table 10 – OLS regression of 12 month portfolio return on demographic, choice and income variables

	Model A		Model B	
	Coefficient	T-statistic	Coefficient	T-statistic
Constant	0.126	6.705	0.127	6.722
EquitiesStock	0.166	47.592	0.166	47.635
Age	0.000	1.623	0.000	1.636
MaleDummy	0.004	2.485	0.004	2.500
Log (Pay)	-0.009	-4.823	-0.009	-4.844
SwitchDummy	-0.010	-3.201	-	-
Switches	-	-	-0.001	-3.602
	N=2499		N=2499	
	R-Sq(adj) = 49.1%		R-Sq(adj) = 49.1%	

Dependent variable is 12Rtn, the 12-month return on the member's portfolio for the period ending May 2006. Independent variables are as defined in Table 1. EquitiesStock is a control variable in that the period in question saw strong equity market returns. The equations are estimated using only those members who have made an active choice of investment fund. Results using the full sample of members are qualitatively similar. See equation (4) in the text. T-statistics based on White adjusted standard errors.

The results show that there is no significant relationship between age and portfolio performance. Males earn a small, but statistically significant additional return of 40 basis points compared with females. Higher paid members earn marginally lower returns than others, after controlling for the equity allocation decision. This is interesting as a contrast to our earlier suggestions of income as a proxy for financial sophistication.

One notable result in this analysis is that, other things being equal, switchers earn lower returns than members who hold their asset allocation constant. Members who switch in the period earn returns that are 100 basis points, on average, lower than other investors. The difference is significant at the 5% level. Model B shows that this result is robust to the use of number of switches instead of the dummy variable. This is consistent with Barber and Odean's (1999) finding of overconfidence and excess trading amongst retail brokerage investors.

6. Conclusions

In this paper we have used a unique administrative dataset to examine the contribution and investment decisions made by members of a large UK-based DC plan which is sponsored by a FTSE-100 company. We find that the members' contribution rates are positively related to their age and level of income, which is broadly consistent with lifecycle saving theory. However, we also find evidence that is consistent with behavioural theories, for example that higher contribution rates are chosen by sophisticated investors who also are prepared to choose their own investment strategy, and that investors with conservative portfolios do not save at higher rates to compensate for the lower expected return.

In terms of investment choice, we find that use of the default fund declines with tenure and with income. Default fund use increases with age, which may be because the default is largely a fixed-income investment. We find that the equity allocation decreases with age, which is consistent with the lifecycle investment approach, and that equity allocation is higher for males than females and increases with income,

results which are consistent with previous research on subjective risk tolerance. There is some evidence of home bias in the members' portfolios, but less than has been commonly found. Members with complex, equity based portfolios have lower home bias than their peers. There is little evidence that members allocate their contributions using a naïve 1/n diversification strategy across all available choices, but some members do follow a conditional 1/n diversification strategy and equally weight across the subset of funds they have chosen. Our data on investment return are too limited to draw strong conclusions on the determinants of return. We do, however, find that the more active an investor is, other things being equal, the lower the returns they earn.

The recent literature on individual financial decision making over the lifecycle has emphasised the effect of behavioural biases in decision making. There is evidence that some members of this plan are prone to these behavioural biases, especially when it comes to the active management of their portfolios. However, we also find that a large percentage of the plan's membership behave according to the predictions of standard lifecycle saving theory and lifecycle asset allocation. One speculation is that this might be a result, at least partially, of the effectiveness of the company's pensions communications strategy. While we are unable to test this directly, we can conjecture that a reasonably good pensions communications strategy would be more effective at communicating the importance of saving for retirement than with getting across the message of efficient risk diversification. This is what we find here. As a consequence, the members of this pension scheme are much closer to being rational lifecycle optimisers than many other recent studies have found.

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Endnotes

[1] The company wishes to remain anonymous.

[2] In the presence of time-varying investment opportunities, there are additional intertemporal hedging demands as first emphasised by Merton (1971, 1973).

[3] For example, a member contributing 15% of salary to the plan and accepting the default investment would have an asset allocation of contributions of 66.7% index linked gilts (first 10% of salary) and 33.3% equities (the additional 5% of salary.) This is a relatively unusual default fund structure in the UK.

[4] ***ChoiceDummy*** and ***EquitiesFlow*** are potentially endogenous regressors in equation (1) given that they are decisions made by the plan member at the same point in time as the decision on ***SaveRate***. However, in practice the correlations between Choice Dummy and Equities Flow and the residuals from the OLS estimation of equation (1) are practically zero. Furthermore, our attempts to produce instruments for ***ChoiceDummy and EquitiesFlow*** using a matched pair approach failed to find a suitable highly correlated instrument for either variable. Hence, we estimate equation (1) using OLS.

[5] We drop the ChoiceDummy variable from Model B as it is highly correlated with EquitiesFlow.

Chapter Seven: There's No Time Like the Present: The Cost of Delaying Retirement Saving

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Published jointly with David Blake, Andrew Cairns and Kevin Dowd.

Abstract:

Many people delay joining a pension plan until well into their working lives. We use a stochastic simulation model to show the cost of this delay in terms of the higher pension contributions that must eventually be paid to ensure an adequate retirement income. We find the levels of contributions required for individuals who start saving late are so high it is questionable whether they are affordable for anyone not on a high income. We also analyse the cost in terms of reduced pension of an interrupted labour market history, such as that experienced by someone who leaves work for a period to bring up a family.

1. Introduction

As state pensions in many countries become less generous relative to average earnings and the provision of occupational defined benefit (DB) pension plans becomes less common, defined contribution (DC) pension plans have become an increasingly important retirement saving vehicle. In most DC plans the individual has important decisions to make in terms of whether to join, when to join, how much to pay into the plan and how to invest the contributions.

The later an individual begins contributing to a DC pension plan, other things being equal, the larger the contributions he or she will have to pay to ensure an adequate retirement income. Interrupting contributions can also lead to a substantially reduced pension. In this paper, we use a stochastic simulation model to estimate the likely distribution of retirement incomes from a variety of alternative DC pension plan participation profiles. In particular, we show the cost in terms of higher contributions of deferring pension plan membership and of having an interrupted labour market participation history.

Our results provide serious cause for concern: they indicate that the contribution rates required to generate reasonable pension outcomes are often high, and sometimes well beyond what most individuals would be able to afford, given their other financial commitments. Our study therefore has an important role to play in educating employees about these implications and helping them develop realistic retirement saving plans.

2. Evidence on delayed pension plan participation

Many individuals choose not to contribute to a pension plan. For example, the National Association of Pension Funds Annual Survey of UK plans (NAPF, 2004) shows that where membership is not automatic, on average only 58% of eligible employees join their employer's DC pension plan. Some of the employees who have not joined might, of course, be contributing to their own personal pension plan, but in

most cases they will have decided not to save for a pension, or to defer saving to a later stage in their career.

There is evidence that older workers are more likely to be members of their employer's pension plan. Office for National Statistics (ONS) data for the UK for 2003 show that occupational pension plan participation rates are positively related to tenure with the employer: the participation rate for employees who are eligible to join their employer's pension plan and who have less than two years' service with the employer is 61%, while the comparable figure for employees with service of five years or more is 91%.[1] More direct evidence of a link between age and pension plan participation comes from a study by Nyce (2005), which examined 48 US 401(k) DC pension plans covering over 300,000 employees. The results – some of which are reproduced in Table 1 - show that participation rates rise with both age and income. Individuals with higher incomes are more likely to participate in the pension plan than those on lower incomes, but even after controlling for income, participation rates are higher amongst older workers.

Table 1 – Participation Rates in 401(k) Plans by Worker's Age and Income

Income	Age 21-29	Age 30-39	Age 40-49	Age 50-59	Average
$25-34.9k	62.7	70.9	73.7	78.7	71.2
$45-54.9k	84.8	86.9	86.8	87.9	86.7
$75-99.9k	83.9	90.6	91.3	91.3	90.4
Total	62.7	75.3	78.1	80.3	74.7

Note: % of eligible workers who have joined the plan.
Source: Extracted from Table 3 of Nyce (2005)

3. Pensions in life-cycle financial planning

Standard economic theory offers an explanation as to why individuals may choose not to save at certain points in their working life. The life-cycle theory of Ando, Brumberg and Modigliani (Modigliani and Brumberg, 1954; Ando and Modigliani, 1957), and Friedman's permanent income hypothesis (1957) both imply that individuals smooth consumption over their lifetime. In essence, in each period an individual can consume up to the annuity value of his or her expected wealth, and saving will take place only when current income exceeds this annuity value. From this perspective, a decision to defer retirement saving could simply represent a view that income will be higher in future. However, life-cycle theories have been troubled by evidence that many households fail to maintain their pre-retirement level of consumption in retirement, which suggests they might not have saved enough to properly smooth their lifetime spending. For instance, Banks et al. (1998) find a drop in consumption at retirement that cannot be explained fully by standard consumption smoothing models. Some of the reduction in consumption expenditure is a natural consequence of withdrawal from the labour market: e.g. travel costs to work are no longer incurred. However, another possible explanation for this drop in consumption is that members of these households are surprised by how low their pension is and are forced to adjust their consumption accordingly.

Behavioural economics provides an alternative view that suggests decisions to defer saving are driven by behavioural biases and thus may not represent optimal behaviour. For example, Thaler (1994) argues life-cycle theory fails to consider bounded rationality, which suggests individuals cannot do the multi-period optimisation calculations that are required for life-cycle saving, and bounded self-control, which implies individuals are unable to follow through with previously identified plans to save rather than consume - "Real people have trouble both in figuring out how much to save and in implementing any given goal" (Thaler, 1994, p.189). Laibson et al. (1998, p. 93) suggest that individuals have a "systematic tendency to err… in the direction of instant gratification" which they explain in terms of personal long-term discount rates being lower than short-term ones.[2]

Bernheim et al. (2001) found, using the Panel Study of Income Dynamics and the Consumer Expenditure Survey, that the average replacement ratio in retirement in the US is around 64%. But there is considerable variation around this figure, even among households with similar socioeconomic characteristics. Life-cycle theory explains this variation in terms of differences in time preference rates, risk tolerance, exposure to uncertainty, and relative tastes for work and leisure at advanced ages. These factors have testable implications concerning the relationship between accumulated wealth and the shape of the consumption profile. Bernheim et al. found little support for these implications. The data are instead consistent with "rule of thumb," "mental accounting," or hyperbolic discounting theories of wealth accumulation.

To the extent that decisions to defer pension saving do stem from such behavioural biases, individuals might benefit from commitment mechanisms, such as automatic enrolment of employees into the pension plan and regular saving plans, designed to mitigate the effects of the biases. (Benartzi and Thaler, 2004).

4. Modelling the consequences of delayed pension plan participation

Irrespective of whether the decision to defer saving for retirement is based on rational analysis or behavioural biases, it is important to understand how much an individual needs to save over different periods to ensure an adequate income in retirement. To address this issue, we estimate the likely range of retirement incomes from a variety of different DC pension plan participation profiles. As Booth (2004) notes it is important to consider risk in pension plan accumulation and the probability of achieving a certain outcome, rather than focusing only on the most likely result. Hence, we use a stochastic model, which allows us to understand the distribution of retirement income outcomes. We use data representative of the UK to illustrate the analysis, but the broad conclusions are likely to hold across most other national markets where DC pension plans are becoming common.

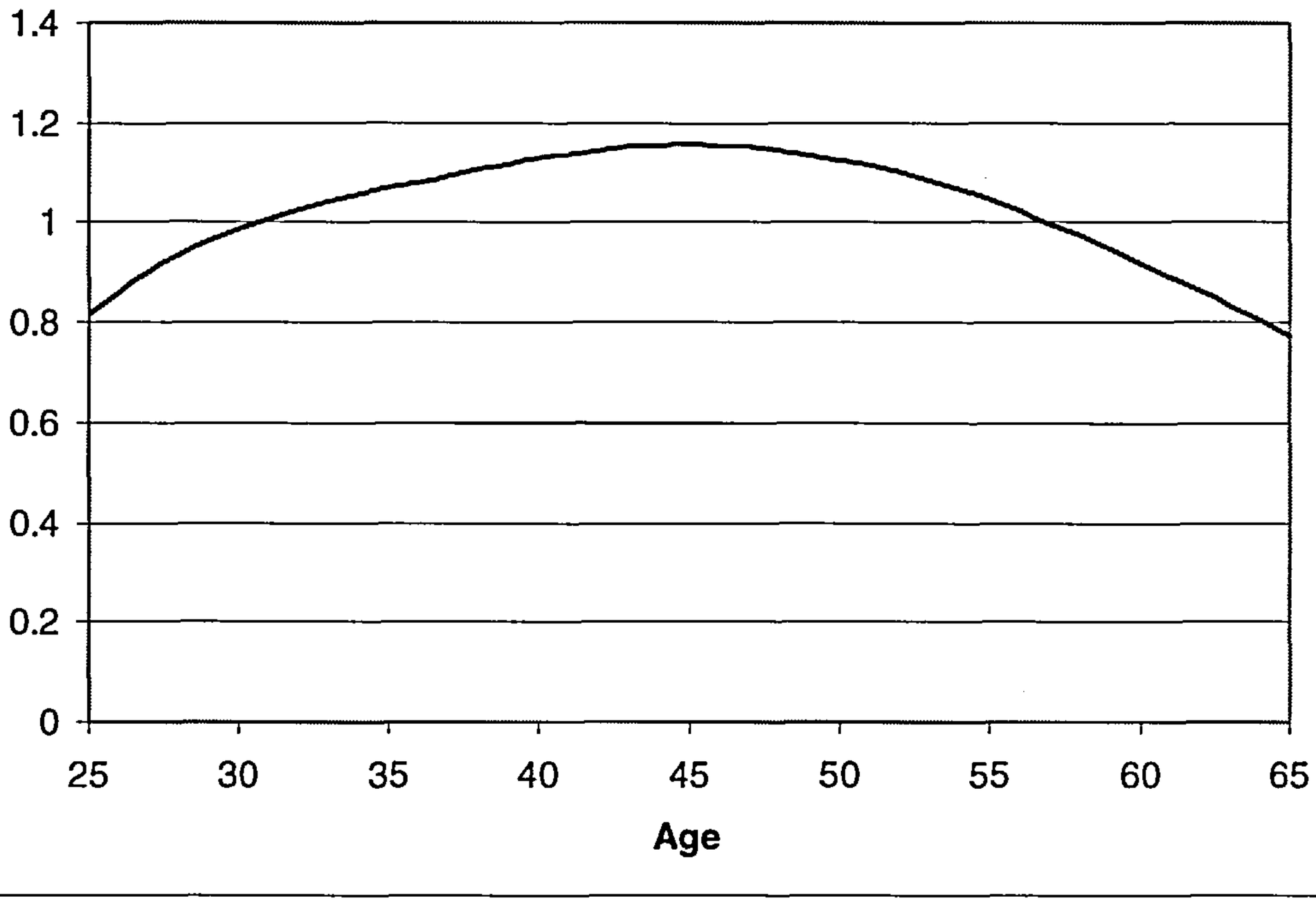
We take as our benchmark the case of an average UK male who joins a pension plan at age 25 and retires at 65 – the current state pension age for a man in the UK. We assume that he contributes 10% of his salary each year to the pension plan, based on survey evidence that this is close to the average combined (i.e. employee plus employer) contribution rate in occupational DC schemes in the UK. The Pensions Commission (2004) reports contribution rates of this magnitude from surveys conducted by the NAPF and the Association of Consulting Actuaries. Average US contribution rates appear similar, with Munnell and Sunden (2006) suggesting that 9% is the typical contribution rate for a 401(k) scheme member (6% employee; 3% employer match.) While we use the 10% contribution rate in most of our analysis, we also conduct a sensitivity analysis using alternative rates.

We assume the individual's career earnings experience matches that of a typical male employee in the UK and to simplify the analysis we further assume that there is no risk to the accrual of pension benefits arising from unemployment. Figure 1 shows the age-earnings profile of the employee, scaled to average male earnings (=1.0). The profile incorporates relatively rapid promotion in the earlier years of the employee's career, with a peak in the mid-to-late 40s, and below-average promotional increments thereafter. Employees have above average earnings in their mid-careers and below average earnings at the beginning and end of their careers. In addition to these promotional increments, the employee will also experience an annual increase in real wages arising from productivity increases over his career. We assume a 2% per annum increase in real wages, in line with the annual increase in national average earnings in the UK over the post-war period.[3]

The alternative scenarios we investigate involve delays in joining the pension plan to various ages between 35 and 55. We document the impact of this deferment on the retirement income outcome for a 10% contribution rate, and calculate the contribution rate that would be required to replicate the pension benefits produced by membership from age 25. We also show the impact of deferring retirement to age 70, given growing comment (e.g. Pensions Commission, 2004) that increasing longevity should be matched by higher retirement ages, and of retiring early at age 55, which could happen to an individual as a result of ill health or redundancy. Finally, we

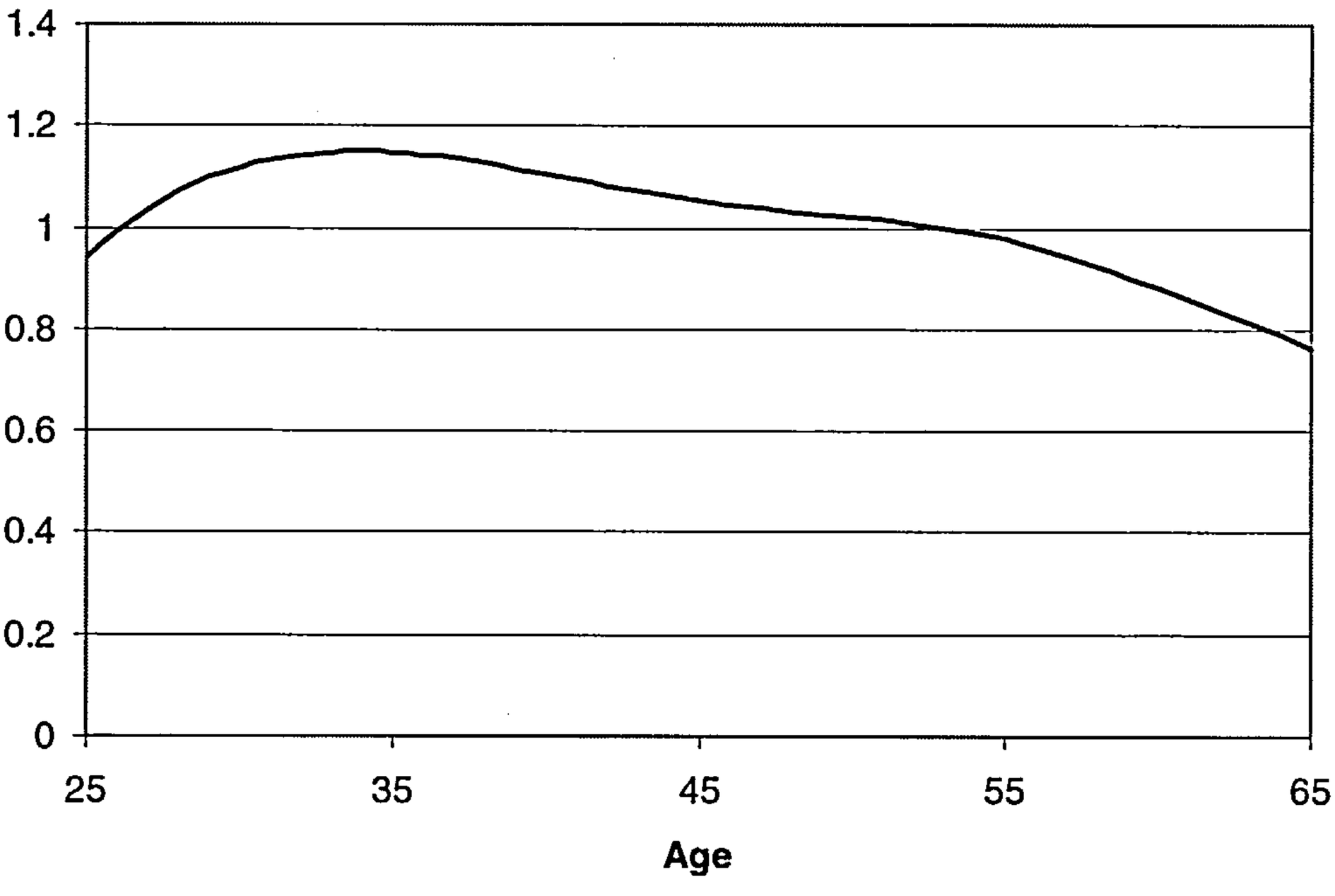
investigate some scenarios for a female pension plan member, in which we compare an unbroken pension plan participation record with the case where the woman has a spell out of the labour market to raise a family. To do this, we use the age-earnings profile of a typical female worker in the UK; such a worker's earnings peak in her early 30s, around a decade before the average male (see Figure 2).

Figure 1:
Age-Real Earnings Profile: Average UK Male



Notes: Chart shows the Age-Real earnings profile for the average male employee in the UK. Earnings follow the path of the curve as the employee grows older, but are also subject to additional real growth on account of economy wide productivity gains.

Figure 2:
Age-Real Earnings Profile: Average UK Female



Notes: Chart shows the Age-Real earnings profile for the average female employee in the UK. Earnings follow the path of the curve as the employee grows older, but are also subject to additional real growth on account of economy wide productivity gains.

The model we use to conduct our analysis is the PensionMetrics model described in detail in Blake et al. (2001) and briefly in the Appendix. This model uses stochastic simulation to determine the anticipated distribution of pension outcomes, measured in terms of the ratio of initial pension to final salary (i.e. the replacement ratio), for any given set of input parameters such as contribution rate, asset allocation strategy, anticipated retirement age, and so on, taking into account the stochastic nature of investment returns, interest rates and salary levels.

In respect of the investment of the pension contributions, we consider four alternative stylised asset allocation profiles. We investigate a conservative, low risk strategy that is 100% bonds and a high risk strategy invested 100% in UK equities. We also consider a balanced strategy that is 60% equities and 40% bonds – a common asset mix in US plans – and a deterministic life-cycle strategy that invests a proportion equal to (100-member's age) in equities and the remainder in bonds.[4] This life-cycle strategy is designed to reduce the investment risk borne by the member in the years immediately preceding retirement, on the grounds that it would be difficult to recover from losses sustained at such a late stage in the working life. The balanced and life-cycle strategies use annual rebalancing.

Following Byrne et al. (2005) we use a combination of historical returns data and forward-looking return estimates to parameterise the stochastic model. The source for the historical returns is the ABN Amro / LBS data set discussed in Dimson et al. (2001) and available commercially through Ibbotson Associates. We use data for the post-war period of 1947 to 2003 to estimate the volatility and correlation structure of the asset classes (See Table A1 in the Appendix). However, we do not use the historical mean returns as our estimate of future returns. Instead, we use forward-looking return assumptions to account for the possibility that the historical realised equity risk premium - defined as the difference between the average return on equities and the return on Treasury bills - is larger than can reasonably be expected in future.

We use the forward-looking return estimates because some commentators (e.g. Fama and French, 2002; Arnott and Bernstein, 2002; and Dimson et al., 2001) believe that the realised equity risk premium over the post-war period is an upward biased estimate of the likely future risk premium. They argue that high historical equity returns between 1950 and 1999 were mainly due to: a) unexpectedly high profitability and hence strong dividend growth and b) an unexpected fall in long-term discount rates, the result of a sustained decline in the volatility of earnings, dividends and returns. Neither of these factors can be relied upon to boost future equity returns. These commentators conclude that the best estimate of a global equity risk premium is about 3.5% relative to US Treasury bills, and we use this suggested equity premium to produce an alternative set of forward-looking nominal return parameters, which we adjust for pension plan charges (1.0%) and expected inflation (2.5%).[5] We conduct a sensitivity analysis of our return assumptions later in the paper.

While some pension funds are actively managed, we make no allowance for any (positive or negative) excess returns generated by active management. We also assume that annual returns on the assets in the pension fund follow a multivariate normal process.[6] The return parameters are shown in Table 2.

Table 2 – Forward-looking Return Parameters

	Nominal Annual Return	Real Annual Gross Return	Real Annual Return Post Charges
Equities (UK & Global)	7.5%	5.0%	4.0%
Bonds	4.5%	2.0%	1.0%
Cash	4.0%	1.5%	0.5%

Notes: Inflation is assumed at 2.5% in line with Bank of England's target for the Retail Price Index ("RPIX"). The 1.0% annual charge is now typical of DC pensions in the UK. No allowance is made for any excess returns from active management. The bond return assumption reflects current market yields. The equity return figure is based on a market level dividend discount model, where dividends grow in line with GDP, while the cash return is derived by subtracting a 3.5% equity risk premium from the equity return figure. The approach is consistent with that used by the UK's Financial Services Authority (2003).

When the plan member reaches retirement age, the accumulated fund is converted into a single life annuity that provides a level income to him until he dies. The annuity rate is based on a long-term interest rate consistent with the returns on fixed-income assets earned by the fund in the year leading up to retirement and with the PMA92 survival probabilities at the relevant age taken from mortality tables published by the Institute and Faculty of Actuaries: these reflect the mortality experience of males buying pension annuities from UK life offices. Where we analyse scenarios for female plan members, we use the corresponding female mortality tables (PFA92). We do not take account of the possibility of future improvements in longevity.

We present the results of the simulation in terms of the replacement ratio – that is, the ratio of initial pension to salary immediately prior to retirement. Many final salary, DB pension plans have offered a replacement ratio of $1/60^{th}$ of final pay for each year worked, up to a maximum of $40/60^{ths}$ of final pay. Under such a plan, a worker with 40 years' service would therefore get a pension income of $2/3^{rds}$ of final salary. We can use this ratio as a benchmark for the outcomes from the DC plan.

5. Results and analysis

5.1 The case of an average male

Table 3 shows the distribution of replacement ratios for our benchmark case of a male who contributes 10% of salary to the pension plan from age 25 to age 65. The results are based on 5000 simulations using the PensionMetrics model. The median replacement ratio for that individual ranges from 0.29 – where the contributions are invested only in bonds – to 0.39 for the 100% equity strategy. The differences in median replacement ratios across the four investment strategies are, of course, explained by the differing levels of equity content and the impact this has on the expected investment return. It follows that the median replacement ratios are also influenced by the expected returns assumed for the various asset classes.

It is also clear from the Table that the pension outcomes are very risky, with the 5% value-at-risk replacement ratios for starting age 25 ranging from 0.12 to 0.18. The interpretation of these figures is that the individual has a 1-in-20 chance of receiving a replacement ratio of that amount or less. The 'low risk' strategy of 100% bonds limits the downside compared with the 100% equity and balanced strategies, but only at the expense of a significant reduction in the mean and median replacement ratios. This strategy has been called one of 'reckless conservatism' and this description is reinforced by an examination of the inter-quartile range. For the 100% bonds strategy, the range is 0.23 to 0.37, the interpretation of which is that there is a 50% probability of the outcome lying in this range. By contrast, the 100% equity strategy has the same lower bound as bonds but almost twice the upper bound. The balanced and life-cycle strategies appear to offer relatively attractive risk-return trade-offs compared to the single asset class strategies. Both have relatively high median replacement ratios (0.37 and 0.35, respectively), while having a more limited downside (5% VaRs of 0.16 and 0.18, respectively.) The life-cycle strategy has better downside results than the balanced strategy, but loses some of the upside potential (75^{th} percentile VaRs of 0.49 and 0.53, respectively.) Notably, the life-cycle strategy has the same 5% VaR level as the conservative 100% bonds strategy, but a significantly higher median replacement ratio.

Table 3 also reveals that delaying pension plan membership beyond age 25 has the predictable result of shifting downward the range of likely replacement ratios. For example, deferring membership by ten years to age 35 reduces the median replacement ratio from the balanced managed strategy from 0.37 to 0.31. The corresponding figures for deferment to ages 45 and 55 are 0.22 and 0.11 respectively.

Table 3 – Replacement Ratios by Age of Joining Pension Plan – Male Retiring at 65

Start Age	Strategy	Median Replacement Ratio	Mean Replacement Ratio	Inter-quartile VaR Range	5% VaR Replacement Ratio	Contribution Rate to Match Age 25 Start	Contribution Rate for 50% Replacement Ratio
25	100% Bonds	0.29	0.31	0.23 – 0.37	0.18	-	17.2
	Balanced 60:40	0.37	0.44	0.26 – 0.53	0.16	-	13.5
	100% Equities	0.39	0.56	0.23 – 0.65	0.12	-	12.8
	Life-cycle	0.35	0.41	0.26 – 0.49	0.18	-	14.3
35	100% Bonds	0.25	0.27	0.21 – 0.31	0.16	11.6	20.0
	Balanced 60:40	0.31	0.36	0.22 – 0.44	0.15	11.9	16.1
	100% Equities	0.33	0.43	0.20 – 0.53	0.11	11.8	15.2
	Life-cycle	0.30	0.33	0.23 – 0.40	0.16	11.7	16.7
45	100% Bonds	0.19	0.20	0.16 – 0.22	0.13	15.3	26.3
	Balanced 60:40	0.22	0.24	0.16 – 0.28	0.11	16.8	22.7
	100% Equities	0.23	0.27	0.15 – 0.33	0.09	17.0	21.7
	Life-cycle	0.21	0.22	0.17 – 0.26	0.13	16.7	23.8
55	100% Bonds	0.10	0.10	0.09 – 0.11	0.07	29.0	50.0
	Balanced 60:40	0.11	0.11	0.09 – 0.13	0.07	33.6	45.5
	100% Equities	0.11	0.12	0.08 – 0.14	0.05	35.5	45.5
	Life-cycle	0.10	0.11	0.09 – 0.12	0.07	35.0	50.0

Notes: Balanced strategy is 60% equities; 40% bonds with annual rebalancing. Life-cycle strategy invests a proportion equal to 100 minus member's age in equities with the remainder in bonds, with annual adjustment. Median, Mean, Inter-quartile VaR (value-at-risk) range (between 25th and 75th percentiles of the distribution of replacement ratios) and 5% VaR (below which 5% of the distribution of replacement ratios fall) all based on the member contributing 10% of salary throughout pension plan membership. Contribution rate to match age 25 is the contribution rate required from the later age of joining to replicate median replacement ratio estimated for age 25. Contribution rate for 50% replacement ratio is that required to have 50% probability of a replacement ratio of at least 0.50.

An alternative way to look at this is to calculate what level of contribution rate would have to be paid from these later starting ages to replicate the median replacement ratio generated by a 10% contribution rate paid from age 25. Using the balanced managed strategy, the answer to this is 11.9% from age 35, 16.8% from age 45 and 33.6% from age 55, and the results for the other asset allocation strategies are broadly similar. These results show that anyone delaying contributing to a pension plan beyond their 30's must devote a very significant portion of their income to making these 'catch up' contributions. Indeed, the levels of the contributions required from the later starting ages are such that it might not be possible for individuals on low-to-middle incomes to afford them.[7]

The increase in the contribution rate required as a result of delaying pension plan membership is, at first glance, less than might be expected. For example, reducing the contribution period from 40 to 30 years might be expected to raise the required contribution rate by 33% (i.e. 40 years contributions need to be spread over 30 years) even before taking account of the forgone ten years of investment returns. That the required contribution rate rises by only 16-19% is explained by the employee's age-earnings profile. Real earnings rise through most of the employee's career and thus the percentage increase in contributions is being applied to a higher *level* of salary.

The Table also shows that even when starting pension contributions at age 25, the median replacement ratios are well below the ratios targeted by traditional final salary pension plans. This point is confirmed by the final column of the Table, which shows the contributions required to have a 50% chance of achieving a replacement ratio of at least 0.50 of final salary (a common replacement ratio in public sector plans). Again, it is valid to question the affordability of the contribution rates required by individuals starting pension contributions at later ages.

Just about the only positive thing that we can say about delaying pension plan membership is that shorter contribution periods reduce the variability of outcomes. For example, the interquartile VaR range for the replacement ratio for the balanced managed strategy from age 25 is 0.27. By comparison, for the same strategy from age 55, the range is reduced to 0.04. However, being more certain about the value of your (very much smaller) pension does not seem to be a particularly good reason to delay starting to save.

An individual might be able to make a given target replacement ratio more affordable by retiring at a later age. Table 4 gives the outcomes for the same starting ages and investment strategies as Table 3, but this time based on the assumption that employment and saving continue to, and the pension benefits are not taken until, age 70. The age-earnings profile we have used implies real wage growth declines from the individual's late-40s until the point of retirement. To enable an easier comparison with the previous results, we assume the decline in real wage growth ends at age 65

and the real growth remains steady for the additional five years of employment. Given that relatively few people currently work beyond age 65, there is little firm evidence on the true age-earnings profile post-65.

Table 4 – Replacement Ratios by Age of Joining Pension Plan – Male Retiring at 70

Start Age	Strategy	Median Replacement Ratio	Mean Replacement Ratio	Inter-quartile VaR Range	5% VaR Replacement Ratio	Contribution Rate to Match Age 25 Start	Contribution Rate for 50% Replacement Ratio
25	100% Bonds	0.36	0.40	0.28 – 0.48	0.20	-	13.9
	Balanced 60:40	0.47	0.58	0.32 – 0.71	0.19	-	10.6
	100% Equities	0.50	0.76	0.29 – 0.90	0.14	-	10.0
	Life-cycle	0.45	0.53	0.33 – 0.64	0.21	-	11.1
35	100% Bonds	0.32	0.35	0.26 – 0.42	0.19	11.3	15.6
	Balanced 60:40	0.41	0.49	0.29 – 0.60	0.18	11.5	12.2
	100% Equities	0.43	0.61	0.26 – 0.74	0.13	11.6	11.6
	Life-cycle	0.39	0.44	0.29 – 0.53	0.20	11.5	12.8
45	100% Bonds	0.25	0.27	0.21 – 0.31	0.16	14.4	20.0
	Balanced 60:40	0.30	0.34	0.22 – 0.42	0.15	15.7	16.7
	100% Equities	0.31	0.40	0.20 – 0.49	0.11	16.1	16.1
	Life-cycle	0.29	0.31	0.23 – 0.38	0.16	15.5	17.2
55	100% Bonds	0.15	0.16	0.13 – 0.18	0.11	24.0	33.3
	Balanced 60:40	0.17	0.19	0.14 – 0.22	0.10	27.6	29.4
	100% Equities	0.18	0.21	0.13 – 0.25	0.08	27.8	27.8
	Life-cycle	0.17	0.18	0.14 – 0.20	0.11	26.5	29.4

Notes: Balanced strategy is 60% equities; 40% bonds with annual rebalancing. Life-cycle strategy invests a proportion equal to 100 minus member's age in equities with the remainder in bonds, with annual adjustment. Median, Mean, Inter-quartile VaR (value-at-risk) range (between 25th and 75th percentiles of the distribution of replacement ratios) and 5% VaR (below which 5% of the distribution of replacement ratios fall) all based on the member contributing 10% of salary throughout pension plan membership. Contribution rate to match age 25 is the contribution rate required from the later age of joining to replicate median replacement ratio estimated for age 25. Contribution rate for 50% replacement ratio is that required to have 50% probability of a replacement ratio of at least 0.50.

Table 4 shows that replacement ratios at age 70 for given starting ages and contribution levels are substantially increased, relative to the equivalent scenarios with retirement at age 65. For example, focussing on the balanced managed strategy, the median replacement ratio increases from 0.37 to 0.47 for someone starting contributing at age 25, while the increase for someone starting at age 55 is from 0.11 to 0.17. The inter-quartile ranges also shift up, although the improvements in the 5% VaR levels are somewhat lower. We might not like the prospect of working longer and later into life, but it is clearly an effective way of improving the affordability of pensions. The benefit in terms of lower required contributions for any target level of

retirement income can be seen in the final column of the Table, which illustrates required contributions for a 0.50 replacement ratio. For an individual starting paying into the pension plan at age 55 and using the balanced managed strategy, the required contribution rate to achieve this replacement ratio for retirement at age 65 is 45.5% of salary, but this falls to 29.4% of salary if retirement is postponed to age 70.

The impact of deferring retirement is the result of contributions being paid for five years longer and the annuity rate increasing to take account of the reduced period for which the pension is expected to be paid given the more advanced age at purchase. However, it is important to note that the life expectancy of a 70 year old is unlikely to be a full five years less than that of a 65 year old. The fact that an individual has survived an extra five years tends to indicate a higher chance of prolonged life – a feature of mortality statistics that is cheerfully known in the annuity industry as "mortality drag".

Naturally enough, retiring earlier will have the opposite effect. The results for retirement at age 55 are shown in Table 5. The median replacement ratio for someone retiring at age 55, having contributed 10% of salary to the balanced managed strategy since age 25, is 0.17, with an interquartile range of 0.13-0.22. The comparable figure for a retirement age of 65 is 0.37, with an interquartile range of 0.26-0.53. The required contribution rates for a 0.50 replacement ratio at age 55 are all at least 50% greater than the corresponding rates required for retirement at age 65. Early retirement is therefore extremely costly.

The situation is particularly unfortunate for those who start retirement saving late, but then find themselves out of work in their 50s. The only potential mitigating factor is that if an individual is forced to retire on the grounds of ill-health, they may be eligible for an 'enhanced' or 'impaired life' annuity. This would take account of their reduced life expectancy and offer a higher rate of income than the rates used in our modelling.

Table 5 – Replacement Ratios by Age of Joining Pension Plan – Male Retiring at 55

Start Age	Strategy	Median Replacement Ratio	Mean Replacement Ratio	Inter-quartile VaR Range	5% VaR Replacement Ratio	Contribution Rate to Match Age 25 Start	Contribution Rate for 50% Replacement Ratio
25	100% Bonds	0.14	0.15	0.12 – 0.17	0.10	-	35.7
	Balanced 60:40	0.17	0.19	0.13 – 0.22	0.09	-	29.4
	100% Equities	0.17	0.22	0.12 – 0.27	0.07	-	29.4
	Life-cycle	0.17	0.18	0.13 – 0.22	0.09	-	29.4
35	100% Bonds	0.11	0.12	0.10 – 0.13	0.09	12.7	45.5
	Balanced 60:40	0.13	0.14	0.10 – 0.17	0.08	13.1	38.5
	100% Equities	0.14	0.16	0.09 – 0.20	0.06	12.1	35.7
	Life-cycle	0.13	0.14	0.10 – 0.16	0.08	13.1	38.5
45	100% Bonds	0.07	0.07	0.06 – 0.07	0.05	20.0	71.4
	Balanced 60:40	0.07	0.07	0.06 – 0.09	0.05	24.3	71.4
	100% Equities	0.07	0.08	0.06 – 0.10	0.04	24.3	71.4
	Life-cycle	0.07	0.07	0.06 – 0.08	0.05	24..3	71.4

Notes: Balanced strategy is 60% equities; 40% bonds with annual rebalancing. Life-cycle strategy invests a proportion equal to 100 minus member's age in equities with the remainder in bonds, with annual adjustment. Median, Mean, Inter-quartile VaR (value-at-risk) range (between 25th and 75th percentiles of the distribution of replacement ratios) and 5% VaR (below which 5% of the distribution of replacement ratios fall) all based on the member contributing 10% of salary throughout pension plan membership. Contribution rate to match age 25 is the contribution rate required from the later age of joining to replicate median replacement ratio estimated for age 25. Contribution rate for 50% replacement ratio is that required to have 50% probability of a replacement ratio of at least 0.50.

5.2 The case of an average female

So far, we have assumed that individuals might delay joining the pension plan, but that once they have joined they continue to make contributions to the plan until retirement. However, for some individuals, the contribution record will be interrupted, for example by unemployment or an extended period of illness. An interrupted contribution record is also very common for female workers who leave the labour market for a period in order to raise a family. We analyse this latter scenario in Table 6, which shows two alternative labour market participation profiles for a female employee: a five-year career break and a ten-year career break, both starting at age 30.[8]

Table 6 – Replacement Ratios by Labour Market Participation Experience – Female Retiring at 65

Contri-bution Periods	Strategy	Median Replacement Ratio	Mean Replacement Ratio	Inter-quartile VaR Range	5% VaR Replacement Ratio	Contribution Rate to Match Full Period	Contribution Rate for 50% Replacement Ratio
25 – 65	100% Bonds	0.28	0.31	0.23 – 0.36	0.17	-	17.9
	Balanced 60:40	0.36	0.43	0.25 – 0.52	0.16	-	13.9
	100% Equities	0.38	0.55	0.23 – 0.65	0.11	-	13.2
	Life-cycle	0.35	0.40	0.26 – 0.48	0.18	-	14.3
25 –30;	100% Bonds	0.26	0.28	0.21 – 0.33	0.16	10.8	19.2
35 - 65	Balanced 60:40	0.33	0.38	0.23 – 0.46	0.15	10.9	15.2
	100% Equities	0.35	0.48	0.21 – 0.57	0.11	10.9	14.3
	Life-cycle	0.32	0.36	0.24 – 0.43	0.17	10.9	15.6
25 –30;	100% Bonds	0.23	0.25	0.19 – 0.28	0.15	12.2	21.7
40 - 65	Balanced 60:40	0.28	0.32	0.21 – 0.39	0.14	12.8	17.9
	100% Equities	0.30	0.40	0.19 – 0.48	0.10	12.7	16.7
	Life-cycle	0.27	0.30	0.21 – 0.36	0.15	13.0	18.5

Notes: Balanced strategy is 60% equities; 40% bonds with annual rebalancing. Life-cycle strategy invests a proportion equal to 100 minus member's age in equities with the remainder in bonds, with annual adjustment. Median, Mean, Inter-quartile VaR (value-at-risk) range (between 25th and 75th percentiles of the distribution of replacement ratios) and 5% VaR (below which 5% of the distribution of replacement ratios fall) all based on the member contributing 10% of salary throughout pension plan membership. Contribution rate to match full period is the contribution rate required over the interrupted contribution history to replicate the median replacement ratio estimated for an uninterrupted work history. Contribution rate for 50% replacement ratio is that required to have 50% probability of a replacement ratio of at least 0.50.

The replacement ratios for pension plan participation from age 25 to age 65 are all marginally lower than the equivalents for males shown in Table 3. This reflects a combination of the different age-wage profile and the longer life expectancy of females, which feeds through into lower annuity rates. The Table also shows that relative to the benchmark of unbroken participation from age 25, a five year career break reduces the median replacement ratio from 0.36 to 0.33 (under the balanced managed strategy) and the ten-year break reduces it further to 0.28. However, it is worth noting that our analysis assumes the career break has no impact on the subsequent age-earnings profile[9] – and this assumption is likely to be optimistic. Thus, the combination of longer life expectancies and career breaks to raise a family means that women face considerably greater obstacles than men in achieving adequate pension provision. And, of course, women often face the additional problem of having lower salary incomes as well.

5.3 Sensitivity analysis

5.3.1 Equity risk premium

The results above are conditional on the assumed values for the parameters of the model. The most important of these is the size of the equity risk premium. We selected a value of 3.5% on the grounds that this value is supported by the recent literature as a forward looking estimate. Naturally, with a more optimistic equity risk premium, the distribution of replacement ratios will be shifted upwards, and vice versa. Table 7 shows the extent of these shifts when the equity risk premium is reduced to 1.5% or raised to 5.5%. Clearly, only the balanced, life-cycle and 100% equity strategies are affected, but the effect is significant. With a start age of 25 and a balanced strategy, the median replacement ratio falls by 19% from 0.37 to 0.30 when the equity risk premium drops to 1.5%, and increases by 24% from 0.37 to 0.46 when the equity risk premium rises to 5.5%. The corresponding changes for the 100% equity strategy are a 28% fall and a 44% increase. The percentage changes are smaller at higher starting ages. Nevertheless the Table gives a flavour of the extent of the uncertainty attached to the pension from DC plans as a consequence of one of the key determinants of differential returns.

Table 7 – Sensitivity Analysis of the Equity Risk Premium: Replacement Ratios by Age of Joining Pension Plan – Male Retiring at 65

Start Age	Strategy	Equity Risk Premium (relative to T-bills)					
		1.5%		3.5%		5.5%	
		Median Replacement Ratio	Inter-quartile VaR Range	Median Replacement Ratio	Inter-quartile VaR Range	Median Replacement Ratio	Inter-quartile VaR Range
25	100% Bonds	0.29	0.23 – 0.37	0.29	0.23 – 0.37	0.29	0.23 – 0.37
	Balanced 60:40	0.30	0.21 – 0.42	0.37	0.26 – 0.53	0.46	0.31 – 0.67
	100% Equities	0.28	0.17 – 0.45	0.39	0.23 – 0.65	0.56	0.33 – 0.98
	Life-cycle	0.30	0.23 – 0.41	0.35	0.26 – 0.49	0.42	0.31 – 0.58
35	100% Bonds	0.25	0.21 – 0.31	0.25	0.21 – 0.31	0.25	0.21 – 0.31
	Balanced 60:40	0.26	0.19 – 0.36	0.31	0.22 – 0.44	0.37	0.27 – 0.53
	100% Equities	0.25	0.16 – 0.39	0.33	0.20 – 0.53	0.44	0.27 – 0.73
	Life-cycle	0.26	0.20 – 0.35	0.30	0.23 – 0.40	0.34	0.26 – 0.46
45	100% Bonds	0.19	0.16 – 0.22	0.19	0.16 – 0.22	0.19	0.16 – 0.22
	Balanced 60:40	0.19	0.15 – 0.25	0.22	0.16 – 0.28	0.25	0.19 – 0.33
	100% Equities	0.18	0.12 – 0.27	0.23	0.15 – 0.33	0.28	0.18 – 0.42
	Life-cycle	0.19	0.15 – 0.24	0.21	0.17 – 0.26	0.23	0.18 – 0.29
55	100% Bonds	0.10	0.09 – 0.11	0.10	0.09 – 0.11	0.10	0.09 – 0.11
	Balanced 60:40	0.10	0.08 – 0.12	0.11	0.09 – 0.13	0.11	0.09 – 0.14
	100% Equities	0.10	0.07 – 0.13	0.11	0.08 – 0.14	0.12	0.09 – 0.16
	Life-cycle	0.10	0.08 – 0.11	0.10	0.09 – 0.12	0.11	0.09 – 0.13

Notes: Balanced strategy is 60% equities; 40% bonds with annual rebalancing. Life-cycle strategy invests a proportion equal to 100 minus member's age in equities with the remainder in bonds, with annual adjustment. Median, Mean, Inter-quartile VaR (value-at-risk) range (between 25th and 75th percentiles of the distribution of replacement ratios) and 5% VaR (below which 5% of the distribution of replacement ratios fall) all based on the member contributing 10% of salary throughout pension plan membership.

5.3.2 Contribution rates

Our final sensitivity analysis focuses on the member's contribution rate. We have assumed in previous analyses that the member contributes a constant 10% of salary throughout his or her period of scheme membership. This assumption was based on survey evidence that 10% is close to the average contribution rate for these types of schemes. However, many scheme members save less than 10%, while it is also open to most members to raise their contributions above 10%, assuming they have sufficient spare income to do so. Table 8 shows replacement ratios (median and inter-quartile VaR ranges) for retirement at 65 with various joining ages based on

contribution rates of 5%, 10% and 15% of salary. Raising the contribution level has the predictable result of raising the median replacement ratio and all of the distribution values listed in the Table. In fact, the values scale perfectly – a 50% higher contribution rate produces a 50% higher replacement ratio. The inter-quartile range shifts up and widens by a factor of 50%, as the 25th and 75th percentiles rise by 50%. Raising contribution levels is, like working longer, a powerful way to improve the adequacy of an individual's retirement income provision, albeit one which may not be viewed as attractive by the individual.

Table 8 – Sensitivity Analysis of the Contribution Rate: Replacement Ratios by Age of Joining Pension Plan – Male Retiring at 65

Start Age	Strategy	Contribution Rate (% of salary)					
		5%		10%		15%	
		Median Replacement Ratio	Inter-quartile VaR Range	Median Replacement Ratio	Inter-quartile VaR Range	Median Replacement Ratio	Inter-quartile VaR Range
25	100% Bonds	0.15	0.12 – 0.19	0.29	0.23 – 0.37	0.44	0.35 – 0.56
	Balanced 60:40	0.19	0.13 – 0.27	0.37	0.26 – 0.53	0.56	0.39 – 0.80
	100% Equities	0.20	0.12 – 0.33	0.39	0.23 – 0.65	0.59	0.35 – 0.98
	Life-cycle	0.18	0.13 – 0.25	0.35	0.26 – 0.49	0.53	0.39 – 0.74
35	100% Bonds	0.13	0.11 – 0.16	0.25	0.21 – 0.31	0.38	0.32 – 0.47
	Balanced 60:40	0.16	0.11 – 0.22	0.31	0.22 – 0.44	0.47	0.33 – 0.66
	100% Equities	0.17	0.10 – 0.27	0.33	0.20 – 0.53	0.50	0.30 – 0.80
	Life-cycle	0.15	0.12 – 0.20	0.30	0.23 – 0.40	0.45	0.35 – 0.60
45	100% Bonds	0.10	0.08 – 0.11	0.19	0.16 – 0.22	0.29	0.24 – 0.33
	Balanced 60:40	0.11	0.08 – 0.14	0.22	0.16 – 0.28	0.33	0.24 – 0.42
	100% Equities	0.12	0.08 – 0.17	0.23	0.15 – 0.33	0.35	0.23 – 0.50
	Life-cycle	0.11	0.09 – 0.13	0.21	0.17 – 0.26	0.32	0.26 – 0.39
55	100% Bonds	0.05	0.05 – 0.06	0.10	0.09 – 0.11	0.15	0.14 – 0.17
	Balanced 60:40	0.06	0.05 – 0.07	0.11	0.09 – 0.13	0.17	0.14 – 0.20
	100% Equities	0.06	0.04 – 0.07	0.11	0.08 – 0.14	0.17	0.12 – 0.21
	Life-cycle	0.05	0.05 – 0.06	0.10	0.09 – 0.12	0.15	0.14 – 0.18

Notes: Balanced strategy is 60% equities; 40% bonds with annual rebalancing. Life-cycle strategy invests a proportion equal to 100 minus member's age in equities with the remainder in bonds, with annual adjustment. Median and Inter-quartile VaR range all based on the member contributing the specified % of salary throughout pension plan membership. The analysis uses an equity risk premium of 3.5% relative to T-bills.

6. Conclusions

Many individuals delay starting to contribute to a pension plan until well into their working lives. This might be because they are waiting for their income to increase above their perceived permanent income (as in 'life-cycle' theory), or because they are paying off university or mortgage loans or raising a family, or because of procrastination. They may simply be risk averse and prefer the certainty of consumption now to the *possibility* of consumption in the future. In this paper, we have analysed likely retirement incomes for someone starting to contribute to a pension plan from age 25 and calculated the additional contributions that someone starting saving later in life has to make to 'catch up'. These catch-up contributions are large – and in some cases, so large that it is difficult to imagine that they are affordable for anyone not on a high income. Deferring retirement to a later age goes some way to easing the burden of annual contributions, but is not always possible; in any case, working longer is a solution that many people would rather avoid.

The results suggest people should start saving for a pension as soon as possible and raise the question of how they can be helped to do so. In the UK the Pensions Commission has published extensive analysis (2004, 2005) of possible approaches to improve pension saving. Compulsion – simply requiring by law that everyone saves for a pension – is a relatively extreme answer that may bring its own problems. Less rigid 'behavioural' mechanisms, such as automatically enrolling employees in their employer's pension plan while continuing to give them the right to opt out, have been shown to be effective in raising pension plan participation rates (Choi et al. 2002) and may represent a better alternative. The Pensions Commission has (2005) suggested that automatic enrolment should be used in a planned new national pension savings scheme, for employees without adequate existing pension provision.

Education and advice for employees will probably also be required. It seems reasonable to believe that at least some employees would be spurred into action if they were aware of, and understood the implications of, statistics like the dismal ones

we have presented in this paper. Financial planners and advisors have a key role to play in this education process.

Appendix – The PensionMetrics simulation model

The PensionMetrics (PM) accumulation model is a stochastic simulation model whose purpose is to investigate the design of DC pension plans. In a DC scheme, pension contributions from the plan member and his or her employer are invested in a portfolio of assets. The returns on the assets will be stochastic and some assets will have more volatile returns than others. The DC pension fund will therefore grow in a stochastic fashion too.

The PM model generates a range of outcomes (i.e., a probability distribution function) for the value of the replacement pension from the accrued DC pension fund on the retirement date of the plan member. The replacement ratio is calculated as the ratio of the pension from the DC fund to the plan member's final salary. The pension from the DC fund is, in turn, calculated as the ratio of the value of the DC fund to the annuity factor. The annuity factor is the expected present value of an annual pension of one unit from retirement until death and depends on both the interest rates ruling at the time of retirement and estimates of the survival probabilities of the plan member for each year after retirement. These survival probabilities are taken from the PMA92 and PFA92 tables of mortality rates produced by the Institute and Faculty of Actuaries which are based on the mortality experience of respectively male and female pensioner annuitants in the UK in the early 1990s.

The model requires assumptions about both risk factors and control factors. The first risk factor relates to real (i.e., inflation-adjusted) asset returns. The benchmark asset returns model we use is a multivariate normal model, with the variance-covariance matrix calibrated using time series returns on assets over the post-war period. Experimentation has shown that the particular asset returns model used makes little difference to the distribution of pension outcomes, except in the extreme tails of the distribution. In this study, we therefore just report results from the benchmark multivariate normal model. The historical return and correlation parameters are shown in Table A1 below. The mean returns we use are based on a forward looking

analysis of the equity risk premium which is described in section 4, with the parameter values shown in Table 2.

Table A1 – Real Returns and Earnings Growth 1947 to 2003

	UK T-bills	UK Equities	UK Bonds	US Equities	UK Real Earnings Growth
Mean Return (Arithmetic %)	1.19%	9.18%	1.79%	8.71%	2.07%
Standard Deviation (Annual %)	3.99%	23.22%	13.31%	21.04%	2.00%
Correlation Matrix					
UK T-bills	1.000				
UK Equities	0.051	1.000			
UK Bonds	0.465	0.513	1.000		
US equities	0.136	0.576	0.253	1.000	
UK Real Earnings	0.049	-0.026	-0.347	0.045	1.000

Source: Returns from ABN Amro / LBS data from Ibbotson Associates (Dimson *et al.* 2001). Earnings data from the Office for National Statistics.

The second risk factor relates to interest rates. We need to model the evolution of interest rates over time in order to forecast the annuity factor at retirement. The interest rate model that we use is based on the Vasicek (1977) model which links bond returns and bond yields in a consistent manner.

The third risk factor is earnings. Earnings are modelled using the age-earnings profile (or salary scale) of the plan member. This shows how salary varies with age in the plan member's profession at a given point in time. We assume that an individual's salary over his or her career follows the same profile as the rest of his or her profession (which in general will be gender specific), but is subject to annual uprating in line with the real growth in national average earnings. In this study we use the profile of the average male and female employee in the UK.

The final risk factor is unemployment. This is modelled as a binary variable (1: employed, 0: unemployed) for each period, with an age-dependent probability of unemployment, e.g. taken from national average unemployment rates at different ages. However, in this study, for reasons of simplicity, we assume the unemployment probability is zero.

There are three control variables: variables that are set by either the pension plan member or the pension plan provider in each period of the model. The first is the pension fund contribution rate, which we assume to be a constant proportion of the plan member's income for the whole period. We use 10% in this study.

The second is the asset allocation which is the key control variable in the model, since experiments show that it dominates the distribution of pension outcomes. This study investigates four stylised asset allocation profiles: a 100% bonds strategy; a 100% UK equities strategy; a 'balanced managed' strategy, invested in equities (60%) and bonds (40%); and a deterministic life-cycle strategy that invests a proportion (100-member's age) in equities and the remainder in bonds. The latter two strategies use annual rebalancing.

The third control variable is the retirement age. The base retirement age is set at 65. But we experiment with different retirement ages.

Having specified all the risk and control factors, we use the model to perform thousands of simulations of the stochastic variables, such as the asset returns and interest rates, and then generate an empirical distribution of possible replacement ratios for the plan member's selected retirement date. A replacement ratio of unity implies that the particular DC pension plan has fully replicated the plan member's final salary. However, the generated distribution of replacement ratios will typically be quite wide. To make a suitable comparison, we need to specify one or more percentiles from the distribution and then compare these values with the target pension ratio of unity. The i^{th} percentile of this distribution is also known as the value-at-risk (VaR) at the $(100 - i)^{th}$ confidence level.

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Endnotes

[1] However, this tells us nothing about the behaviour of the 34% of employees who are either not eligible to join their employer's plan, or who work for an employer which does not offer a pension plan.

[2] In other words, individuals use hyperbolic rather than exponential discounting.

[3] The impact of differing career salary profiles, by gender and by type of occupation, on the retirement income from DC pensions is discussed in detail in Blake et al. (2004). For simplicity, in this paper we focus on one age-earnings profile, namely that of a typical male, but it is also clear that many of our results carry over to female workers, or workers in specific occupations. Some results for females are also presented in Table 6.

[4] We thank the reviewer for suggesting the latter two strategies. Notably, in the UK "balanced" strategies tend to have higher equity content (80%+) than in the US, while life-cycle products tend to switch from equity to bonds only in the last five years prior to planned retirement. See Byrne et al. (2005) for a discussion.

[5] UK legislation for 'stakeholder' DC pensions capped annual charges at 1% per annum and this has become a common charge rate for DC plans in the UK. The inflation rate we assume is consistent with the target set by the government for the Bank of England.

[6] This was the simplest of the seven asset return models used in Blake et al. (2001). That study showed that the specification of the asset-return process had relatively little impact on the estimated pension outcome.

[7] In some cases, legislative limits may also limit contributions into tax-favoured pensions vehicles to an amount less than the rates we have calculated. However, recent changes in UK regulations mean that individuals can now pay up to 100% of

salary each year into a pension plan, subject to an annual contribution limit of £215,000 and an overall pension fund cap of £1.5m. Hence most individuals in the UK are not now constrained, other than by their income, in what they can pay into their pension plan.

[8] ONS statistics show that the mean age amongst married women in the UK for the birth of a first child is 29.9 years, and for the second child 31.5 years.

[9] The woman rejoins at the salary she would have received had she remained in continuous employment.

Chapter Eight: Default Funds in UK Defined Contribution Pension Plans

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Abstract:

Most defined contribution (DC) pension plans give their members a degree of choice over the investment strategy for their contributions. Many plans also offer a 'default' fund for members unable or unwilling to choose their own investment strategy. We analyse the range of default funds offered by UK 'stakeholder' DC plans, which by law must offer a default fund. We find the default funds are typically risky, but also that they vary substantially across providers in their strategic asset allocation and in their use of lifecycle profiles that reduce investment risk as the planned retirement date approaches. We use a stochastic simulation model to demonstrate that the differences can have a significant effect on the distribution of potential pension outcomes experienced by plan members who adopt the default fund as the path of least resistance. We also analyse the fees charged for the default funds and the historical performance of a subset of funds.

Introduction

Defined contribution (DC) pension plans are an increasingly common form of retirement income provision in the US, the UK and many other economies. Most DC plans allow members a degree of choice about how to invest their contributions. Typically, a range of mutual funds is offered in the plan and the member can choose one or more of them in which to invest. Many plans also have a default option that is automatically used if the member does not actively choose a fund.

Previous research shows that a large proportion, and often the majority, of employees are inclined to take the 'path of least resistance' and passively adopt the default arrangements that exist in their plan. For example, Choi *et al.* (2002) review US evidence on the tendency for members to accept plan defaults for key features such as the contribution rate and the investment fund. Even though employees are free to opt out of default arrangements, very few actually do. In the plans Choi *et al.* studied, between 42% and 71% of participants accept the default contribution rate and between 48% and 81% of plan assets are invested in the default fund, which is typically a money market fund. In the UK, consulting firm Hewitt Bacon and Woodrow estimate that more than 80% of members in DC plans accept the default fund choice (Bridgeland, 2002).

Default funds do bring a number of benefits, especially if they are well chosen with the needs of the pension plan members in mind. Where plan members have relatively little financial knowledge, default funds simplify the pension saving process, which in turn might raise participation rates. The default fund provides an 'obvious' choice for the uninformed member, seemingly endorsed by the sponsoring employer or pension plan provider, and helps them deal with an otherwise complex decision (Madrian and Shea, 2001).

However, the tendency of DC pension plan members to accept plan defaults does mean that the provider or plan sponsor's choice of these defaults has the potential to have a significant impact on the welfare of plan members. Put simply, well-chosen

default funds will benefit members, while poorly-chosen defaults will impose a cost on uninformed members. Furthermore, to the extent that there is cross-sectional variation in default funds across pension plans that is not explained by differing membership characteristics, members will face something of a lottery. Financial analysts and planners have an important role to play in helping pension providers and plan sponsors to put appropriate default arrangements in place. In this paper we investigate this issue by analysing the variety of different types of default fund offered by stakeholder DC plans in the UK. We document the range of different approaches in use and provide a quantification of what these differences mean in terms of the potential pension outcomes for plan members.

Stakeholder pension plans were introduced in the UK in April 2001 with the aim of providing a simple, carefully regulated and low cost savings product that could improve pension provision amongst low and middle-income employees. In essence, they are personal pension arrangements which operate on a DC basis and are offered by financial institutions. They share most of the features of other DC pension arrangements, for example, in terms of permissible contribution rates, the availability of benefits, and tax treatment. However, stakeholder plans also have a number of specific features intended to make them easy for inexperienced investors to use.[1] The feature of interest to us is that the regulations require each plan to have a default fund so that members do not have to make an active choice about how to invest (Statutory Instrument 2000:1403). The requirement to have a default fund and the public availability of data for most plans on the default fund used makes the stakeholder pension market an interesting area in which to study the investment strategies financial institutions offer to 'uninformed' pension plan members.

The stakeholder market is also a significant part of the UK pensions system. Stakeholder plans are offered by most of the major insurance companies and asset managers in the UK. While they can be sold as retail financial products, they are often used by companies for occupational pension provision. The employer 'adopts' a plan provider and its employees can then enrol in the plan. All employers with five or more employees, and who do not provide a qualifying occupational pension plan,

must make a stakeholder plan available to their employees, but do not need to contribute to it (Blake 2003).

As at May 2006, over 2.7m stakeholder pension accounts had been opened since the launch in 2001 (DWP, 2006) Figures from HM Revenue and Customs (2006) show that 1.5m individuals contributed to stakeholder pension plans during the 2004/05 tax year and that total contributions were £2.4bn. The corresponding figures for employer-sponsored group personal pensions, which are similar to stakeholder plans in many respects including the investment strategies they use, were 1.8m contributing members and £4.0bn of contributions. Assets under management in personal and stakeholder plans were estimated to amount to £300bn at the end of 2005, compared to an overall funded pension market, including defined benefit plans, of £1,400bn. (UBS, 2006)

Our analysis of the default funds in stakeholder plans finds that they are typically risky, with high equity content, but also that there are substantial differences across funds in terms of their asset allocation and the nature of their lifecycle profiles that automatically switch the member's pension fund assets to fixed-income investments and/or cash as the planned retirement date approaches.[2] These differences mean that an individual employed in one company accepting the default arrangements can end up with a very different investment product from a similar individual who happens to work for a different employer, which has selected a different pension plan provider. We also find that fees vary substantially across the various fund offerings, although many plans do charge at the 1.0% original fee cap.

We use a stochastic simulation model to illustrate the distributions of possible pension outcomes that the different fund structures generate for plan members accepting the default arrangements.[3] The results of these simulations suggest that the choice of default fund can have a major impact on likely pension outcomes. High equity strategies have the obvious benefit of higher expected pensions in payment. However, this comes at the cost of greater variability and members of plans with equity-based default funds may receive lower pension outcomes than those using

more cautious strategies if their retirement happens to coincide with a period of equity market weakness. Our analysis of the actual historical performance of a subset of funds confirms the potential for members to receive substantially different outcomes depending on the nature of the default fund in their pension plan.

These results are of potential concern, especially in light of the evidence that most members of DC pension plans passively accept the default fund chosen by the plan provider. Unless the different choices of default fund made by different providers are somehow correlated with the characteristics of the members of the different plans – and we know of no evidence to this effect – then plan members face an effective lottery: their choice of investment strategy is driven by the provider's choice of default fund rather than their own circumstances and attitude to risk.

1. Previous literature on modelling investment strategy in DC pensions

A number of previous studies investigate the effects of alternative investment strategies on the anticipated outcomes of DC pension plans. For example, Booth and Yakoubov (2000) used historical return data from the annual Barclays Capital *Equity-Gilt Study* for the UK to investigate the retirement income implications of five different investment strategies. They assumed the 'standard' fund had a constant 70% equity / 20% bonds / 10% cash mix. This standard fund is combined with four lifecycle strategies – a switch to bonds over the ten years preceding retirement; a switch to cash in the final year before retirement; a switch to cash for the final three years; and a switch to bonds for the final three years. They found limited support for the superiority of lifecycle approaches, and also that an equity-based fund in the ten years preceding retirement 'stochastically dominates' the cash– and fixed-income–based strategies – principally because of the higher expected return.

Blake *et al.* (2001) investigated similar issues using the 'PensionMetrics' stochastic simulation model. Amongst the asset allocation strategies they investigated were a pension-fund-average approach – invested across a range of asset classes in proportions typical of UK occupational pension funds in the late 1990s – and a

lifecycle strategy that switches from the pension fund average into a 50% bonds / 50% T-bills portfolio over the final ten years before retirement. They also found that the overall distribution of potential outcomes is very wide. In line with Booth and Yakoubov, they found that a well-diversified, high-equity strategy (i.e. the pension-fund-average strategy) produces the best overall outcomes and that, while the lifecycle strategy avoids some of the worst potential outcomes, it does so by significantly reducing the expected level of pension.

A third study, Hibbert and Mowbray (2002), used a stochastic model to investigate the outcomes from a variety of asset allocation strategies (including 100% cash, 100% bonds, and 100% equity asset allocations, and various forms of lifecycle strategy). They too found that the 100% equity strategy produces the highest expected value for the pension annuity, albeit with a wide range of potential outcomes. The lifecycle strategies significantly narrow the range of potential outcomes, but at the expense of reduced expected value, particularly where the lifecycle switch begins 15 years from retirement.

Our work differs from the papers discussed above principally in that it focuses directly on the fund structures actually offered as the default in UK stakeholder pension plans. The following section describes these fund structures in detail.

2. Data on default funds in stakeholder DC plans

UK legislation requires stakeholder pension plans to be registered with The Pensions Regulator, which makes the register available to the public. As at December 2006, 45 plans were listed on the register and these plans form the universe for our analysis. Of the 45 plans, 14 are closed to new business, e.g. because of mergers between providers, and so no longer provide public information on their fund structures, leaving 31 plans on which we were able to collect data. This sample, in effect, represents all of the stakeholder plans actively marketed in December 2006. The key variables of interest are the basic asset allocation of the default fund and the nature of the lifecycle profile used by the fund.

It is important to stress that the term 'plan' here refers to a pension arrangement offered to the marketplace by an insurance company, asset manager or, in some cases, a membership organisation such as a trade union. An employer can 'adopt' a plan and offer it to its employees. Thus each of our plans will likely be used by many different employers and groups of employees. Equally, many of the plans are offered on a retail basis and any individual can join, either arranging this themselves or via a financial adviser.

In the occupational context, the employer chooses a financial institution to offer a stakeholder pension product to its employees. The choice will be made based on factors such as brand, track record and cost. Each financial institution will have a 'standard' default fund that it typically uses when implementing a plan for an employer. It is open for the employer to accept this standard plan or to ask that the financial institution uses another fund as the default for that employer's employees. An employer might do the latter if it felt the standard default fund was inappropriate, e.g. too risky, for its employees, but our industry contacts suggest few employers actually do so. So, in most cases the financial institution's choice of default fund prevails.

Example: Widgets Inc chooses Byrne Investments to offer a stakeholder pension plan to Widget's employees. Byrne Investments usually nominates its FTSE 100 Index Tracking Fund as the default for stakeholder schemes. The management of Widgets can either accept the usual default fund from Byrne Investments as the default for their employees, or they can ask Byrne to implement an alternative default for their employees. Widget's management may be reluctant to override the judgement of the financial institution, even though they know their employees better than Byrne Investments does.

With the financial institution's standard default fund likely to be implemented in most cases, the fact that these stakeholder plans are, in most cases, generic plans offered to the whole marketplace rather than tailored for any specific group of

employees suggests that the default funds across plans should be similar. Put simply, the default funds should be suitable for the average employee in the economy who randomly chooses, or is randomly allocated, one of available default funds. However, our data does not show this. In fact, we find substantial variation, both in terms of the basic strategic asset allocation and in terms of the use of lifecycle strategies.

Default funds are potentially less important in the retail setting. Where an individual joins a pension plan under the guidance of a financial adviser, it is likely that the adviser will guide the individual towards a fund choice that is consistent with his or her financial circumstances and degree of risk tolerance. In addition, individuals approaching a pension provider directly (i.e. doing business on an execution-only basis) are more likely to be financially knowledgeable and prepared to make their own fund choice. Nonetheless, there is the potential for relatively uninformed consumers to deal directly with the plan provider and be inclined to accept whatever default fund is proposed.

Table 1a shows the range of default funds in terms of fund type and style of management. The 'balanced managed' type fund, which is typically invested 50% to 60% in UK equities, and 20% to 30% in overseas equities, 10% to 20% in bonds, and up to 5% in cash, is used by 13 of the 31 plans. Most of the balanced managed funds are actively managed, but four use a passive approach. A total of 18 plans offer a 100% equity fund as default - 13 of these are invested globally and five are invested only in domestic UK equities. The most common asset allocation for the global funds is 60% UK equities and 40% (capitalisation-weighted) overseas equities, although 50:50 and 70:30 splits are also in use. The majority of these 100% equity funds use passive management.

Table 1a – Number of Stakeholder Pension Plan Default Funds by Type

	Total	*Actively Managed*	*Passively Managed*
Balanced Managed	13	9	4
Global Equity	13	5	8
UK Equity	5	1	4
Total	31	15	16

Number of default funds that fall into each category. Balanced Managed funds invest in equities and bonds; Global Equity funds typically have a 60:40 split between UK and overseas equities, although some use 50:50 or 70:30; UK Equity Funds are 100% invested in UK equities. One of the Balanced Managed funds has a limited return smoothing mechanism included.

Since April 2005, all stakeholder default funds have been required to use some form of lifecycle asset allocation profile.[4] While all default funds must use a lifecycle approach, Table 1b shows that there is variation in the manner in which providers implement it. The most common structure (involving 13 of the 31 plans) is to start switching from the equity or balanced fund five years prior to retirement, moving progressively to a final year allocation of 75% long-dated bonds and 25% cash. A further 11 plans use the same 75:25 final year allocation, but begin switching between six and ten years prior to retirement.

UK pension legislation requires that the benefits from DC pensions be taken via a (taxable) life annuity with the option to take up to 25% of the value of the fund as a tax-free lump sum at retirement.[5] This explains why many lifecycle products switch from equities to a final pre-retirement allocation of 75% long bonds and 25% cash, the former to hedge the interest rate risk in the annuity price[6], and the latter to protect the portion of the fund likely to be taken as a lump sum.

Table 1b – Number of Stakeholder Pension Plan Default Lifecycle Profiles

	Years to Retirement When Lifecycle Switch Starts						
Final Year Allocation	5	6	7	8	10	15	*Total*
75% Bonds 25% Cash	13	2	3	1	5	-	24
100% Bonds	1	-	-	-	1	-	2
100% Cash	3	-	-	-	-	1	4
Total	17	2	3	1	6	1	30

Number of default fund lifecycle profiles falling into each category. The lifecycle profile switches from the default fund strategic asset allocation to the final year allocation shown in the Table over the period shown. One fund, not shown in the table, is a "Target Date" fund where the manager manages the risk level with a specified year of retirement in mind, e.g. 2040.

The Table shows, however, that is not the only approach in use. Some plans use different final-year asset allocations: two plans switch to a final allocation of 100% long bonds, and four plans offer lifecycle profiles that have a final year asset allocation of 100% cash.

By way of comparison, it is interesting to look at the extent of similarity between default funds in UK plans and those in use in other markets. In terms of the US 401(k) market, data from a small survey by the Profit Sharing/401(k) Council of America (2001) shows conservative strategies dominate US defaults. The survey finds 46% of plans using a stable value fund (or guaranteed investment contract) as the default, while 21% use a money market fund. Balanced funds, with holdings in stocks and bonds, are used by 21% of plans and lifecycle funds by 13%. Sweden's state-wide Premium Pension Scheme is another interesting point of comparison. As a national scheme there is only one default fund, which is allocated 82% equities, 10% bonds and 8% in alternative assets. (Cronqvist and Thaler, 2004) Interestingly, scheme members who actively chose their portfolio in the early years of the scheme tended to have portfolios with higher equity content, higher home bias, higher fees, and lower returns than the default structure. It appears that just as UK pension

providers fail to agree on what constitutes an appropriate default fund, there is little consensus internationally.

The key point to take from the UK data is that an individual joining a stakeholder pension plan and passively accepting that plan's default fund can get a substantially different asset allocation and lifecycle profile depending on which provider he, or his employer, has chosen. In the following section we attempt to quantify the significance of these differences by using a stochastic simulation model to assess the impact of the different default funds on anticipated pension outcomes.

3. Simulation method

The model we use is the PensionMetrics model of Blake *et al.* (2001). This model uses stochastic simulation to determine the anticipated distribution of pension outcomes for any given set of input parameters, such as asset allocation strategy, anticipated retirement age, and so on.

In a DC plan, pension contributions from the plan member and his or her employer are invested in a portfolio of assets. The returns on the assets will be stochastic and some assets will have more volatile returns than others. The DC pension fund will therefore grow in a stochastic fashion too. The PensionMetrics model uses Monte Carlo simulations to generate a range of outcomes (i.e., a probability distribution function) for the value of the accrued DC pension fund (and hence the pension) at any given future date, conditional on a set of assumptions concerning contributions, asset returns, mortality and other relevant factors. The model requires assumptions about both control factors and risk factors.

There are three control variables: variables that are set by either the pension plan member or the pension plan provider in each period of the model. The first is the pension fund contribution rate, which we assume to be a constant proportion of the plan member's income for the whole period, while the second control variable is the retirement age. For the purposes of our modelling we assume that the plan member is

a male who joins the plan at age 25 and retires at 65 – the current state pension age for a male in the UK. We also assume that he contributes 10% of his salary each year to the stakeholder pension plan. We use this figure because the Pensions Commission (2004) reports typical contribution rates of this magnitude from surveys conducted in the UK by the National Association of Pension Funds (NAPF) and the Association of Consulting Actuaries. Average US contribution rates also appear similar, with Munnell and Sunden (2006) suggesting that 9% is the typical contribution rate for a 401(k) plan member (6% employee; 3% employer match).

The third control variable is the asset allocation which is the key control variable in the model, since previous research shows that it dominates the distribution of pension outcomes. In this study, we assume contributions are invested in the default fund and the fund allocations are based on the asset allocation profiles we found to be in use in the stakeholder pension marketplace.

We create a number of stylised strategic asset allocation profiles based on our analysis in the previous section of the types of default fund offered in the UK. These are: 'Balanced Managed' – invested mainly in equities (with a typical weighting of 81%), but also in fixed-income (16%) and cash (3%); 'Global Equity' – with a 60:40 split between UK and overseas equities; and 'UK Equity' – 100% UK equities. We use the median asset allocation of the relevant funds as the basis for the Balanced Managed profile. For comparison, we also show the results of a conservative, 100% bonds investment strategy, although none of the plans in our sample offer such a strategy as the default. The asset allocation profiles are shown in Table 2a.

Table 2a – Stylised Default Fund Asset Allocation Profiles (Percentages)

	UK Equities	*Overseas Equities*	*UK Bonds*	*Sterling Cash*
Balanced Managed ("BM")	52	29	16	3
Global Equity ("GE")	60	40	-	-
UK Equity ("UK")	100	-	-	-
100% Bonds	-	-	100	-

Strategic asset allocation of stylised default fund profiles used in our simulations. These are based on the actual default funds observed in the sample of stakeholder pension plans. The 100% bonds strategy is not actually offered as a default fund in the schemes in our sample, but is assumed to be a choice open to plan investors to choose.

For each initial asset allocation strategy with the exception of 100% bonds, there are four lifecycle variants: no lifecycle switch; a move to 75% bonds and 25% cash that starts five years prior to retirement; a move to 75% bonds and 25% cash from ten years prior to retirement; and a move to 100% cash from five years prior to retirement. In each case the switch is assumed to take place in a linear fashion over the relevant time horizon. The lifecycle profiles are shown in Table 2b. Together with the three initial asset allocation profiles, these give us a total of 12 representative default fund asset allocation strategies plus the 100% bonds non-default option.[7]

Table 2b – Stylised Default Lifecycle Profiles

Profile	*Switch Start Date*	*Final Year Allocation*
"NL"	None	As initial allocation
"BC5"	5 years prior to retirement	75% long bonds (15yrs+) 25% Cash
"BC10"	10 years prior to retirement	75% long bonds (15yrs+) 25% Cash
"C5"	5 years prior to retirement	100% Cash

Stylised lifecycle profiles used in our simulations. These are based on the actual lifecycle profiles observed in the sample of stakeholder pension plans. Each profile involves a linear switch from the initial allocation to the final year allocation over the period indicated by the switch start date. In the simulations these profiles are combined with the strategic asset allocations shown in Table 2a, with the exception of the 100% bonds strategy.

The first risk factor in the PensionMetrics model relates to real (i.e., inflation-adjusted) asset returns. We use two alternative parameterisations of the return processes. The first parameterisation is based on historical data, and assumes that annual returns on the assets in the pension fund follow a multivariate normal stochastic process[8] that is calibrated according to the realised real returns on key UK and international market indices over the period 1947 to 2003. The source for the returns is the ABN Amro / LBS data set discussed in Dimson *et al.* (2001) and available commercially through Ibbotson Associates. US equities are used as a proxy for overseas (i.e. non-UK) equities. Descriptive statistics for the returns are shown in Table A1 in the Appendix. While some funds are actively managed, no allowance is made for any (positive or negative) excess returns generated by active management. The returns received are also reduced by the pension fund annual charge, which is assumed to be 1.0% in line with the typical charge level on stakeholder pension plans. However, we also conduct a sensitivity analysis of the impact of fund charges in Section 5.

We also run alternative simulations using forward-looking investment return assumptions to account for the possibility that the historical realised equity risk premium is larger than can reasonably be expected in future. Some commentators argue that the historical equity risk premium is an upward biased estimate of the

likely future risk premium. They claim that high historical equity returns were in part due to unexpectedly strong dividend growth and to a fall in the level of the required risk premium, neither of which can be relied upon in future to boost future equity returns (e.g. Arnott and Bernstein 2002, and Dimson *et al.* 2001). Dimson *et al.* conclude that the best estimate of a global equity risk premium is about 3.5% relative to US Treasury bills, and Arnott and Bernstein (writing near the year-2000 peak of the equity markets) make the case for an even smaller premium. We use the equity premium suggested by Dimson *et al.* to produce an alternative set of forward-looking nominal return parameters, which we adjust for pension plan charges (1.0%) and expected inflation (2.5%). We use the same volatility and correlation structure as in the historical data.[9] The forward-looking return parameters are shown in Table 3.

Table 3 – Forward-looking Return Parameters (Percentages)

	Nominal Annual Return	*Real Annual Return*	*Real Annual Return Post Charges*
Equities (UK & Overseas)	7.5	5.0	4.0
Bonds	4.5	2.0	1.0
Cash	4.0	1.5	0.5

These forward looking return estimates are used in our simulations. Inflation is assumed at 2.5% in line with the Retail Price Index inflation target set for the Bank of England by the Government. The 1.0% charge reflects the typical charge level in stakeholder plans, although we also conduct a sensitivity analysis of this assumption in Table 7. No allowance is made for any excess returns from active management. The cash return is derived by subtracting a 3.5% equity risk premium from the 7.5% expected equity return proposed by PwC (FSA 2003).

As an aside, it is worth noting that the UK Financial Services Authority's (FSA) rules require customers buying financial products to be issued with deterministic projections of the future value of their investment based on assumed investment growth rates of 5%, 7% and 9%. A review of these projection rates by the consulting firm PricewaterhouseCoopers (PwC) (FSA, 2003) argued – partly based on Dimson *et al.* – that a reasonable forecast for the mean annual return for equities is 7.5% (nominal, pre-charges) and for bonds 4.5% in an environment where inflation is forecast to average 2.5%. Our adjusted return parameters are therefore broadly consistent with the FSA analysis.

The second risk factor relates to interest rates. We need to model the evolution of interest rates over time in order to forecast the annuity factor at retirement (i.e. the expected present value of a pension of £1 per annum from retirement until death). When the plan member reaches the retirement age of 65, the accumulated fund is converted into a single life annuity that provides a level income to him until he dies. The annuity rate is based on a long-term interest rate consistent both with the investment returns earned by the fund prior to retirement and with the 'PMA92' survival probabilities at age 65 taken from the mortality tables published by the Institute and Faculty of Actuaries: these reflect the mortality experience of males buying pension annuities from UK life insurance companies. The pension at retirement is found by taking the ratio of the pension fund and the annuity factor. The interest rate model that we use is based on the Vasicek (1977) model which links bond returns and bond yields in a consistent manner.

The third risk factor is earnings. Earnings are modelled using the lifetime earnings profiles for different types of occupation. These show how salary varies with age in the same occupation at a given point in time. We assume that an individual's salary over time follows the lifetime earnings profile of his or her profession, but also is subject to annual uprating in line with the real growth in national average earnings. The plan member's wage growth experience in this case is assumed to match that of a typical male employee in the UK and to simplify the analysis we assume that there is no risk to the accrual of pension benefits arising from unemployment or disability.[10]

Having specified all of the risk and control factors, we use the model to perform thousands of simulations of the stochastic variables, such as the asset returns and interest rates, and then generate an empirical distribution of pension outcomes for the plan member's selected retirement date. We report the simulation results in terms of the replacement ratio, that is, the ratio of initial pension to the member's salary immediately prior to retirement. A replacement ratio of unity implies that the particular DC pension plan has generated a pension income equal to the member's

pre-retirement salary Most final-salary defined benefit (DB) pension plans in the UK have targeted replacement ratios of two-thirds or one-half for a full contribution period of 40 years (i.e., they are based on either a sixtieths or eightieths annual accrual rate). However, in DC plans the generated distribution of possible replacement ratios will typically be quite wide. To make a suitable comparison, we need to specify one or more percentiles from the distribution. The i^{th} percentile of this distribution is also known as the value-at-risk (VaR) at the $(100 - i)^{th}$ confidence level. In this paper, we report the median and mean replacement ratios and use the 5% pension-Value at Risk (pension-VaR) as our measure of downside risk.

The following section presents the results of our simulations for the various default fund strategies.

4. Simulation results

Table 4 shows the results of our historical-data-based simulations. We give the median and mean replacement ratios for each of the 13 investment strategies, together with the 5% value-at-risk level as a measure of downside risk. All results are based on 5000 simulations using the PensionMetrics model.

Consistent with prior studies (Booth and Yakoubov, 2000; Blake *et al.*, 2001; Hibbert and Mowbray, 2002) the key conclusions are that the anticipated replacement ratio varies in an economically significant manner across asset allocation strategies, and that there is a wide range of possible pension outcomes for any given strategy.

Table 4 – Simulation Results – Return Parameters Based on Historical Data

Strategy	*Median Replacement Ratio*	*Mean Replacement Ratio*	*5% Pension-VaR*
Strategy 1: BM-NL	0.77	0.96	0.28
Strategy 2: GE-NL	0.95	1.31	0.29
Strategy 3: UK-NL	0.88	1.36	0.22
Strategy 4: BM-BC5	0.69	0.86	0.28
Strategy 5: BM-BC10	0.63	0.75	0.28
Strategy 6: BM-C5	0.70	0.85	0.29
Strategy 7: GE-BC5	0.85	1.14	0.29
Strategy 8: GE-BC10	0.75	0.96	0.29
Strategy 9: GE-C5	0.86	1.14	0.29
Strategy 10: UK-BC5	0.80	1.18	0.23
Strategy 11: UK-BC10	0.70	0.99	0.25
Strategy 12: UK-C5	0.80	1.18	0.24
Strategy 13: 100% Bonds	0.28	0.30	0.17

Results are based on 5000 simulations using the PensionMetrics model (assuming a multivariate normal distribution). The real return, volatility and correlation parameters are based on historical data from Dimson et al (2001) adjusted for an assumed 1.0% annual charge. All figures are expressed in terms of the replacement ratio (i.e. DC pension to final salary). There is a 1-in-20 chance that the strategy in question will produce a replacement ratio below the level indicated in the 5% pension-VaR column. Balanced Managed (BM) funds invest in equities and bonds; Global Equity (GE) funds have a 60:40 split between UK and overseas equities; UK Equity Funds (UK) are 100% invested in UK equities. NL means no lifecycle strategy is applied; BC5 means the strategy switches to 75% bonds and 25% cash over the last five years of plan membership; BC10 denotes a switch to 75% bonds and 25% cash over the last ten years of plan membership; while C5 denotes a switch to 100% cash over the last five years of plan membership.

The median replacement ratios for the initial default asset allocation strategies – i.e. without any lifecycle profile – range from 0.77 for the Balanced (BM) strategy to 0.95 for the Global Equity (GE) strategy. Put another way, the BM strategy has a 50% chance of producing a pension of at least 77% of the pre-retirement salary, while the GE strategy has a 50% chance of producing a pension at least 95% of pre-retirement salary. The difference between the medians is, of course, largely explained by the variation in equity weighting across the strategies considered.

While the median replacement ratios for these strategies compare favourably with typical final salary pension plan replacement ratios, each strategy also generates a wide range of possible outcomes. The downside risk involved can be appreciated from the pension-VaR figures. The Table shows that the 5% pension-VaRs range from 0.22 for the UK Equity strategy to 0.29 for the GE strategy. The interpretation in the case of the UK Equity strategy, for example, is that there is a 1-in-20 chance of the pension turning out to be 22% of pre-retirement income or less.[11]

All of the default strategies we investigate have high equity content, typically between 70% and 100%. It follows that very risk-averse investors ought to opt out of the default and make an active choice of a more conservative fund (although we know that inertia may prevent them from doing so). Table 4 also shows simulation results for a fund comprising 100% long-term UK government bonds. This can be considered the low risk benchmark. The median replacement ratio for that strategy is 0.28, which, unsurprisingly, is much lower than the equity-based alternatives. Also as would be expected, the variability around the median is lower too – the 5% pension-VaR replacement ratio at 0.17 is closer to the median than is the case in the comparable equity-dominated strategies. However, it is also worth noting that the 5% VaR level for the cautious strategy is actually *below* that for the equity strategies. While equities are volatile, the high expected return limits the extent of the downside risk in the longer term. In this context, fixed income investment for the full pension plan tenure may be characterised as 'reckless conservatism'.

The lifecycle profiles used in several of the default arrangements are designed to reduce the risk that falling equity markets in the years immediately prior to retirement cause losses in the pension fund from which there is too little time to recover. Table 4 shows that the lifecycle profiles (Strategies 4 – 12) raise the 5% VaR levels by only a marginal amount. The reason is that in these simulations using a high equity risk premium the downside outcomes under lifecycle strategies are affected by forgoing the higher expected return from equities for a number of years. This give up of potential return is also evident in the form of a reduced expected level of pension. For example, a ten-year lifecycle profile, switching towards bonds and cash, reduces the median replacement ratio for the balanced managed strategy from 0.77 to 0.63.

The risk reduction effect are, unsurprisingly, largest for strategies that have high initial equity contents (Strategy 2 vs. 7-9; 3 vs. 10-12) and lower for strategies that already have higher fixed-income content (Strategy 1 vs. 4-6). The reduction in risk and in median replacement ratio is greater when the lifecycle switch begins ten years from retirement rather than five years before (Strategies 5, 8, and 11). It is also interesting to note that for the five-year lifecycle profiles there is little difference between profiles with a final year asset allocation of 75% bonds and 25% cash (Strategies 4, 7, and 10) and those that end with 100% cash (Strategies 6, 9, and 12): the median replacement ratios and 5% pension-VaRs are nearly identical in all cases. Though a switch to long bonds is usually recommended as a hedge for annuity rates, our simulations suggest that long bonds are, on average, of little greater benefit than cash in protecting the annuity purchasing power of the pension fund.

The simulation results in Table 4 show that higher equity strategies generally lead to higher replacement ratios. However, this is due in large part to the high equity risk premium (of over 7%) used to parameterise the model. To accommodate the possibility that this equity risk premium estimate is too high, Table 5 presents simulation results based on our alternative, and arguably more realistic, forward-looking return projections, which incorporate a lower equity risk premium. The results of Table 5 indicate that a smaller assumed equity premium leads to a dramatic

drop in both the median and mean replacement ratio for all of the strategies, and also to a narrowing of dispersion across the different strategies. The range of median replacement ratios for strategies without a lifecycle feature (Strategies 1, 2, 3) now runs from 0.39 to 0.43, below what many individuals would consider to be necessary for a comfortable retirement. The 5% pension-VaRs are of more concern, ranging from 0.12 to 0.17. Lifecycle profiling again produces modest reductions in risk, with higher 5% pension-VaRs. This risk reduction still comes at a price in terms of a lower median replacement ratio, but the 'price' is much lower than is the case in Table 4.

The low-risk benchmark strategy of 100% bonds looks more attractive in comparison with the equity-based strategies when the lower equity risk premium is used. The gap between the median return from this strategy and those from the equity-based strategies is narrower than before and the 5% VaR level for the cautious strategy is higher than for some of the equity-based ones. However, it is worth noting that several of the equity-based strategies, particularly those with lifecycle features, provide higher median replacement ratios *and* equal or higher 5% VaR levels. The cautious strategy, therefore, appears appropriate only for investors who cannot tolerate short-term volatility in their pension assets and are prepared to sacrifice long-term return to avoid it.

Table 5 – Simulation Results – Return Parameters Based on Forward-looking Estimates

Strategy	*Median Replacement Ratio*	*Mean Replacement Ratio*	*5% Pension-VaR*
Strategy 1: BM-NL	0.41	0.50	0.17
Strategy 2: GE-NL	0.43	0.56	0.15
Strategy 3: UK-NL	0.39	0.56	0.12
Strategy 4: BM-BC5	0.40	0.47	0.18
Strategy 5: BM-BC10	0.39	0.44	0.19
Strategy 6: BM-C5	0.40	0.47	0.18
Strategy 7: GE-BC5	0.41	0.52	0.17
Strategy 8: GE-BC10	0.40	0.49	0.18
Strategy 9: GE-C5	0.42	0.52	0.17
Strategy 10: UK-BC5	0.38	0.52	0.14
Strategy 11: UK-BC10	0.37	0.49	0.16
Strategy 12: UK-C5	0.38	0.52	0.14
Strategy 13: 100% Bonds	0.29	0.31	0.18

Results are based on 5000 simulations using the PensionMetrics model (multivariate normal distribution). The return parameters are based on forward-looking estimates net of an assumed 1.0% annual charge. The volatility and correlation structure is based on historical data from Dimson et al (2001). All figures are expressed in terms of the replacement ratio (i.e. DC pension to final salary). There is a 1-in-20 chance that the strategy in question will produce a replacement ratio below the level indicated in the 5% pension-VaR column. Balanced Managed (BM) funds invest in equities and bonds; Global Equity (GE) funds have a 60:40 split between UK and overseas equities; UK Equity Funds (UK) are 100% invested in UK equities. NL means no lifecycle strategy is applied; BC5 means the strategy switches to 75% bonds and 25% cash over the last five years of plan membership; BC10 denotes a switch to 75% bonds and 25% cash over the last ten years of plan membership; while C5 denotes a switch to 100% cash over the last five years of plan membership.

The replacement ratios shown in Tables 4 and 5 are based on an assumed annual contribution rate of 10% of salary over 40 years of pension plan membership. On the basis of the low equity risk premium return estimates used in Table 5, the 10% contribution rate does not produce replacement ratios that many people would find attractive. This is important because, as noted above, 10% of salary is a common contribution rate in practice (Pensions Commission, 2004).

We calculate that the required contribution rates for a two-thirds replacement ratio after 40 years of membership range from 15.7% for a GE strategy with no lifecycle feature, through to 18.0% for a UK equity fund that begins switching to bonds and cash ten years prior to retirement. It is interesting – but not surprising – to note that these rates are consistent with total contribution rates paid into occupational DB pension plans (see for example NAPF 2003). At these contribution rates the 5% pension-VaR levels range from 0.20 for the UK strategy to 0.34 for the BM strategy with a 10-year lifecycle switch. So even with relatively high contribution rates, the default funds remain risky for the pension plan members. One way to reduce the risk is to opt out of the default fund and invest in a more conservative fund. However, that comes at a cost: an investor following a conservative 100% bonds strategy would have to contribute 23.2% of salary throughout their 40 year career in order to have a 50% probability of a replacement ratio of two-thirds or better, well above that required by the equity-based strategies.

Disturbing as these results might be, it is should be noted that the analysis we have performed is relatively *generous* to the stakeholder plans in comparison with traditional DB pension plans. The reason is that we have assumed that the stakeholder pension fund is used to buy an annuity with a level stream of payments, payable only to the plan member until death, and we ignore any further benefits that could be provided by the annuity. However, most DB pensions, at least as currently structured, allow for indexation of the pension in line with retail prices up to some specified maximum, such as 2.5% per annum, and for a 50% pension payable to the spouse after the death of the member. Replicating these benefits from the DC plan

would raise the annuity cost by approximately 40% to 65% – either reducing the replacement ratio or requiring a corresponding increase in contributions.[12]

Finally, the above analysis ignores the attitude to risk of the individual plan member. It is important to recognise that if the member is risk averse with a concave utility function, the dispersion of replacement ratios could have large welfare implications. The life-cycle feature may reduce the expected replacement ratio from a particular strategy, but to the extent that it also reduces the dispersion of outcomes significantly, it might well be an optimal strategy from the individual's point of view (see for example, Cairns et al., 2006).

5. Fund charges

Our simulation analysis was carried out using an assumed 1.0% annual management charge. However, further analysis of fund charges is required because charges can have an important impact on the performance of a DC pension scheme. For example, Carhart (1997) shows that mutual fund charges have a near one-for-one impact in reducing mutual fund performance. Charges are particularly important in the context of default funds because passive members may pay little attention to the charges they are paying or may be unaware of the impact on performance. One particular concern is that a provider could exploit this inertia by nominating a high charge fund as the default.

The importance of charges is recognised in the regulations governing stakeholder pension plans in that there is a price cap. When stakeholder pensions were introduced in 2001 the cap was set such that total charges could not exceed 1.0% per annum. In 2005 this was changed as a result of industry lobbying and the new cap is 1.5% per annum for the first ten years of each customer account, falling to 1.0% thereafter. The higher cap in the initial years was designed to allow providers to recover the upfront marketing and set up costs.

From the mutual fund market and from the institutional pension market, we would expect charges to vary depending on the nature of the investments in the fund. Equity management typically costs more than fixed income management, and active management typically costs more than passive management. However, it is important to note that in the stakeholder market individual members pay bundled fees that cover marketing costs, including sales commission, and administrative record keeping as well as fund management. Industry contacts suggest the proportion of the charge that covers pure asset management is relatively small. That may explain the results in Table 6, which show that while there is some variation in the level of fees across default funds, most providers charge at the 1.0% level that was set out in the initial stakeholder regulations.

Table 6 shows that passively managed funds do, on average, charge less than actively managed funds. Across the full sample, the difference in the mean charge between active and passive is 20 basis points. However, the modal charge for both groups is 1.0% and some passive funds charge more than active funds. The government's initial 1.0% cap on charges seems to act as something of an anchor for providers – an officially endorsed charging level – which in a sense may be counterproductive.

There is substantial variation in charging across the full sample, from a low of 0.6% to a high of 1.5%, although for any fund charging more than 1.0% the regulations require the charge to drop to 1.0% or below after ten years. Some of the variation reflects product type, for example balanced funds typically charge more than equity funds. However, after allowing for this there is still variation. Some of this may be explained by what is included in the bundled charge, e.g. the level of decision support given to members. Furthermore, the higher charging plans tend to have a more retail focus, while the lower fees are available for larger employer purchased arrangements. In some cases, plan providers say they may discount fees for larger schemes or those with higher earning employees, although few publicly disclose the level of discount on offer.

Table 6 – Default Fund Charges by Fund Type

	All Funds		Balanced Funds	
	Active	Passive	Active	Passive
Mean	1.08%	0.88%	1.12%	0.78%
Mode	1.00%	1.00%	1.00%	No mode
Minimum	0.75%	0.60%	0.80%	0.60%
Maximum	1.50%	1.45%	1.50%	1.00%
No. of funds	15	15	9	4

	Global Equity Funds		UK Equity Funds	
	Active	Passive	Active	Passive
Mean	1.03%	0.88%	1.00%	0.98%
Mode	0.95%	0.75%	1.00%	1.00%
Minimum	0.75%	0.65%	1.00%	0.90%
Maximum	1.50%	1.45%	1.00%	1.00%
No. of funds	5	7	1	4

Mean, mode, minimum and maximum annual management charge for each category of default fund. In each case the charge is a bundled fee that covers administration and record keeping as well as asset management. It will also include an element to cover sales and marketing costs including adviser commission if applicable. Some funds offer discounts to larger schemes, but these are typically not disclosed publicly. Balanced Managed (BM) funds invest in equities and bonds; Global Equity (GE) funds typically have a 60:40 split between UK and overseas equities; UK Equity Funds (UK) are 100% invested in UK equities. One plan with a passive global equity default fund did not disclose its charges.

Overall, the analysis shows that DC scheme members passively accepting their plan's default fund may face charges quite different from those paid by members of other similar schemes. However, there is no evidence of providers charging higher rates for their default funds than they do for comparable funds in their stakeholder pension ranges.

Given the variation in fund charges, it is appropriate to conduct a sensitivity analysis of our replacement ratio simulations. Table 7 shows the impact fees can have on replacement rates. In the standard case we use the 1.0% fee level set out as the maximum under the original stakeholder regulations. We conduct a sensitivity analysis where the fees are either 0.75% per annum or 1.25% per annum. The latter is higher than allowed by stakeholder regulations, but could be charged by providers in non-stakeholder contracts. We assume that all funds earn the market return gross of fees, i.e. there is no superior performance by higher cost (e.g. active) managers. To conserve space, we show only the basic default fund strategies and ignore the variants of lifecycle. To the extent that active managers earn higher gross returns, this could offset some of the drag of higher fees. Overall, a plan with a 0.75% annual charge generates a median replacement ratio that is about 10% (or alternatively 4% percentage points of final salary) higher than a plan with annual charges of 1.25%.

Table 7 – Sensitivity Analysis of Replacement Ratios at Varying Fund Charge Levels

	0.75% Charge		*1.0% Charge*		*1.25% Charge*	
Strategy	*Median Replacement Ratio*	*5% Pension-VaR*	*Median Replacement Ratio*	*5% Pension-VaR*	*Median Replacement Rati0*	*5% Pension-VaR*
Strategy 1: BM-NL	0.43	0.17	0.41	0.17	0.39	0.16
Strategy 2: GE-NL	0.45	0.16	0.43	0.15	0.41	0.14
Strategy 3: UK-NL	0.41	0.12	0.39	0.12	0.37	0.11
Strategy 12: All-Bonds	0.30	0.18	0.29	0.18	0.28	0.17

Results are based on 5000 simulations using the PensionMetrics model (assuming a multivariate normal distribution). The return parameters are based on forward-looking estimates net of the stated level of annual charge. The volatility and correlation structure is based on historical data from Dimson et al (2001). All figures are expressed in terms of the replacement ratio (i.e. DC pension to final salary). There is a 1-in-20 chance that the strategy in question will produce a replacement ratio below the level indicated in the 5% pension-VaR column. Balanced Managed (BM) funds invest in equities and bonds; Global Equity (GE) funds have a 60:40 split between UK and overseas equities; UK Equity Funds (UK) are 100% invested in UK equities. NL means no lifecycle strategy is applied.

6. Historical fund performance

Our simulations are designed to show the potential variability of outcomes across the different default fund strategies and within each strategy. It is also interesting to look at actual performance. Stakeholder pensions were introduced in 2001 so there is only a limited performance history available. Furthermore, some default funds have only been introduced in the past couple of years and lack any meaningful performance history. Nonetheless, we can look at the dispersion of returns across strategies, the risk of the strategies and the variation of return within each category for a subset of funds that have been in existence for three and five years (22 and 16 funds, respectively). We would caution, though, about over generalising the results from a small sample such as this.

Table 8 shows average performance, return volatility and Sharpe ratios for the various categories of default funds over both three and five year periods ending in December 2006. The Table also shows performance dispersion within each category by including the minimum and maximum annualised returns.

As the data cover a relatively short period, they must be interpreted with the market background in mind. The five year data include that later stages of the bear market following the technology stocks 'bubble' together with the subsequent market recovery, while the three year data cover mainly the recovery period. The Table shows substantial performance dispersion across all of the default funds, with a range from 10.60% to 17.56% annualised return over three years and from 5.00% to 9.51% over five years. Most of this dispersion is due to the differing asset mixes across categories. However, there is also dispersion within categories. In addition to fees and active management performance, the differences for the balanced managed and global equity categories can be explained by the fact that asset mix varies within these groups, for example some global equity funds split 50:50 between UK and overseas markets, while others opt for 60:40 or 70:30. The returns for UK-only funds can vary on account of charges, stock selection performance and whether the fund follows a narrow (e.g. FTSE 100) or broad (e.g. FTSE All-Share) benchmark.

Table 8 – Three and Five Year Performance of Default Funds

<u>Three Years</u>	Number of Funds	Average Annualised Return	Average Annualised Volatility	Average Sharpe Ratio	Minimum Annualised Return	Maximum Annualised Return
Balanced - All	10	12.65%	6.71%	1.43	10.60%	15.85%
Balanced - Active	7	12.15%	6.02%	1.58	10.60%	14.37%
Balanced - Passive	3	13.81%	8.32%	1.09	12.56%	15.85%
Global Equity - All	8	15.22%	9.53%	1.11	11.78%	16.83%
Global Equity - Active	3	15.05%	9.18%	1.13	14.55%	15.73%
Global Equity - Passive	5	15.32%	9.75%	1.10	11.78%	16.83%
UK Equity - All	4	16.94%	7.95%	1.54	15.88%	17.56%
UK Equity - Active	1	17.14%	8.59%	1.45	17.14%	17.14%
UK Equity - Passive	3	16.87%	7.74%	1.57	15.88%	17.56%
<u>Five Years</u>						
Balanced - All	10	6.72%	9.40%	0.29	5.00%	8.42%
Balanced - Active	7	6.50%	8.50%	0.31	5.00%	7.87%
Balanced - Passive	3	7.22%	11.49%	0.24	6.47%	8.42%
Global Equity - All	3	7.83%	13.00%	0.27	6.81%	8.35%
Global Equity - Active	1	6.81%	12.73%	0.19	6.81%	6.81%
Global Equity - Passive	2	8.34%	13.13%	0.30	8.33%	8.35%
UK Equity - All	3	8.39%	12.55%	0.32	7.18%	9.51%
UK Equity - Active	1	9.51%	12.07%	0.43	9.51%	9.51%
UK Equity - Passive	2	7.83%	12.79%	0.27	7.18%	8.49%

Annualised performance, volatility and Sharpe ratios net of standard fees for the period to 31/12/06. Balanced Managed (BM) funds invest in equities and bonds; Global Equity (GE) funds have varying splits between UK and overseas equities; UK Equity Funds (UK) are invested 100% in UK equities. Includes only funds with the full three or five years of data respectively. Source: Financial Express Analytics (www.financialexpress.net) and company websites.

The data are generally unsupportive of active management. The average passive fund outperforms the average active fund in the balanced and global equity categories over three and five years. However, in some categories the active funds do have better Sharpe ratios than the passive funds, indicating better risk-adjusted performance. For UK equities, there is only one active fund, but it does outperform the corresponding passive funds.

7. Conclusion

We have shown that a wide variety of strategic asset allocation and lifecycle profiles are offered as the default fund in stakeholder DC pension plans in the UK. Our simulations show that the choice of profile can have a significant effect on the range of retirement incomes likely to be experienced by plan members. Where plan members passively accept the default arrangements offered to them, as behavioural economics research predicts the majority would do, then the provider's choice of default fund type will be a crucial determinant of their subsequent retirement income.

The main point of commonality amongst the default funds is that they are risky, with quite high (although still varying) allocations to equity. The simulations show the benefit of high equity strategies in terms of relatively high levels of expected pension. The simulations also reveal the cost in terms of relatively wide ranges of possible outcomes and the corresponding downside risk. The median replacement ratio in our simulations varies across strategies from 0.63 to 0.95 using a high equity risk premium assumption, with the 5% value-at-risk replacement ratio of downside measure ranging from 0.22 to 0.29. Using a lower equity risk premium assumption, the corresponding ranges are 0.37 to 0.43 for the median and 0.12 to 0.19 for the 5% downside measure. It follows that the majority of plan members will do well from investing in an equity-based default fund, but some – perhaps simply due to the timing of their period of membership - will have a less positive experience and outcome.

Our findings raise important questions about how providers select their default funds. It is possible that the selection is determined by membership characteristics (e.g., gender, age, occupation, salary profile, risk appetite, etc.). We do not have access to data that will allow us to test this conjecture. However, any attempt to explain differences between default funds along these lines would be complicated by the fact that the plans we have examined are generic arrangements that can be adopted by any employer and, in many cases, purchased by individuals through retail financial channels. This would suggest that providers should tailor their products for the requirements of the 'average' customer in the marketplace. Our data suggest that either they do not do this or that they take quite different views on the characteristics of the 'average' customer.

It is also possible that differences between default funds might be related to the characteristics of plan providers. In particular, if the marginal costs of production of particular types of fund differ between providers, then providers might be inclined to nominate their lowest cost fund as the default. For example, an asset manager with economies of scale in index funds might nominate an index fund as the default, while an insurance company with substantial balanced fund business might choose a balanced fund as the default. If this is the case, then so far as the typical plan member is concerned, the default fund has no obvious match with his or her characteristics.

We have focused on default funds on the basis of evidence that most plan members use them. However, members have the option to choose funds other than the default, and this raises the question of whether providers give an appropriate range of choice. Some evidence on this is provided by Elton *et al.* (2004) in the context of the US 401(k) DC pension market. They find that in almost half of the 400 cases they investigate, the choice offered by the plan sponsor is inadequate to allow members to form portfolios on the efficient frontier and that the inferior fund range can have a significant impact on members' terminal wealth. They interpret their findings as suggesting that most sponsors carry out poor due diligence in selecting fund ranges. This is somewhat surprising given that employers would seem to be better placed to devote resources to fund selection than their individual employees. Consistent with

this latter view, Langford *et al.* (2006) provide evidence from the Australian superannuation market that retail offerings, which are chosen by individuals, tend to have higher fees and lower returns than wholesale funds used in an occupational context, which are typically selected by an employer on behalf of its employees.

The results in this paper show the potential lottery for DC scheme members passively accepting default investment arrangements when these defaults vary across providers in a manner not explained by the characteristics of scheme members. In terms of practical suggestions for reform, these are essentially two fold: choose better default funds and try to reduce members' reliance on default funds in the first case.

Choosing better default funds requires an in depth understanding of the characteristics of the particular employees where the scheme is going to be implemented. A literature exists linking risk tolerance to various demographic characteristics, e.g. Hallahan et al (2004), and employers and pension product providers could jointly assess the profile of employees before deciding on a default. Employers also need to be more proactive in asking for tailored defaults for their employees, rather than just accepting 'what everyone else has'.

More significantly, the problem of default funds lessens if we can reduce the, typically high, percentage of members relying on the default. The inertia that leads to default fund use is deep seated, but intelligent scheme design may be able to mitigate it to an extent. Few members are likely to be able or keen to build their own risk-tailored multi-asset strategy from asset class building blocks – as many DC scheme fund menus imply they will want to do – but they may be able to choose amongst a limited number of risk-graded multi-asset strategies that have been pre-packaged for them and labelled clearly, for example cautious, balanced and adventurous managed funds. Targeted communications may also be effective in engaging members in investment choice, for example a letter saying that the account balance has just passed £100,000 or $100,000 and noting that the member has yet to choose their own investment strategy for this sizeable 'pot' may provoke a response. In the UK, these

approaches are just beginning to be tried and look like a step forward, albeit that the results are as yet unknown.

Overall, our results suggest employers sponsoring DC plans need to take great care in selecting the default fund, which in many cases will be the fund used by the majority of their plan members. Otherwise, plan members end up taking part in a lottery in which they have only a low chance of being matched to a fund that reflects their characteristics. Financial analysts and planners have a key role to play in assisting plan sponsors with this important task.

Appendix – Historical Asset Class Return Data

Table A1 – Historical Real Returns and Earnings Growth: 1947 to 2003

Returns	UK T-bills	UK Equities	UK Bonds	US Equities	UK Real Earnings Growth
Arithmetic Mean Return	1.19%	9.18%	1.79%	8.71%	2.07%
Annual Standard Deviation	3.99%	23.22%	13.31%	21.04%	2.00%
Correlation Matrix					
UK T-bills	1.000				
UK Equities	0.051	1.000			
UK Bonds	0.465	0.513	1.000		
US equities	0.136	0.576	0.253	1.000	
UK Real Earnings	0.049	-0.026	-0.347	0.045	1.000

The historical returns are from ABN Amro / LBS data from Ibbotson Associates (Dimson et al. 2001). Earnings data are from the Office for National Statistics. The mean return figures are used in our historical return based simulations. The correlation and volatility data are used in both our historical returns based and forward looking returns simulations. US equity data is used in the simulation as the proxy for overseas equities. In the simulations, real returns are reduced by 1% to reflect pension plan charges. We conduct a sensitivity analysis on charges in Table 7.

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Endnotes

[1] Stakeholder plans must have a low level of minimum contributions (£20), no penalties for ceasing or reducing contributions, no penalties for transferring to another arrangement, and total charges were initially capped at 1.0% per annum. From April 2005 providers are allowed to charge a fee of up to 1.5% for each of the first ten years the pension product is held by a customer. After ten years the fee cap reduces to 1.0% (www.hm-treasury.gov.uk).

[2] Lifecycle asset allocation profiles are used to attempt to reduce the risk that a fall in equity prices close to the planned retirement date reduces the member's retirement income. Bodie *et al* (1992) argue that if an individual's human capital (i.e. future labour income) is less risky than equity, then at younger ages this capital will constitute a relatively high proportion of total wealth and thus can be balanced by investing a greater proportion of the individual's financial wealth in risky assets. As time moves on, the share of wealth accounted for by human capital declines and it makes sense to reduce the risk attached to financial wealth. Furthermore, younger individuals have more scope to increase their work effort to make up for any shortfall generated by losses in financial assets.

[3] We also emphasise that although our analysis is based on stakeholder pension plans in the UK, it can be generalised to other DC pension arrangements where there are similar default options.

[4] A previous version of this study found that in 2004 prior to the regulation change approximately 50% of stakeholder plans had default funds that used a lifecycle profile, while an further 20% had it as a feature that members could choose,

[5] Technically, it is possible to defer buying an annuity until age 75 by drawing an income directly from the pension fund, but in practice only those with substantial alternative assets will be in a position to do this. Such people are typically not the target membership for stakeholder pension plans.

[6] Retirement annuities are priced on the basis of prevailing long-term interest rates and assumptions about the likely longevity of the person buying the annuity. Other things being equal, a given level of annuity will become more expensive to purchase

as long-term interest rates fall. This can be hedged by holding a portfolio of bonds that will increase in value as long-term interest rates fall.

[7] Not all of these strategies are observed in practice, but for completeness we have presented all possible combinations of the observed default fund types and default lifecycle profiles.

[8] This was the simplest of the seven asset return models used in Blake *et al.* (2001). That study showed that the model for asset returns had considerably less impact on the estimated pension outcome than did the strategic asset allocation strategy.

[9] We use standard deviation and correlation figures based on annual returns. We do not take account of the possibility that the structure of risk and correlation over longer holding periods differs from that of a one year holding period, as argued by Campbell and Viceira (2005). In the context of financial planning, ignoring any mean reversion in investment returns can be considered a 'prudent' basis for analysis.

[10] The impact of differing career salary profiles, by gender and by type of occupation, on the retirement income from DC pensions is discussed in detail in Blake *et al.* (2007). For simplicity, in this paper we consider only the career wage growth profile of a typical male employee in the UK.

[11] The pension plan member would also be eligible for the basic state pension and, if total income was low, to certain means-tested state benefits.

[12] For example, as at June 2006 a fund of £100,000 would buy a man aged 65 a level annuity of £6,840 on a single life basis; an RPI (retail price index) linked annuity of £4,656 on a single life basis; or an RPI linked annuity paying a 50% pension to the surviving wife (also age 65) of £4,068. Source: Standard Life figures in FSA comparative tables (www.fsa.gov.uk).

Chapter Nine: Conclusions and Policy Suggestions [1]

Introduction

This thesis has documented and analysed the retirement saving decision-making behaviour of members of UK DC schemes using evidence drawn from focus groups, survey data and administrative data.

It has also examined the consequences of inertia and delayed retirement saving and examined the default funds in use in UK DC plans.

Decision-making in DC plans is important because DC plans are becoming more common in the UK and the retirement income outcomes from them have significant welfare implications for millions of individuals.

This section discusses some of the implications of the research and suggestions for improvements to pension scheme design. The main issues are in making saving and investment decisions more tractable for DC scheme members.

The chapter concludes with a discussion of possible directions for future research.

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[1] Some of the material in this chapter is drawn from Byrne, Harrison and Blake (2007).

Using behavioural economics to improve retirement saving

A key theme running through this thesis is the use of our knowledge of behavioural biases to help individuals save for their retirement. Typically, these types of interventions use inertia to positive rather than negative effect, or change the framing of the retirement saving decision to encourage more "appropriate" saving behaviour.

The balance of evidence is that behavioural interventions, such as automatic enrolment and save more tomorrow, are warranted and effective. Automatic enrolment is a key component of the new system of Personal Accounts from 2012. 'Save More Tomorrow' is not an element of the design of that scheme, but could be used more widely in private occupational and personal pension provision. There is evidence of growing use of this type of arrangement in the US (for example, Vanguard, 2006) driven in part by the enthusiasm of pension scheme providers for getting more assets, and hence revenues, into the private saving system.

One objection to this type of endeavour is that it could be regarded as "paternalistic" – making the assumption that the scheme sponsor or designer knows what is best for the employees or scheme members better than they do. As Thaler and Sunstein (2003) note, paternalistic is a term that, when used by economists, is often not intended to be complementary. However, many behavioural interventions in retirement saving can be regarded as what Thaler and Sunstein call "libertarian paternalism". In this case pension scheme design is such that – given what we know of behavioural biases – it guides individuals to what we believe they would choose to do if they had full knowledge and self-control. Importantly, the interventions do not compel individuals to take a certain action, merely guide (*"nudge"*) them towards it.

Another important point noted by Thaler and Sunstein is that there is no neutral design. Any form of design is likely to impart some bias to the decisions individuals make. The issue is whether we are conscious of the influence the designer has and use it to achieve intended outcomes. Benartzi et al. (2007) refer to the practice of designing arrangements to help people make better decisions as "choice architecture".

Better default funds

The evidence that many DC investors take a passive approach and are inclined to accept default arrangements means that those responsible for DC schemes need to think carefully about the default funds they offer to members. In many schemes, the default fund will be used by the vast majority of members. Chapter eight documented that most default funds in stakeholder pension plans are simple balanced funds (with high equity content) or equity index-tracking funds.

Byrne at al (2007) suggests diversified growth funds, which contain a mix of traditional and alternative assets, may provide a better risk/return trade-off for members than existing products that rely very heavily on equities. In a survey of UK pensions professionals, Byrne et al. found 78% of respondents viewed diversified growth funds as either appropriate or very appropriate for use in DC schemes.

A growing number of DB pension schemes are adopting liability driven investing (LDI) approaches for their assets. Typically, this means investing some of the scheme assets in a manner that should hedge changes in the scheme's liabilities, for example occurring due to a fall in interest rates, while adopting a more diversified asset structure for the assets which the scheme has available to generate investment growth. This latter idea is referred to as 'diversified growth' and means a greater role for asset classes such as private equity, property, commodities, infrastructure and, potentially, hedge funds.

The rationale behind diversified growth funds (also known as 'new balanced') is that they create a more efficient risk/return trade-off than equities alone. This is an idea that seems to translate readily to DC – there appears no particular reason why such a diversified growth fund would not be suitable for use in a DC scheme as the default (where it can be lifecycled, if required). DC scheme members are unlikely to be comfortable taking an investment view on alternative asset classes, but if the assets are available in a packaged form and managed by the fund manager then members may be more comfortable. Members don't need to understand traditional and

alternative asset class characteristics, but only that certain asset class combinations can reduce risk and volatility.

One issue raised by diversified growth funds relates to management fees. In general, there is pressure from regulators, consultants and clients to reduce the fees charged on DC funds (for example, Pensions Commission, 2004). However, diversified growth funds contain a number of specialist areas where management fees are typically high. It could be argued that superior (net) performance justifies these high fees, but where pressure is on the headline charge rate, that argument may not be considered.

One solution to this problem may be to use low cost passive management where possible and desirable – for example, developed market equities – and to reserve the higher cost management fees for less developed markets or more complex asset classes, where it can be argued that there is greater potential for active management to be effective. This approach may lead to an average fee for the diversified growth fund that is within the range acceptable to the market.

Managing investment choice

The balance of evidence in this thesis and in the existing literature is that a high degree of investment choice can be counterproductive in DC schemes, confusing members. Byrne et al. (2007) conducted a survey of 54 senior UK pensions professionals with direct experience of managing DC schemes asking what level of fund choice was appropriate in DC schemes. The most common response was to say a range of 6-10 funds, which is narrower than the range many schemes actually offer.

What is the appropriate number of investment fund choices to offer in a typical UK DC pension scheme?	
	Response
1 fund (i.e. no choice)	0.0%
2-5 funds	16.7%
6-10 funds	57.4%
11-20 funds	9.3%
20+ funds	14.8%
Don't Know / no opinion	1.9%
Source: Byrne et al. 2007 survey of 54 senior UK pensions professionals.	

In terms of scheme design, it appears that there is a balance to be struck between providing a range that is narrow enough to avoid confusing members, but that still allows for adequate diversification of investment risk.

Scheme providers may be able to simplify investment choice by providing a small number of risk-graded multi-asset funds that members may choose from. For example, a scheme could offer either three or five multi-asset strategies differentiated by the balance between risky and low-risk assets, with some form of lifecycle overlay to manage risk through time. Members can choose amongst them based on their perceived attitude to investment risk, and the funds can be described or categorised on that basis. This avoids the needs for employees to get to grips with the details of asset class characteristics and focuses them more on outcomes.

One way to characterise the funds is to give them names such as: Adventurous, Balanced, Cautious (the "ABC" approach). These names attempt to differentiate the funds for the reluctant investor. Underlying the classification can be a more objective measure of risk, for example where each fund has a target range for its value-at-risk or volatility parameters. Three funds would seem to be sufficient for this purpose. Although using five funds is possible, it runs the risk of creating the complexity the concept is meant to eliminate. *("Am I very cautious or just moderately cautious...?")* There may be arguments for an even number of funds, although excluding the prospect of a 'middle option' might introduce an unintended layer of complexity.

Members can be provided with some kind of risk profiling questionnaire to help them consider their attitude to risk. Some pensions providers (in private correspondence) suggest that this type of approach has been helpful in reducing the percentage of members who end up in the default fund. The key is in making the fund choice more manageable for the non-expert, although many members will, in any case, be likely to end up in the default fund.

One issue for debate is whether these types of funds should have descriptive names, such as "Cautious" or names based on factual aspects, such as the equity content ('The 75 Fund', which has a 75% equity allocation). The argument for the latter is there is less risk of members being misled, for example where they interpret "Cautious" in a way that is different from the provider's view. However, generally, it seems likely that unsophisticated members will be better served by communicating funds based on *what they are expected to achieve* rather than on the asset allocation and investment style.

Another possible development is use of 'target date' or 'retirement date' funds – where the risk in the fund is managed by the manager with a view to meeting the needs of an investor who plans to retire in or close to the target date. Again the benefit is that the decision made by the scheme member is relatively simple and narrowly focussed. (See Bodie and Treussard, 2007.)

Traditional lifecycle funds switch the member's balance from risky assets, such as equities, to safer assets such as bonds, as the planned retirement date approaches. Typically, this is achieved by switching the units of the funds the member is holding from, say, the equity fund to units in the bond and cash fund. An alternative method that simplifies unit holdings is the target-date fund.

Target-date funds work on a similar principle to conventional lifestyling, but the switching occurs within each dated fund. So, for example, a member expecting to retire in 2040 would buy the "2040 Fund". This would have an internal lifestyling mechanism and would start to switch into safer assets in, say, 2030 so that by 2040 the fund is 75% in fixed income and 25% in cash.

Target date funds have a number of attractions:

- Target-date funds may be easier for members to understand: they simply choose the fund that coincides with their planned retirement date and the manager does everything else. In this way they focus the member on the final outcome rather than on shorter-term performance.
- They are flexible and enable members to phase retirement by investing in more than one fund, or to change the retirement date by switching to a different fund. *("I am no longer retiring in 2025 so I shouldn't be holding the 2025 fund.")*
- They may be easier to administer and lower cost than lifecycle. The member holds the same set of fund units throughout his or her period of membership and switching is done in large increments in the fund rather than as a series of small unit transactions.

The switching can be done on a mechanistic basis – as per lifecycle – or, potentially, on an active basis where a discretionary manager considers the timing of the switch and can respond to market conditions. In the latter case it may be appropriate to allow faster than planned switching to safe assets, but not to allow slower switching given the potentially serious consequences if the manager gets that judgement wrong.

Provision of advice

DC scheme members – current and prospective – may need more advice than they currently receive. The focus group evidence in chapter four in particular, shows scheme members calling for more support for the decisions they must make. The main barriers to greater provision of advice are cost and potential legal liability. Trustees and sponsoring employers appear reluctant to give DC members clear and direct advice for fear of infringing financial services regulation and / or incurring some liability if the advice proves less than ideal. One of the perverse consequences of current financial services regulation and perceptions of potential legal liabilities is that in many DC schemes 'expert' professionals try to avoid shaping members' investment choices and leave the members largely to their own devices. This would appear to be counter-intuitive given reported levels of knowledge amongst members.

One option would be for the pension scheme sponsor to engage a professional financial adviser to deal with members, but this comes at a substantial cost that many employers are not prepared to incur. Equally, members themselves seem unprepared to spend the required amounts on professional financial advice. One idea discussed by Byrne et al (2007) is the idea of safe harbour provisions designed to protect employers from legal liability for the outcome of investment advice provided their actions meet a prescribed level of care. Some provisions of this nature exist in the US and are discussed below. If employers are less wary of liability and of contravening regulations, they may be more prepared to engage with their employees on issues of retirement saving.

Safe harbour provisions may be needed to cover *implicit* as well as explicit advice. In practice, many features of DC schemes - for example default funds - may be accepted by members as implicit advice – that is, members perceive a recommendation, even where none is intended.

US Safe Harbour provisions for DC default funds ("QDIA")[2]

The US Employee Retirement Income Security Act (ERISA) provides relief from liability for investment outcomes for sponsors ("fiduciaries") of DC pension plans, typically 410(k) plans, where members make their own investment choices from an appropriate range of funds on offer. This relief is known as a 'safe harbour'. Some plan sponsors have worried about potential liabilities arising from the performance of default funds on the basis of an interpretation that default funds are not "chosen" by members. Many sponsors have responded by either refusing to have a default fund or choosing a low risk fund, such as cash, as the default to minimise the chances of short-term losses. These decisions can create a number of adverse consequences such as discouraging employees from joining (because they must make a fund choice), preventing use of automatic enrolment (which requires a default fund), and encouraging recklessly conservative investment strategies.

The Pensions Protection Act of 2006 contains several measures designed to support the use of automatic enrolment, one of which is an amendment to the ERISA safe harbour provisions. The new provisions create a safe harbour where:

- Assets are invested in a Qualified Default Investment Alternative (QDIA)
- Members have been given an opportunity to provide investment direction but have failed to do so
- Members have been given notice 30 days before the initial investment and again 30 days before the start of each plan year about how their assets will be invested in the QDIA
- The plan offers a broad range of investment alternatives
- Members are able to switch out of the QDIA into the other funds

[2] For more details see http://www.dol.gov/dol/topic/retirement/index.htm

The regulations also provide requirements for the QDIA:

- It must not impose any transfer penalties on switching to other funds
- It must be managed by a registered investment manager or investment company
- It must be diversified so as to minimise the risk of large losses
- It may not invest employee contributions directly in employer-issued securities
- It may be a lifecycle fund, a target-date fund, a balanced fund, or a professionally managed account

A key point about safe harbour provisions is that they are not compulsory for sponsors to follow. The sponsor is free to choose an alternative course of action. The provisions do, though, give sponsors a firm steer as to what approach the government regards as appropriate. If the provisions are well-designed, they provide a powerful indication of best practice.

Following the US example, UK regulators could consider encouraging employers, trustees and advisers into taking a greater fiduciary role and protect them through 'safe harbour' rules that restrict liability, provided due diligence has been done. Clearly 'due diligence' in this context would need to be defined carefully. Key areas of application include selection of the default fund, the extent of investment choice offered to members, and in determining the nature of the information and advice that is provided to members.

Alternatives to DC

One response to the argument that many individuals struggle to deal with the risk transfer and decision-making responsibility in DC would be to propose alternative means of providing retirement incomes that require less complex decision-making and / or mean individuals are less exposed to risk.

There is little indication that private sector employers are going to return to offering DB schemes given recent experiences regarding cost and risks. Hybrid or shared-risk schemes could offer some prospect a solution where employers achieve a level of risk-bearing they are comfortable with, while employees do not get left bearing individually all the risks of retirement income provision.

However, many, especially smaller, employers regard hybrid schemes as complex and take a 'once bitten, twice shy' approach to bearing investment and mortality risk on behalf of their employees. ACA (2007) shows that 28% of respondents say they favour risk transfer to individuals, whereas 72% favour new risk sharing schemes. Amongst smaller employers (up to 250 employees) 46% favour risk transfer against 54% favouring risk sharing. The percentage of respondents expressing favourable opinions for risk-sharing mechanisms also needs to be viewed against the background that very few schemes have actually introduced hybrid schemes.

More generally, there is a question about whether a private saving system is appropriate for low-to-moderate earners who are not in a position to obtain specialist advice. A more generous state system could meet the needs of this group, funded by higher tax rates but involving lower administrative costs than private provision. However, this runs against the grain of the recent direction of public policy.

On balance it would appear that DC will be the prevalent form of pension provision for the foreseeable future. A major innovation on the DC landscape relates to the proposed national scheme of Personal Accounts.

Designing Personal Accounts

The Government has proposed a new national scheme of Personal Accounts to be introduced from 2012. These are intended to help reduce the number of people who are not saving for their retirement. They will be low cost and will use automatic enrolment to boost the take-up rate. Employers will have to automatically enrol their employees into the scheme or into a private arrangement of comparable quality. Automatically-enrolled members, however, retain the right to opt out.

Some of the features of the proposed system of Personal Accounts have already been determined, but others have not. We know that the system will use automatic enrolment to boost take-up, that the standard contribution rate will be 8% of band earnings, and that there will be a default fund and some degree of investment choice.

Most of the issues we have discussed in this thesis are relevant to the new system of Personal Accounts. Indeed some potential problems become more acute under the 2012 reform. For example, with large numbers of lower earners and first-time pension savers in the system, default fund use is likely to be very high. Furthermore, with a target annual management charge of 0.3% there will be no scope for individual advice to members and little scope for more sophisticated investment strategies.

A wide choice of investment options in the system would seem counterproductive. There is no indication that the 600+ fund range in Sweden's Premium Pension System is at all helpful to members. In recent years, default fund use in that scheme has been high and evidence suggests most active choosers have done less well than the default fund. (Cronqvist and Thaler, 2004)

To the extent that it is felt necessary to have fund choice in the system, some form of filtering could be used to avoid confusing less sophisticated members. Fidelity's proposal for 'open personal accounts' (see MoneyMarketing, 1 September 2006) where most members see only a limited range of funds, but those in search of more

adventurous options can access a wider range, is a variant on this theme. Importantly, the cost of the more exotic choices is borne by those opting to use them rather than by the general membership.

The likely scale of Personal Accounts also creates potential issues. On the positive side, economies of scale should allow for efficient purchasing of the required investment and other services. Of more concern would be the possibility of concentration of large amounts of assets in the default fund creating distortions in the equity markets. This would be unlikely at the outset, but may become an issue as the scheme grows.

The debate about the relative merits of active and passive portfolio management is a thorny one for Personal Accounts. Even with a degree of separation through some form of governance board, active management implies government 'picking winners' while passive management leads to 'government sponsored' investment in a wide range of companies, not all of which will be politically acceptable. The latter is a more likely prospect given the desire to drive fees down. Poor performance from an active manager would also cause problems for the trustees in deciding whether to replace the manager or continue with the existing one in hope of improvement.

The nationwide nature of the scheme also raises the issue of religious or ethical considerations driving fund choice. The question, therefore, is at what point to draw the line between a minority requirement that is significant enough to be catered for within the scheme and a minority interest that is marginal enough to mean that the response is *"if you want that you should opt out of Personal Accounts and get it somewhere else."*

Of the various strategies discussed earlier in the chapter, it seems that target-date funds may be appropriate for Personal Accounts. This would have several important advantages:

- Unwilling investors would find it relatively easy to identify the right fund for their expected retirement date.
- The availability of target-date funds would enable members to change their expected retirement date (by moving from the 2020 to the 2025 fund) and to phase retirement (by dividing contributions between the 2020 and 2025 funds).
- Target-date funds focus members on the outcome and draw attention away from short- and medium-term volatility.
- The Personal Accounts Board would have considerable flexibility in determining the underlying asset allocations and investment styles, and in the selection, monitoring and changing of fund managers without this having an impact on the members' unit holdings.
- There would be no need to establish a separate lifecycle mechanism, which members might find confusing.

If target-date funds are adopted, there remains a question of deciding on the underlying asset allocation and risk profile. A diversified growth approach – utilising a wide range of asset classes, including alternative assets such as commodities and private equity - might have some merits, but will be difficult to achieve under the planned charging level. The intended level of charges means a passive equity strategy is more likely.

In terms of the risk profile, there are a number of issues to consider. Most members will be novice investors and many will be unnerved by volatility. This would argue for a lower risk approach, but there are dangers too in widespread 'reckless conservatism'. Furthermore, many members will have relatively low incomes which would suggest limited *ability* to take risk, for example they may not have the capacity to save more to make up for past losses. However, for these lower earners the state pension and other benefits provide a floor in terms of retirement income, which may mean they can take more risk in their Personal Account.

Directions for further research

The proposed new system of Personal Accounts represents an interesting experiment, for example in the effects of automatic enrolment on a larger group and in the exercise – or not – of investment choice.

One particular issue is that existing evidence on the effects of automatic enrolment is largely based on cases where it was implemented voluntarily by employers who were concerned to ensure that their employees were saving for retirement. It remains to be seen what happens in cases where unwilling employers are compelled to introduce automatic enrolment. For example, participation rates may be lower than expected if employers find ways of encouraging employees to opt out. .

Communications and education may be able to change behaviour through time. A particularly fruitful line of research is tracking the effects of communication and advice interventions in DC schemes. The key issue is in determining which types of interventions have a positive effect on member behaviour. The research is complicated in part by the need to ensure some kind of control group to assess what members might have done in the absence of any intervention. This type of research also requires access to private data from pension schemes, often in a detailed form that leaves trustees and sponsors concerned about breaching data protection laws. Again the new system of Personal Accounts could be a useful testing ground for new approaches of communication information to aid employees in making retirement saving decisions.

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