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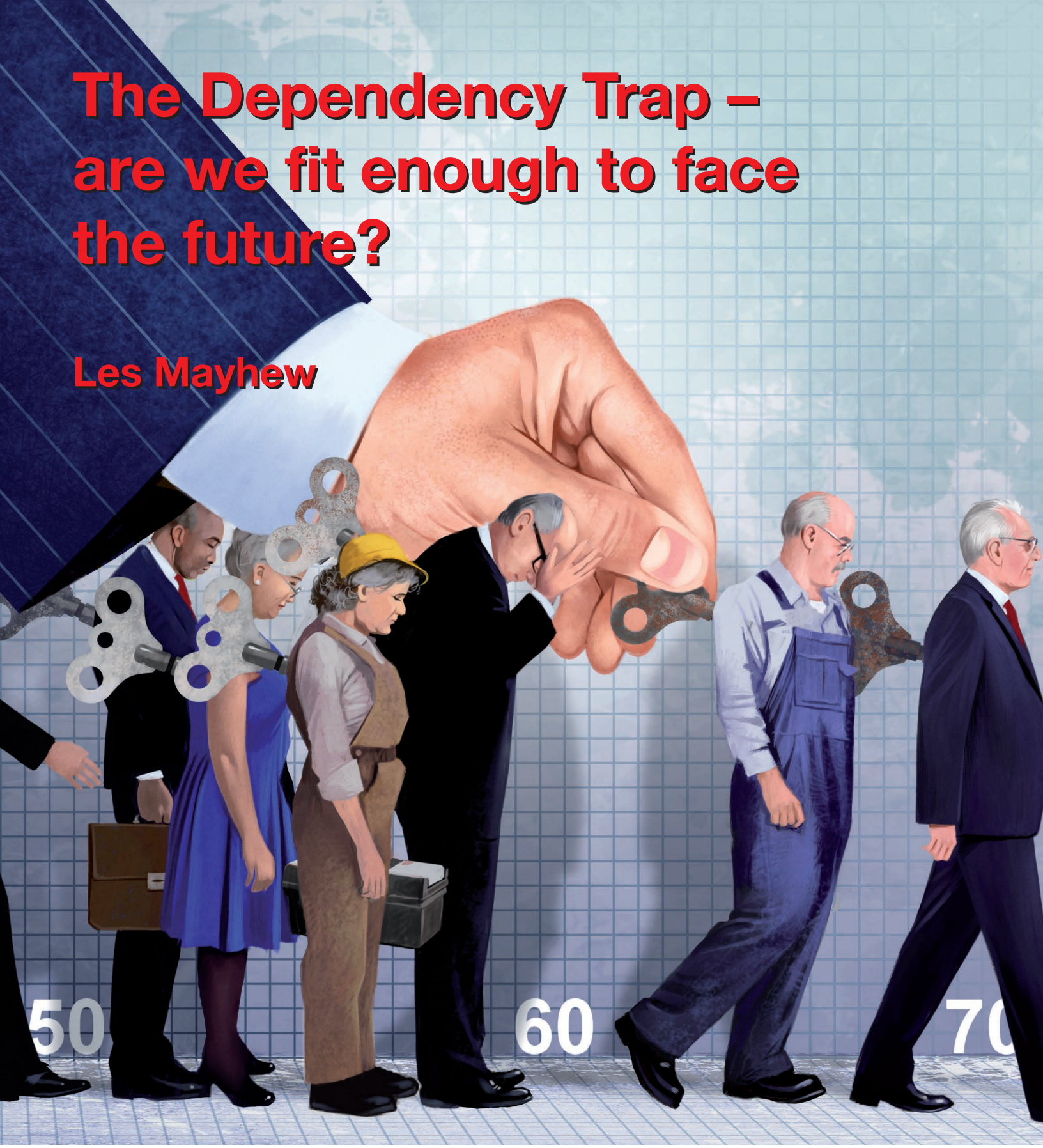
The Dependency Trap – are we fit enough to face the future?

Les Mayhew



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Contents

Foreword V

Preface VI

Executive Summary 1

Introduction 3

Chapter 1: Life expectancy free of disability and in good health 7

Chapter 2: Labour market activity and health 13

Chapter 3: Earnings and pension adequacy over the life cycle 19

Chapter 4: The dependency ratio and state pension age 26

Chapter 5: 'Active Ageing' Scenario 32

Chapter 6: Discussion of main findings 36

Annex A: Definitions of inactivity and disability under the Equality Act 40

Annex B: Annuity values based on pension size 42

Annex C: Trade-offs between the state pension age, dependency ratio, one-third principle and replacement value of the state pension 44

Foreword

The provision of an adequate retirement income remains one of the biggest challenges facing developed economies. Ageing populations and a decline in the ratio of workers to retired people means that the pressure on state systems will continue to become ever more acute. The UK government, like others, has moved to increase the state pension age (SPA) in an attempt to balance pension finances, while maintaining the aim of people spending up to one third of their adult life in retirement.

However, as this report makes clear, the impact of health and disability becomes increasingly significant once people pass 50 years of age and participation in the workforce tails off. Consequently, there are limits to how far the SPA can be raised without simply shifting people from a state pension onto disability benefit. In the absence of a boost to incomes from an increase in productivity, something the Office for Budget Responsibility has now officially given up on, the focus must turn to raising participation rates amongst those aged 50 to 70. The report advocates an "active ageing" scenario, which sees this group increase its participation rate, a development that has already begun to happen as more people extend their working lives.

Longer working lives should also help people to increase their savings for retirement, something that we at Schroders and many others continue to advocate. This report adds to that discussion by highlighting the challenges faced by women, who often have interrupted careers as a result of managing caring responsibilities alongside participation in the workforce. More generally, the report draws attention to the complexity of the savings and retirement decision in a world of uncertain health and individual responsibility. In particular, there is a compelling call for more information to be made available to those in DC pension schemes so as to make the best decisions on when and how rapidly to draw on their pension savings.

Clearly, the private sector has a significant role in helping to meet these challenges and Schroders is very happy to be supporting this report in conjunction with the CSFI.

Lesley-Ann Morgan
Global Head of Defined Contribution and Retirement
Schroders

Keith Wade
Chief Economist
Schroders

Preface

A cynic might say that we would be lucky to live long enough to face the problems identified in this report. Maybe, but the problems of financing old age in an era of increasing longevity, less security of employment and the decline/disappearance of the old defined benefit pension plan are enormous. Governments (of whatever hue) are not unaware of the problem, and are making efforts to tackle it – *inter alia* by auto-enrolment of workers into pension schemes (eg Nest), by removing the burdensome annuitisation requirement, by eliminating the mandatory retirement age, and (most controversial of all) by nudging the State Pension Age up.

But is that enough?

This report – written by Professor Les Mayhew of the Cass Business School, at City University (and a former senior civil servant in the DHSS, DSS, Treasury and ONS) – suggests that it is not. And that even the report produced by John Cridland in March 2017 may have been too optimistic in its recommendations as to what needs to be done to maintain the sustainability of the present pension promise.

Prof Mayhew's contribution is to focus not simply on longevity, but on what he calls 'active ageing'. Raising the SPA will not, by itself, resolve the problem unless it is accompanied by measures to reduce disability (physical or mental), to encourage older workers to remain employed, and (linked to that) to shift the point of peak earnings towards older workers. If, by a combination of education and preventative health care, we can increase the percentage of older workers (whether or not they define themselves as disabled) in work, the government's goal of providing a state pension that is roughly one-third of average earnings to fund a retirement that is up to one third of a person's adult life is realistic. Otherwise, the future looks pretty bleak.

This is an important report, using new tools that cast a cold eye on one of the biggest challenges facing any government – a challenge that cannot be wished away. I am very grateful to Prof Mayhew for all his work – and for letting us publish the results. I am also very grateful to Schroders and Cass for their support, and to my colleague, Jane Fuller, whose interest in pensions is well-known and who worked with Les at all stages. Many thanks to all of them.

Andrew Hilton
Director
CSFI

CSFI

Number 128 January 2018

The Dependency Trap – are we fit enough to face the future?

Les Mayhew

Executive Summary

The UK population is forecast to grow from 65m in 2015 to 75m in 2040, with the number aged 65-plus set to increase by 50%, from 12m to 18m. The classic "dependency trap" is that an ageing society has fewer workers to support every pensioner, piling pressure on health and social care services, and on the taxpayers that fund them. But the standard ratio of those aged 20-64 to those aged 65-plus is a crude measure of whether an economy can thrive as its population ages.

This report, using new data and analytical tools, focuses on economic activity, which starts to tail off when people reach 50, with ill health or disability as the biggest single cause. This means that raising the state pension age (SPA), while necessary, is not sufficient as a response to increased longevity. Attention needs to focus on improving activity rates in the lengthening run-up to retirement. This would raise lifetime earnings and saving levels, as well as providing the tax revenues needed to fund state benefits.

The main points of the report are:

1. On current demographic trends, there will be a 50% growth in the UK population aged 65-plus by 2040. This means that the dependency ratio – the number of people aged 20-64 compared with those aged 65-plus – would deteriorate from more than three times to just over two times if nothing were done.

2. Just as important as age is economic activity, which deteriorates once individuals reach 50 – and does so rapidly from 55. A major cause of inactivity is ill health, and disabling conditions increase with age. So raising the SPA is not enough to mitigate the adverse impacts of ageing on the economy and people's capacity to earn and save.

3. The key challenge for policy-makers, shared with the private sector, is to seek ways to improve economic activity rates between the ages of 50 and 70. This includes public policy initiatives to prevent or delay the onset of ill health, employers' efforts to create more opportunities for workforce participation, and financial services products that mitigate the effects.

4. The good news is that economic activity rates are growing among those over 60, albeit from a low base. This is in response to the increase in the women's SPA and the abolition of a default retirement age. But healthy life expectancy, and related activity rates, vary significantly between UK districts, indicating the importance of measures to narrow the gaps in local outcomes.

5. Gender variations in total life-time earnings remain substantial, with men earning – on average – 80% more than women. This reflects the impact of career breaks, part-time jobs and lower-paid work on the

average total earned by women, with a knock-on effect on pension prospects. This report suggests that working partners should be able to contribute to the pension funds of non-working partners.

6. Overlapping caring responsibilities for children and elderly relatives – the 'sandwich years' - are a growing phenomenon, but they can be predicted, which suggests that bespoke insurance, or care annuity, products could be developed.

7. To expand earnings/savings capacity (and the tax take to pay for pensions) at older ages, three things need to happen: earnings should peak later to improve incentives to stay in work; economic activity rates need to rise from age 50; and productivity should go up. The first two are moving in the right direction, but productivity remains flat.

8. To help people assess whether they are on course to accumulate sufficient pension savings, this report suggests a bespoke calculator that can combine the outcomes from a series of contributions. This would aid decisions about whether to work for longer and save more.

9. The government has stated that people should expect to spend up to a third of adult life in retirement, namely in receipt of a state pension. This is only sustainable if activity rates rise sufficiently, as modelled in this report.

10. The stakes are high: the state pension accounts for about 12% of public spending, so it is important both to raise activity rates and manage pension costs. Taking into account the impact of disability on dependency, our calculations suggest that the SPA might need to rise even faster than proposed by the Cridland review, which would mean abandoning the one-third target.

11. The dependency trap, representing the economic and fiscal conflict between the working population and pensioners, can be avoided by raising taxes, cutting pension benefits and/or increasing economic activity. Clearly, the last is the least painful.

12. This report advocates an 'active ageing scenario'. Raising the activity rate of the working age population from 80% to 85% could be achieved via a 17.5% uplift in activity rates among those aged 50 and over. This would have the effect of slowing down planned rises in the SPA after 2030. This scenario would be good both for individuals and their capacity to save, and for the nation's economic and fiscal outlook.

Introduction

The dependency trap usually refers to societies in which the population becomes over-reliant on government handouts. In this research, however, we are using it to describe a society that is sleep-walking into a conflict between the competing needs of an ageing population for a decent pension and a working-age population that is struggling to save for retirement, with the issues compounded by inequalities in health and income.

Welfare systems built to protect against these eventualities are under increasing strain, and a balance has to be struck between raising taxes to pay for protection and limiting the financial burden on working families. An ageing population increases these dependencies because the number of older people requiring financial and other support grows relative to the working-age population's ability to provide it. This has the potential to lead to a slowdown in economic growth, in the absence of off-setting rises in productivity.[1]

The ageing process is associated with reduced levels of economic activity, increasing frailty and diminishing cognitive ability. However, a theme in this research is that reduced economic activity does not begin with retirement. For example, a well-educated population is more likely to be healthier and economically successful than one that is not, regardless of whether it is ageing (and better educated people are less likely to work in jobs that are susceptible to physical infirmity). According to Sasson[2], the poorest in society are more likely to fall victim to the cumulative effects of decades of unhealthy lifestyle and income inequality. He argues that the wealthier tend to adopt healthy behaviour, and hence are better placed to avoid or defer problems.

Staying healthy enables us to postpone the day when we are too frail to work or too ill to live independently. As a population ages, average health levels decline and so our success as a country in improving longevity paradoxically stores up problems. We eventually become victims of our own success because growth is harder to sustain. Unless that ageing population is supported by increased output per worker, potential economic problems include labour shortfalls that may fuel immigration, reduced pensioner benefits and so on, all of which need to be managed and planned for.

It is commonly observed that since productivity declines with age, the antidote will need to come from elsewhere, such as new technology. However, there is another argument, namely that if more people become economically active and in better health, they would be enabled to work – and save – for longer. Although this appears obvious, there are obstacles, including maintaining a healthy lifestyle and having self-belief. There are also competing obligations such as caring for sick children, elderly relatives or people with disabilities – all essential activities, but hard to plan for and costly in terms of time and money.

Lessening some of these obstacles would enable a greater percentage of the population to be economically active. People would be able to work for longer, have more financial choices in the latter part of their lives and be less dependent on others. Employers would value older workers more than they do now for their skills and experience. However, as this report will argue, progress towards this better state is far too slow. The looming dependency trap is, therefore, a wake-up call to policy makers and all those with an interest in ageing.

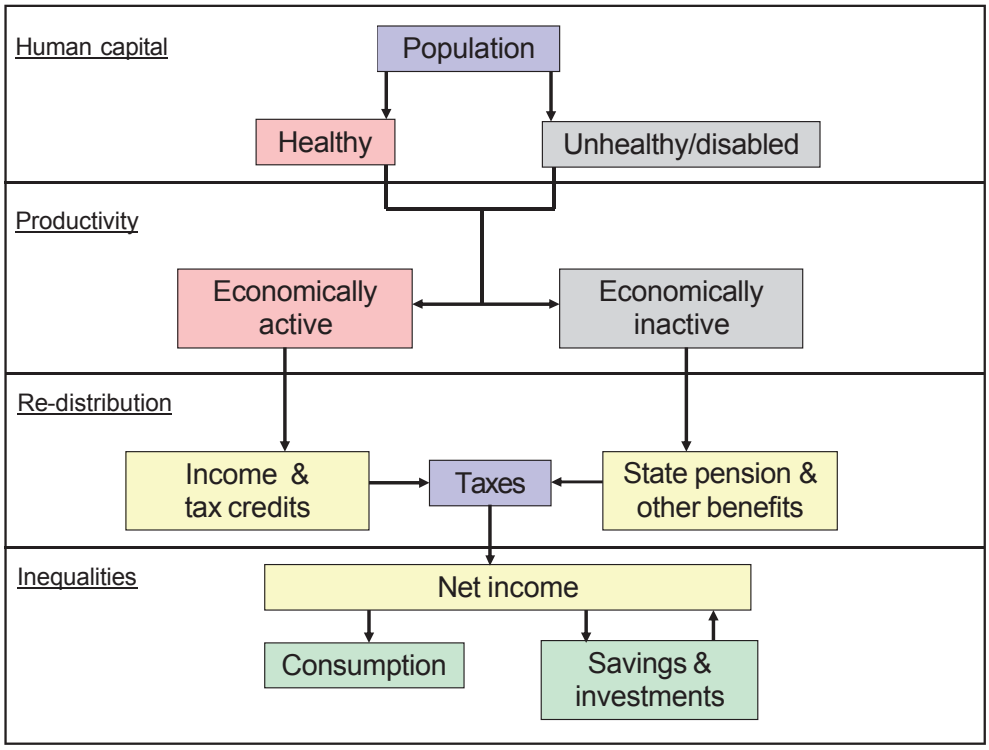
1. Mayhew, L. (2009), 'Increasing longevity and the economic value of healthy ageing and working longer', HMG Cabinet Office Strategy Unit.
2. Sasson, I. (2016). Trends in life expectancy and lifespan variation by educational attainment: United States, 1990-2010 Demography. ISSN 0070-3370

The report points out that rises in longevity are not much use without accompanying improvements in healthy life expectancy. If the gap expands, more taxes will be diverted to pay for health and social care, upward pressure on the state pension age (SPA) will increase and the proportion of adult life spent in retirement will shrink. Meanwhile, taxes will rise and average income fall. The result would be to widen the inequality gap between rich and poor, and the healthy and unhealthy. Although becoming unhealthy at a relatively early age does not have to mean that life is foreshortened, it negatively affects a person's ability to build up a pension and could hasten dependency.

Most of these arguments are well known, but they tend to operate in silos such that the inter-connectivity between an improvement in health, higher activity rates and better pensions is obscured. One manifestation of this is that, as a society, we put relatively few resources into prevention because we never measure its value. This report tries to rectify this by bringing together analytical tools and new data to answer questions such as: how can the economy expand with an ageing population? And, by how much would activity rates need to increase to reduce dependency?

Figure 1 sets out these important relationships. The top level is human capital, whether healthy or unhealthy. A healthier population is more productive and flexible than an unhealthy one, and so staying fitter for longer should become a strategic goal. The population is divisible into economically active and inactive, and the data show that disabled people are more likely to be economically inactive or unemployed. This tendency increases with age, especially from age 50.

Figure 1: Relationship between economic activity, productivity, pensions and taxes – a demographic perspective



The length of a working life is conventionally measured from age 20 to the SPA, but these boundaries are largely false as some people have much longer/shorter working lives than others. This is reflected in earnings (a proxy for productivity), which on average peak in a person's 40s before declining. But what causes earnings to peak, and is decline inevitable? Is the peak changing over time in response to population ageing? And how has ageing affected average earnings at older ages compared with that of younger people?

Since women are more likely to experience interrupted careers, through bringing up children or looking after elderly or sick relatives, their lifetime pattern of earnings and economic activity is a barometer of different pressures in society, such as how to balance caring roles with careers. Questions include whether more women are now working at every age; how career breaks affect their lifetime earnings and ability to save for a pension; and whether there is a squeezed generation who are balancing work with caring for children and elderly parents.

These issues are strategically important not just because of intergenerational fairness and sufficiency of income at an individual level, but also because of affordability and economic management in a society that is simultaneously growing in size and ageing. The UK population is forecast to grow from 65m in 2015 to 71m in 2030 and 75m in 2040. In between, the number of people aged 65-plus will increase from 12m in 2015 to 18m in 2040, while the number aged 20-64 will level out at about 40m.

The dependency ratio

The dependency ratio measures the pressure that a growing number of pensioners places on the tax-paying working population. It is customary to align the lower age with labour force entry and the upper age with the point when state retirement benefits kick in. The standard ratio has divided those aged 20-64 by those aged 65-plus, it was 3.7 in 2007[3]. But since then, with baby boomers starting to retire, it has turned down sharply and would fall to 2.2 by 2040 without increases in the SPA. The dramatic fall in the ratio has become a major strategic concern.

The deterioration in the ratio after 2007 would have been worse without an influx of migrants from Europe and elsewhere – around three million since 2000. The UK government aims to reduce future immigration from about 250,000 a year to the 'tens of thousands', after Britain leaves the European Union. The effect will not be felt immediately, unless existing migrants return home, but it has the potential to put further pressure on the dependency ratio.

These changes are taking place against a background of rising life expectancy. Although increases have slowed in the last few years, the changes of the past 40 years have been hugely significant. For example, in 1975 a person entering the labour force at 20 had a life expectancy of 54.3 years compared with 61.4 today. In addition, the longevity gap between men and women has been closing.[4] Underlying this trend are significant changes in male lifestyles and occupations, which have seen a fall in tobacco-related deaths and heart disease, and fewer men working in hazardous occupations.

Higher up the age scale, increasing longevity has also dramatically affected the age at which people die. For men the modal age (at which the most deaths occur) rose from 72 to 84 between 1975 and 2015 and, for women, from 80 to 89. Changes on this scale are to be celebrated as testimony to how far society has advanced in just 40 years. But they mask another, more troubling, trend: the persistent and growing inequality in life-span between the richest and poorest areas of the country. Inequalities on the scale described in this research are a drag on the economy because they dis-enable people from reaching their potential.[5]

3. Sometimes the dependency ratio is expressed as the number of pensioners per worker i.e. the inverse. Although school-leaving age is 16, the use of the age range 20-64 is more meaningful because of the impact of further education, training and other factors on the 16-19 cohort.

4. Mayhew L. D., Smith,, D. (2014), 'Gender Convergence in Human Survival and the Postponement of Death', *North American Actuarial Journal*, 18(1), p.194-216

5. Mayhew L.D, Smith D. (March 2016) 'An investigation into inequalities in adult lifespan', London: International Longevity Centre UK (ILC-UK). March 2016

Report structure

The report begins by analysing the health of the population using three different measures: the prevalence of disability, disability-free life expectancy and healthy life expectancy. As well as the national data, we also highlight variations at a local level. This shows that reducing health variations is a major imperative as far as managing the dependency trap is concerned. Chapter 2 analyses labour market activity by age and finds that there are large falls in activity rates over the age of 50 and that poor health is partly to blame. This means that raising the SPA has its limits as a means to expand the workforce.

Age-related earnings crucially affect the ability to save for a pension over a working life. Chapter 3 looks at the impact of part-time work and career breaks on women's private pension pots. Currently, the SPA is transitioning from 65 to 66 by 2018 (for women from 60 to 66) and is due to rise to 67 by 2028 and 68 by 2037-39.

Chapter 4 explores the affordability of the principle, stated by the UK government, that people should expect to spend up to one third of their adult life in retirement. With no default retirement age, this has effectively come to mean in receipt of the state pension. The chapter also covers the value of pension benefits relative to earnings and the impact on the dependency ratio of raising the SPA.

Chapter 5 looks ahead to 2040 using different scenarios. It considers whether the SPA can be kept in line with the one-third principle without significant improvements in economic activity rates and, by implication, the health of working-age adults. The concluding section advocates the strategic necessity of a more proactive approach to enabling people to work for longer.

The report also points to the role of the financial services sector: in encouraging individuals to enhance their life-time earning/saving capacity; in providing flexible options when economic activity is interrupted or declines; and in helping people to decide how best to use their private stores of wealth to supplement the state pension.

Chapter 1: Life expectancy free of disability and in good health

Life expectancy and, within that, state-of-health expectancy are important high-level measures for population wellbeing. Period life expectancy at a given age, for any area, is the average number of years a person would live if he or she experienced that area's age-specific mortality rates. Cohort life expectancy, by contrast, is based on the mortality experience of the specified cohort for a given birth year. This research is concerned with both.

In contrast, state-of-health expectancies provide estimates of how long a person can expect to live in very good health, good health or disability-free. The two definitions used today are healthy life expectancy (HLE) and disability-free life expectancy (DFLE). Data to determine HLE and DFLE are based on self-assessment and are collected in the Annual Population Survey (APS), which is a large rolling survey based on some 320,000 households. It covers ages 16 to 95; the health status of those outside this age range is estimated using a combination of census data and imputation.

Box 1 provides details of the questions asked of respondents. HLE, which is the simpler of the two, establishes whether a person's health is simply good, fair, bad or very bad. DFLE tests whether health or disability problems affect one's ability to carry out normal daily activities. These include household chores, such as washing and dressing, shopping and so on. It also draws a distinction between conditions that affect one's ability to carry out activities of daily living either 'a lot' or 'a little'.

The methodology and data collection methods have undergone various changes to improve their accuracy and to harmonise definitions with those used elsewhere. Most notably, these include changes that occurred after April 2013 to bring the definition of disability into line with the legal definition under the 2010 Equality Act. The general framework is consistent with international practice, as set out, for example, in the International Classification of Functioning, Disability and Health (ICF), adopted by the World Health Organisation.

This research concentrates on the most recent period, using data from 2013-15 to measure the prevalence of disability by single year of age, and DFLE expectancy at birth and ages 20, 50 and 65. It also compares adult health expectancies with life expectancy by gender and down to district level, in order to provide a window on the ability to work at older ages – particularly the range of variation between areas of the UK. For actual activity rates, we turn to the Labour Force Survey (LFS), which has been brought into line with the APS in terms of disability.

The LFS allows a consistent picture to emerge of whether a person with a disability is economically active or not. The core age range covered by the LFS is 16 to 64 – above this age, categories are grouped and, therefore, less useful for detailed comparisons. However, APS data enable us to look at older ages in much finer detail, so that we can impute what levels of economic activity to expect assuming the general relationship between economic activity and disability continues to hold.

Of the two definitions, the DFLE is better at discerning the capacity to work because it directly addresses functional capability, whereas the HLE simply deals with illness and general health. In particular, the LFS distinguishes people who report a health issue, but are not classified as having a long-term health problem or disability under the core definition of the Equality Act. We use this important legal definition to separate people who are economically active and disabled from those who are economically inactive and disabled.

The correlation between disability and rates of economic activity can be used to estimate how improvements in health might potentially translate into higher levels of economic activity, while the significant variation in LE, HLE and DFLE by local area shows the gap that needs to be bridged by way of improvement. Since the reasons for economic inactivity can include caring commitments, an improvement in general health, or reduction in disability, will tend to lessen the demands on carers. In other words, there is a double economic benefit depending on whether caring commitments are full or part-time.

Box 1: Defining health and disability-free life expectancy

Healthy life expectancy is defined as the number of remaining years that an individual can expect to live in very good or good general health. The APS asks:

How is your health in general; would you say it was…

Very good?

Good?

Fair?

Bad?

Very bad?

Disability-free life expectancy is defined as the number of remaining years that an individual can expect to live without a limiting long-standing illness.

The APS asks:

Do you have any physical or mental health conditions or illnesses lasting or expected to last 12 months or more?

If yes, does your condition or illness/do any of your conditions or illnesses reduce your ability to carry-out day-to-day activities?

Yes, a lot

Yes, a little

No

The respondent is also asked to take account of what their situation would be like without medication or treatment or any devices such as a hearing aid.

Notes

Guidance is provided on what is meant by activities of daily living. These include washing and dressing, household cleaning, cooking, shopping for essentials, using public or private transport, walking a defined distance, climbing stairs, remembering to pay bills and a variety of moderate manual tasks.

How much assistance a person needs to carry out daily activities is used to judge whether to answer 'a little' or 'a lot'. 'A lot', for example, would be appropriate for someone usually needing some level of support from family members, friends or personal social services for most normal daily activities.

Prevalence of disability and ill-health

Ideally, we would like to use data linking census or survey records to deaths, as this would enable a direct relationship to be identified between mortality and health status. The ONS does not currently offer this facility to statistics users. However, the question is important, especially if it shows that people who become ill or disabled at younger ages live for more years than those who become ill or disabled at later ages. If true, it means that policies that seek to delay the onset of disability or ill health through health improvement programmes at home, school or in the workplace can be better evaluated.

Working with the ONS, we commissioned tables that combine data on the prevalence of people in good health with standard life tables. Tables by single year of age were produced from birth to 95 for each gender (health data for ages 95-plus are less reliable for sampling reasons). As the following will show, this way of presenting the data is extremely useful in uncovering the impact of poor health on labour market participation, and especially the potential to work at older ages.

The results have obvious ramifications for economic output, as well as welfare implications. They emphasise that policies to prevent people from becoming unhealthy and to promote better health are likely to be cheaper than, say, prolonged economic inactivity. Box 2 demonstrates this point. Chart (a) shows two curves based on a standard population of 100,000. The blue curve is the number of people who are expected to survive using a standard UK life table; the red curve is the number at each age that are disability-free based on the APS.

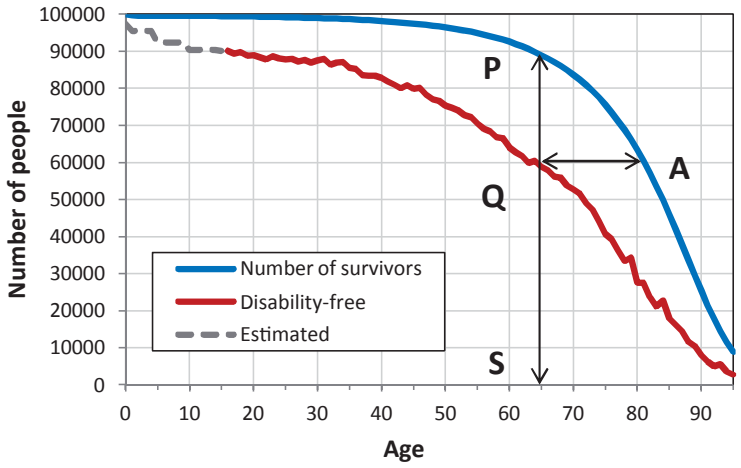
The area encapsulated by the two curves represents the number of life-years exposed to disability. Dividing this quantity by 100,000 gives the difference between DFLE and LE from birth (which is how the gap between life expectancy and disability-free life expectancy is generally expressed). The higher the gap, the greater the number of years and proportion of life spent in disability and vice-versa. In an ideal world, this should be as small as possible.

The ratio between PQ and PS in chart (a) represents the prevalence of disability at each age. The horizontal line QA, by contrast, represents the approximate number of years from becoming disabled to death. It is a crude representation because, as noted, it is not possible to link the lives in each curve directly. In essence, we assume that people die in order of becoming long-term sick or disabled. (This breaks down in the case of death by accident – hence the approximation.)

Chart (b) is derived from chart (a) and shows the prevalence of disability by age. The blue line is for people with any disability and the orange one for those whose activities of daily living are affected to a lesser extent ('a little'). Overall, disability prevalence follows an exponential pattern increasing to over 70% by age 90. The prevalence of disabilities with fewer restrictions on activities of daily living account for more than half of all disability up to about age 50, but it then levels off, giving way to more severe disability, which is far more typical at older ages.

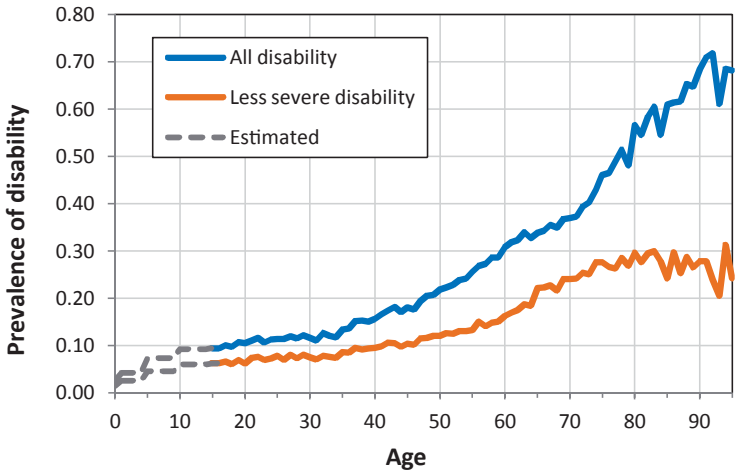
Box 2: Longevity and the prevalence of disability

(a) Chart showing the population still alive with and without disabilities (Base = 100,000)



Definitions: Prevalence of disability = PQ/PS Years spent in disability or long term illness = QA

(b) Prevalence of disability in the population based on the APS showing the 'lot/little' boundary



(c) Life expectancy and DFLE at given ages

Age	Life expectancy	DFLE	Health gap (years)	% of remaining life in good health
0	81.3	62.8	18.5	77.2
20	61.8	45.1	16.7	73.0
50	32.8	20.2	12.6	61.6
65	19.9	10.5	9.4	52.8

Source: ONS

Table (c) of Box 2 shows LE and DFLE at birth, and at ages 20, 50 and 65. Although this shows the expected pattern, it conceals the wide variation between the time individuals actually spend in ill health and the averages for different cohorts. Also, the severity of any disability will vary from person to person and this will affect the ability to work. In Chapter 2, we investigate further the relationship between disability and economic activity and how it varies with age.

Another important finding is that the number of years from the age of onset of a disability to death reduces on average by six to seven months each year. This suggests that a person who contracts a long-term limiting illness at age 20 can expect, on average, another 43 years of life; at 50 it is 26.3 years and at 65, 17.7 years. This reinforces the point that delaying the onset of a limiting illness significantly reduces the proportion of remaining adult life spent in ill health. Not only is this beneficial to individuals but also to society as a whole because it reduces life-time healthcare costs.

One reason that age 50 is worth a closer look is that this is when economic activity rates peak, with a decline setting in well before the SPA. A disability-free man of 50 can expect about another 20 years free of disability, but this hides a lot of variation. The data show that at age 50, 19% of men have some form of disability (9% 'a lot'), and 25% of women (11% 'a lot'). By 65, a third of men and 35% of women have some form of disability. The 50% threshold occurs at 78 for men and 76 for women. Average levels of disability in the whole adult population are 23%, and in the working age population (20 to 64) 19%.

These insights apply at national level, but disaggregated data at a district level show significant variations in life expectancy and even more variation in disability-free and healthy life expectancy. Since disability is a key determinant of economic inactivity, we compared the HLE of men and women living in different areas in order to assess differences in the potential capacity to work. If HLE is relatively high, we assume the capacity is greater than if it is low. When it is low, more people are dis-enabled since the prevalence of disability is higher.

ONS aggregates the results into age bands so, for practical reasons, we chose a midpoint age of 52, rather than 50, for this part of the analysis. In Figure 2, HLE is plotted against life expectancy by district, with each data point representing a different district and the dotted, best-fit, line representing the average trend. The vertical lines (AB and PQ) show the gap between HLE and LE at either end of the life expectancy range. The larger the gap, the greater the number of remaining years spent in ill health or disability, and hence a greater level of dependency than for a person in good health.

The extremities of the distribution range from male HLE at age 52 of 10.7 years in Tower Hamlets to 25.3 years in Wokingham, Surrey. Now, assume a hypothetical SPA of 70: a man aged 52 would require at least 18 years of healthy life to be sure of being fit for work up to that age, although this would depend on the type of occupation. Based on district level data, the figure of 18 years would currently only be achievable in 68% of districts across the UK. For women at 52, HLE reaches 28.6 years in the Orkney Islands, and the equivalent ranges are AB = 12.5 years and PQ = 15.2 years. Hence, the size of gap is greater, but the range of variation is less.

There is a well-established positive correlation between poor health and deprivation and low income and educational attainment. An implication of our findings is that back-to-work policies for people aged 50-plus will be less effective in deprived, low-skilled areas where poor health is endemic. Policies that maintain and prolong good health are more likely to bear fruit by increasing the long-term capacity to work in a wider range of occupations where any form of disability is a barrier. The key point is that the causes of disability are amenable to change if policies can be targeted at preventable conditions causing the most harm.

As socio-economic position is an indicator of working conditions, one expects to see a higher prevalence of activity limitation among those working in manual occupations. However, with the shrinkage of hazardous jobs associated with heavy industry, the causes of ill-health and disability are increasingly linked to lifestyles rather than particular occupations. For example, research has shown that some in manual occupations in more affluent areas have the same DFLE as those in managerial or professional occupations living in more deprived areas. Thus, context is important, including geography and local health behaviours.

Figure 2: Variations in healthy life expectancy at district level in the UK as compared with life expectancy

Key: Line AP = life expectancy; Line BQ = healthy life expectancy

Source: ONS

Implications: income replacement

The 2013 Sergeant Review of Simple Financial Products commissioned by the UK Government recommended that, as a high priority, the industry (led by the Association of British Insurers) should work on an income replacement product. This would address directly the risk of becoming disabled and losing earning capacity. The increased fragmentation of employment and growing ranks of self-employed – to nearly 5 million – suggest that demand ought to be growing for this type of product.

However, four years on, in early 2017, the ABI abandoned the project. According to FTAdviser, the industry body said the environment had changed and claimed that "better and more effective mechanisms have emerged to deliver on the aims of the Sergeant Review". Sue Lewis, chairman of the Financial Services Consumer Panel, questioned whether the industry was motivated to produce "straightforward, easy to understand, value for money products".

Chapter 2: Labour market activity and health

Poor health, whatever its causes, can be seen as a strategic issue in an ageing society, especially where it becomes a constraint on economic growth and leads, for example, to higher taxes. In this chapter, we analyse the relationship between work and health in greater depth. We consider the relationship between economic activity and age, and how it is affected by health. To understand the transitional processes over the life cycle, it is necessary to analyse the data at a finer level of detail than is typically the case.

The Labour Force Survey (LFS) defines adults as either economically active or inactive, but it also subdivides them according to whether they are disability-free, or not. In theory, a person can be in one of four states: economically inactive and disability-free; economically active and disabled; economically active and disabled; and economically active and disability-free. Note that an unemployed person is one who is seeking work, and is therefore deemed to be economically active from a labour market perspective.

As annex A explains, the LFS distinguishes people who report a health problem, but are not classified as having a long-term health problem or disability under the Equality Act (2010). Importantly, the harmonised definition of disability is now the lead statistic for the labour market status of disabled people in Britain (the Act does not apply to Northern Ireland). As was seen in Box 1, this includes anyone who says they have a long-term physical or mental health condition or illness, regardless of the impact this may have on their ability to work or carry out day-to-day activities.

However, there are some caveats to this. Since the current definition of health has only recently become available, we are unable to report changes over time in levels of economic activity by age, using a consistent definition. The data also rely on people acknowledging they have a health problem, which not all do. Because the LFS mainly samples people of working age, information about workers aged 65-plus tends to be less reliable and based on small samples, so we have used the Annual Population Survey (APS), with which the LFS is harmonised, to help fill the gaps.

Table 1 shows a breakdown of the population, in millions, based on the four defined groups. A and B refer to the inactive population, either healthy or disabled, and C and D to the economically active, either healthy or disabled. The 65-plus age group can be divided into economically active or inactive, but cannot be reliably broken down further. From October 2015 to September 2016, 30.9m were economically active from age 20-64, and 17.1m inactive. Of the 6.7m disabled aged 20-64, identified by the LFS (18% of the total), 3m were economically inactive and the rest active.

Table 1: The number of people in different age groups by economic activity and health status (October 2015 to September 2016; millions)

Key	Category	20-49	50-64	65+ (1)	Total (2)
A	Economically inactive disability-free	2.48	1.54		
B	Economically inactive disabled	1.45	1.55	9.91	17.13
C	Economically active disabled	2.33	1.35		
D	Economically active disability-free	18.78	7.03	1.17	30.87
	Total	**25.04**	**11.47**	**11.09**	**47.60**

Notes: (1) & (2) Totals include people who did not state their health

Source: ONS Labour Force Survey

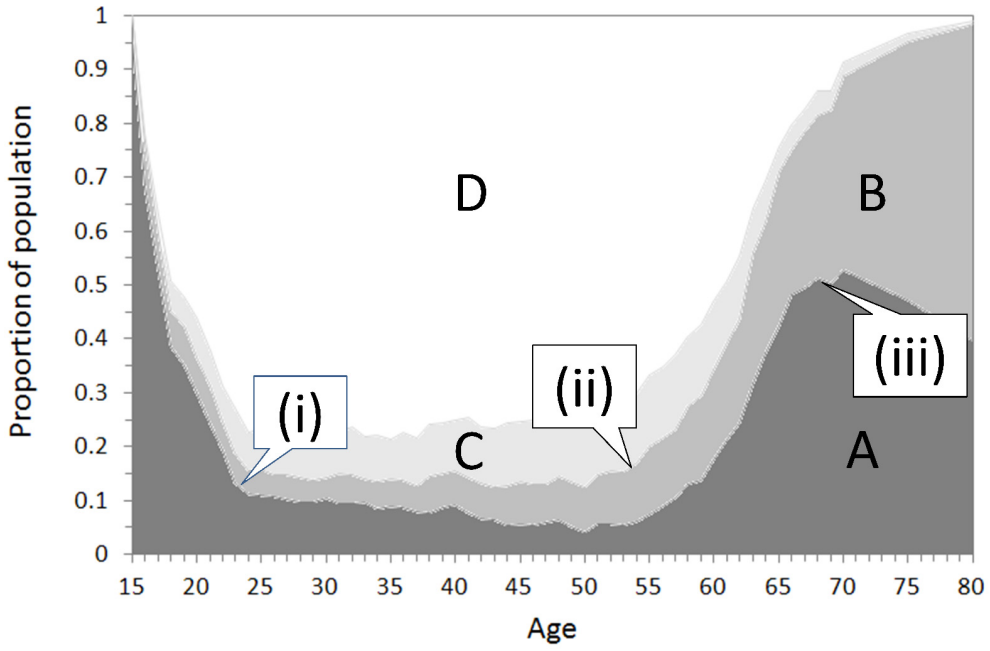
Since the APS and LFS surveys are conducted for statistical purposes, they are unrelated to other purposes such as determining a person's eligibility for disability benefits, which entails a completely different process. A straightforward claimant count would lead to different totals, partly because some are entitled to more than one benefit, and also due to definitional differences. When this is taken into account, the DWP puts the number of inactive working-age claimants of disability benefits at 2.9m, which comes close to the 3m figure in category B (1.45m + 1.55m = 3m).[6]

Further insights are obtained when these figures are re-presented by single year of age. Box 3 gives a proportional split of the population, from 16 onwards, into the four categories. The general picture is that the economically active population starts to level out after age 23 as graduates move into employment, and this continues until 55, after which the rate of economic inactivity rises steeply. The LFS gives the main reason for economic inactivity as sickness and disability, but other important categories are looking after a home or caring (especially among women), early retirement or being a student – although their relative importance varies over the life cycle.

The next significant change occurs at around 70. By this age, the percentage of people who are economically active has fallen to less than 12% of the population. The rest consists of 36% who are inactive disabled and 52% who are inactive and disability-free. At older ages, the proportion that is inactive and disability-free falls steeply, with 70 marking a turning point. The significance of this is that rises in the SPA beyond 70 cannot be relied upon to produce people available to work because the number that are not disabled (i.e. without a long-term limiting illness) dwindles rapidly.

6. Although the totals correspond, it does not mean that there is a perfect match between people claiming benefits and these responding to the surveys and vice versa. Some may not claim benefits for which they may be entitled and others claim benefits to which they are not entitled.

Box 3: Economic activity by age in 2015



Source: ONS, Labour Force Survey October 2015 to September 2016

Chart showing the proportion of the population aged 15-80 in one of four given states:

A: Economically inactive disability-free;
B: Economically inactive disabled;
C: Economically active disabled; and
D: Economically active disability-free

Notes: (i) The proportion of the population that is economically active starts to level out from age 23; (ii) the rate of economic inactivity rises sharply after age 55; (iii) the availability of economically inactive disability-free (i.e. potential workers) falls sharply beyond age 70.

Gender variations in economic activity and working to older ages

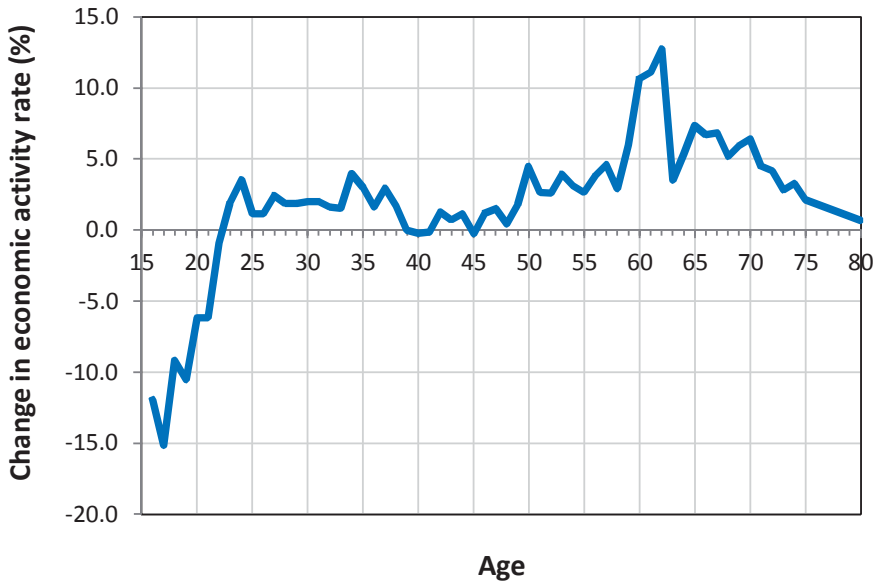
Levels of economic activity vary between men and women, especially in the age range 23 to 55 when levels of female economic activity are 10 to 15 percentage points less than men's at similar ages. The child-raising years create a gap in women's income and also affect future income-earning potential.

The most important long-term change has been the increase in female activity rates relative to men. In 1970 about 55% of women aged 16-64 were economically active and 95% of men. Since then, male rates have fallen to 84% and women's have increased to 74%. The growth in the proportion of women in the labour force is strongly related to the rising number of mothers re-entering the labour force and remaining in employment for longer. This strategic shift in patterns of work reflect changes in the labour market, in particular a transition from manufacturing to service industries and much greater interchangability between traditionally male and female jobs.

In the 10 years to 2015, the number of economically active people rose from 30.4m to 32.2m,[7] reflecting the growth in the UK population coupled with a buoyant and flexible jobs market. However, change can also be seen in the age structure (see Figure 3), with falls in the percentage of economically active people below 23 (for educational reasons) and higher activity rates at older ages.

Especially interesting is the growth in economic activity from age 60, although from a much lower base. This is a reaction not only to the increase in the women's SPA, as well as squeezed household incomes, but also to the abolition of the default retirement age of 65. From a policy standpoint, the increase in activity rates at older ages is a welcome sign that people are responding to the stimuli of higher pension ages and the removal of barriers to working for longer.

Figure 3: Change in economic activity rates by single year of age between 2005 and 2015



Source: ONS, LFS

7. Mayhew, L.D., D. Smith and B. Rickayzen (2017) Flexible and affordable methods of paying for long-term care insurance (forthcoming, North American Actuarial Journal)

Life cycle factors affecting mainly women in the labour market

The transition to higher female participation in the labour force has run in parallel with significant changes in household structures and living arrangements. Most households are childless, fewer people are getting married and those who do are more likely to end up divorcing. These trends have been accompanied by an increase in the average age at which first marriages occur, and by rising levels of cohabitation as a replacement for, or pre-cursor to, marriage. More women enter university today and the delay in child-bearing is linked to their educational level.

Access to further education has been the most important driver of changes in female labour market behaviour. Although women have overtaken young men in terms of average educational attainment, men and women still engage in different fields of study. While a large proportion of females graduate with degrees in humanities, female participation in science and engineering remains relatively low, affecting future earning prospects. Many women choose careers such as teaching or nursing that pay less but are more flexible, in which career breaks and a return to work are easier to manage.

These factors also account for a much larger share of female than male employment being part-time. Despite an improvement in the labour market situation for women, gaps persist in employment outcomes. These are reflected in differences in responsibility levels, with fewer women in managerial positions, leading to lower life-time earnings and poorer pension prospects. This means they find it harder to be financially independent of their partners, and poorer still if they are a lone parent trying to juggle raising children with work.

In general, couple households give rise to more resilient living arrangements, especially those in which there are two incomes and access to affordable childcare. Family breakdown is expensive from a personal and welfare payment standpoint, and so it is to the state's advantage to pursue policies that respond to people's needs at different points in the life cycle. Labour market policies tend to be of the 'single issue' variety, such as equal pay, the minimum wage, maternity or paternity leave. Pension arrangements, in contrast, tend to be centred on the individual rather than the household or family.

Caring for ageing relatives or a sick partner is a good example of how unexpected events can affect employment prospects in unpredictable ways. Data on the Carers Allowance, a UK benefit for people with caring responsibilities, show that women are the main carers, with their numbers peaking between ages 35 and 59. Some care durations last 10 years or more – although the average is much less. The same data show that male carers are much fewer, but gradually increase in number with age – presumably looking after a sick parent or partner.

An increasingly common phenomenon is overlapping caring responsibilities towards children and elderly parents, which are demographic in origin. The affected cohort has been dubbed the 'sandwich' or 'pivot' generation, but how predictable is this eventuality and what can be done? Using newly available data on health, it should be possible to model with greater clarity the prospective timing and duration of sandwich years. This would enable the development of bespoke insurance policies and financial products, such as care annuities, to tide people over the loss of income[8]. Although a full analysis is beyond the scope of this research, a simple rule of thumb is proposed for determining the potential number of sandwich years, based on the birthdays of the youngest child and oldest grandparent.[9]

Consider three generations with the middle one caring for the generation on either side. If the age at which children attain independence is L and the age at which elderly care starts is U, then the condition for sandwich years to occur is $s - f > U - L$, where s is the youngest child's year of birth and f is the oldest grandparent's year of birth, with the number of sandwich years given by $(s - f) - (U - L) = n$. For example, assume the child was born in 1993 and the grandparent in 1920; let L equate to adulthood, i.e. age 18, and the age of infirmity U be 85. The formula predicts up to six sandwich years in this example – depending on when the grandparent dies. Clearly, this would not have arisen had the youngest child been born six years earlier.

8. Mayhew, L.D., D. Smith and B. Rickayzen (2017) Flexible and affordable methods of paying for long-term care insurance (forthcoming, North American Actuarial Journal)
9. Mayhew, L.D.(2010) The UK Care Economy: Improving Outcomes for Carers. Commissioned report by Carers UK.

Implications: the employment gap

The cost of working-age disability-related benefits is a longstanding issue. Numerous government attempts over many years have not reduced the problem by nearly enough. There is controversy, for example, over the issue of whether older long-term unemployed people are simply 'parked' on disability benefits until they qualify for the state pension.

A government report published in November 2017, 'Improving Lives: the future of work, health and disability', set out how the aim of seeing one million more people in employment, over the next decade, might be achieved. It proposes a target of halving what it calls the disability employment gap – the difference between the employment rates of disabled and non-disabled people. Action recommended for employers ranges from recruitment and retention of disabled workers to managing employee ill health.

While the long-term aim must be to improve the capacity for people to work for longer through health improvement, in the short term there is a transitional gap caused by rises in the SPA, affecting women in particular, and the large cohort of disabled people of older working age.

Some have criticised the legal framework allowing people to access pension savings from 55, saying that it depletes the pot too early. But there are two important reasons for allowing access 10 years before the SPA (and as that rises, this may become even more important).

The first is as a bridge to the state pension, covering a decline in earnings from about the age when, as this report shows, it becomes more likely. The second is that the lump sum can be used to pay off debt, including mortgage debt, so reducing outgoings at a time when earnings go into decline or become less certain.

The 'Independent Review of the State Pension Age', led by John Cridland (presented to Parliament in March 2017), suggests a 'Mid-Life MOT' to provide holistic financial advice with a 30-year time horizon. It is envisaged that employers would be the facilitators. Since most employers have no experience of this, the most effective provider of advice and guidance is the financial services industry, which is more used to dealing with individual financial circumstances.

Our report highlights the risk that, for women in particular, careers may be interrupted by caring responsibilities. It notes that 'sandwich years', where caring for children and an elderly relative overlap, are becoming more frequent but also predictable. This is an example of where innovation in annuity design could help cover short-term income shortfalls.

Chapter 3: Earnings and pension adequacy over the life cycle

The traditional career path of staying in one job throughout one's working life is no longer the norm; instead people are more likely to have one profession but multiple jobs with several employers. This is why a good education and professional qualifications are an important form of income protection – a so-called 'meal ticket' for life. The bottom line is that the ability to save, start a family, buy a house and pay off loans is related to income over the life cycle, where the main form is remuneration from work.

For those who have paid down debt and accumulated wealth, income streams will tend to diversify, and having a job becomes less important. For others, work remains the main source of income – but, as we have seen, the ability to work is also dependent on health. In the UK, there are 2.9 million working-age people claiming disability benefits[10] worth £36bn a year (the actual number who are economically inactive and disabled is closer to 3m, based on the LFS, but not everyone claims or is eligible). DWP data show that of the total number of disability benefit claimants, around 48% also claim housing benefit, adding another estimated £7bn to the cost.

The question addressed in this chapter concerns the ability of men and women to build up a private, or defined-contribution (DC), pension during careers that may be interrupted by spells of inactivity and job change, or shortened by ill health, disability or other circumstances. The results are presented in tabular form along the lines of: 'If I worked for x years and my income was the typical average for my age, what size of pension pot could I accumulate?'

Clearly, it is not possible to know for certain what investment returns will be, how much income you will have, whether you will become sick or disabled, or the ultimate size of your pension pot(s). However, the issue is strategically important for three reasons. The first is the demise of defined-benefit (DB) pension schemes based on length of service and final salary. These arrangements are costly to employers and do not fit neatly with modern flexible career paths. Second, the gap left by falling DB provision needs to be filled by other schemes – typically DC, in which the individual bears the risk in terms of how much to save, investment performance and when – and how – to cash in a pension. Third, the higher SPA will force people to consider how to cover any income gap without necessarily having to work for longer.

We choose as our example a person, man or woman, who earns the average for his or her age over the life cycle. Bearing in mind variations in the pattern of pension contributions, we assume that a person can start or terminate contributions at any time, depending on their situation and the job they are in. In general, the sooner a person starts to save for a pension, the longer funds will be invested and the greater the eventual returns. For interrupted careers, contributions may cease for a period before resuming, and so the eventual pension pot will be smaller.

10. Figure based on working-age individuals and includes benefit combinations comprising employment support allowance, incapacity benefit, severe disablement allowance, injury benefit, disability living allowance, and personal independence payments (source: DWP).

Average annual earnings by age and gender

Men and women's gross annual average earnings by year of age are shown in Box 4. Based on ONS data from the Annual Survey of Hours and Earnings (ASHE), the chart combines full and part-time work to derive a fair representation of the earnings potential of individuals, regardless of the hours worked. Although the data are sparse for people above the SPA or below 20, and do not include other income sources, we find that age-related male annual earnings closely follow a parabolic shape, peaking at age 47. The roots of the parabola cross the axis at 15 and 79 when notional average gross income is zero, suggesting a theoretical work span of 64 years!

The picture for women is distorted due to the greater incidence of part-time working and interrupted careers, the combined effect of which is to depress the gross average. For this reason, the figures are not representative of their earnings potential. However, if we were to compare men and women in full-time work, we would still find that annual earnings for women are lower, at £28,000 compared with £37,000, based on ASHE data. It is also apparent that the same parabolic pattern does not apply to women, reflecting the greater complexity of their working patterns. For the purpose of building a pension, it is life-time earnings that are relevant, so we need to weight the averages by economic activity rates at each age.

Taking all this into account, the life-time average earnings of men are around 80% greater than for women, assuming that the relationship between income, age and economic activity holds true over time. Chart (b) in Box 4 shows average earnings weighted by age-related rates of economic activity. Since activity rates are always less than 100%, the chart shows average earnings to be considerably lower because it includes those working and not working. The gap between weighted and unweighted earnings expands with age, as inactivity increases.

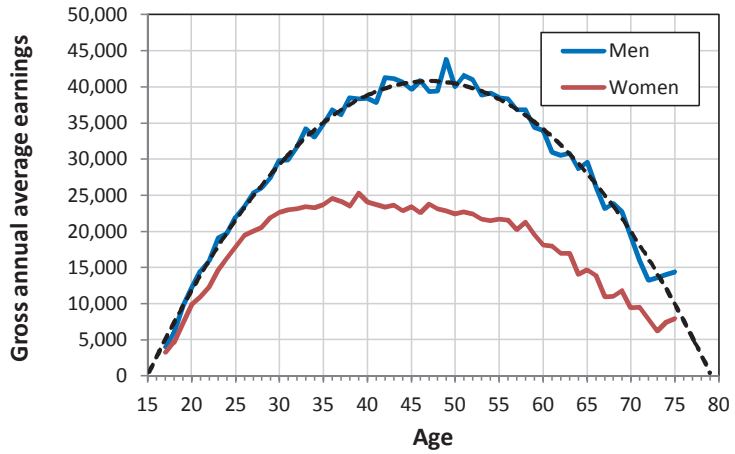
If the pattern in Box 4 in 2015 is compared with that of 2005, we find that nominal earnings were more at every age in 2015. However, after uprating earnings data from 2005, using changes in the Consumer Prices Index, we find that male gross annual earnings, in real terms, are lower in 2015 between ages 17 and 55 and higher after 55. The peak year for earnings in 2005 was 44, compared with 47 in 2015. In an ageing population, it is reasonable to expect the age at which earnings peak to increase over time and rates of economic activity to improve. Indeed, this is strategically important for the economy.

The evidence suggests that the purchasing power of incomes has fallen at younger ages compared with 2005, but increased later in life. The Bank of England has drawn attention to the fact that productivity levels and real wages, which are closely linked, are still not back to 2008 levels, although the total number of hours worked has increased (see Bank of England Inflation Report, August 2017). Poor productivity, compared with competitors in global markets, is seen as a major weakness of the UK economy, which could get worse as the population ages.

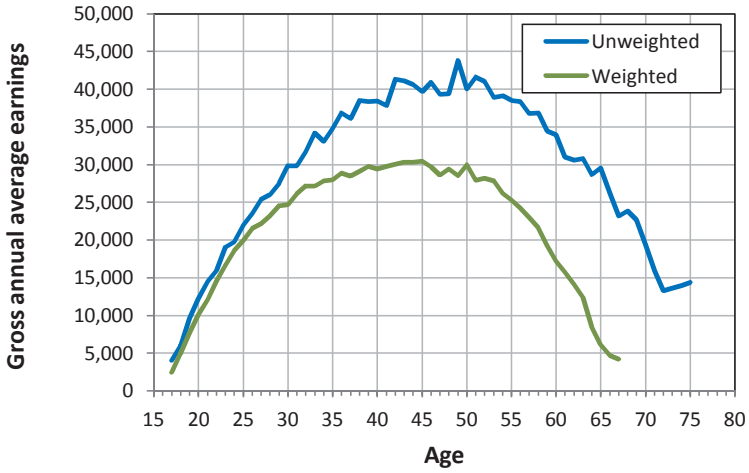
Prospects for income in retirement are bound to be uncertain, but for them to improve three conditions must be satisfied. First, the age at which gross average earnings peaks needs to rise to improve work incentives; second, economic activity rates need to improve, especially at older ages, to boost income and tax revenues; and third, productivity needs to increase to lift standards of living. The evidence is that the first two of these conditions are moving in the right direction, but productivity remains flat. Satisfying these conditions will positively affect pension saving, expanding the private resources available to supplement the state pension.

Box 4: Average earnings over the life cycle in 2015 (Source: ONS ASHE)

(a) Male and female gross average annual earnings 2015



(b) Weighted and unweighted male gross average annual earnings



Key: Weighted = Adjusted for economic inactivity

Source: ONS, ASHE

Impact of working patterns on defined contribution pensions

Notwithstanding pension arrangements in the public sector, the closure of DB schemes to new members in the private sector and the rise of DC have switched the onus of responsibility for pension saving from the enterprise to the individual. Money paid into a private pension scheme by the individual, plus the tax rebate, and by the employer is invested by the pension provider.

The amount people will ultimately receive depends on how much was paid in, how well the investments have done and how they decide to take the money out. They can leave it invested and draw down regular, or irregular, payments; take out a lump sum (a quarter of accumulated funds can be withdrawn tax free); or use all or part to buy an annuity (See the 'Implications' panel at the end of this chapter).

Individuals may have more than one workplace scheme. For example, the government estimates that people will have an average of 11 jobs during their careers, which could mean 11 different pension pots.[11] They may also have a personal pension – self invested or with an asset manager.

The number of people with DC schemes has been boosted by the introduction of auto-enrolment (AE) in workplaces. The employer must automatically enrol employees and make mandatory contributions, unless the individual opts out. In December, the Department for Work and Pensions (DWP) published: "Automatic Enrolment Review 2017: Maintaining the Momentum". This proposes lowering the age of entry to 18, from 22. While the level of earnings that triggers AE would be kept at £10,000, once that is reached the proposal is that contributions should be made on every pound earned (compared with the current start point of £5,876.).

A key issue remains contribution levels. Even when the regime is fully implemented in 2019-20 (and not until the mid-2020s for younger workers), the amount being saved will only be 8% of earnings, with half coming from the employee and the rest from the employer (3%) and the tax rebate (1%).

There are some obvious differences between DC schemes and entitlement to the state pension. The value of the latter depends on the number of years of national insurance contributions, and can include care credits. The equivalent of 35 years is needed to qualify for the full 'new' state pension of £159.55 a week, or £8,297 a year, in 2017-18. The amount that will be received is known with some certainty in advance of reaching the SPA.

With private or workplace schemes, there is no income guarantee. The outcome is the amount accumulated before the individual decides to access it, which they can do from 55. Career breaks for caring do not count. This disadvantages women, who have lower average annual earnings and are more likely to have interrupted careers. The breaks make job switches more common, and that can lead to a proliferation of pension pots. If they work part-time, perhaps in more than one job, they may not earn enough in any one place to reach the threshold for auto-enrolment.

For both men and women who have contributed to a series of pension schemes, it is difficult to see all their pots in one place or to get information about how much they will eventually accumulate. A 'pensions dashboard' is due to be launched in 2019, following work by an ABI-led project group and with the DWP leading on the government side. While this may help people to plan for retirement, it does not produce predictable pension income for elements other than the state pension.

This report recommends the provision of more realistic guides, or bespoke calculators, which combine contribution periods with various start and end ages, and different crystallisation points. This would not replace arrangements enjoyed by higher earners, who make lump sum contributions from time to time, but it would assist those on more modest earnings, who are considering whether to add to their pension savings.

Box 5 illustrates this for men and women by single year of age. It is assumed that the benefits are taken at 65. Contribution levels are based on a percentage of average annual gross earnings, and the durations are based on 10-year segments to keep the size of the tables manageable. The illustrative contribution rate is 10% of salary per annum and the real rate of investment return is 2.5%. Table entries represent the amount that would be accumulated at age 65. To find the outcomes for pot values, it is necessary to pick a start and end age during which contributions are made. If a person has more than one contribution spell because of a career interruption or is in more than one scheme, the pot values of both spells can be added together.

11. The Pension Tracing Service: https://www.gov.uk/government/news/new-pension-tracing-service-website-launched

Box 5: Pension pots based on gross annual average earnings by age (£000s)

(a) Men

	End age									
Start age	20	25	30	35	40	45	50	55	60	65
20	0	28	68	118	175	236	297	358	413	458
25		0	47	97	154	215	276	337	392	454
30			0	59	116	177	239	299	354	400
35				0	68	129	190	251	306	352
40					0	73	134	195	250	295
45						0	74	134	189	235
50							0	73	127	173
55								0	67	112
60									0	56
65										0

A man earning the gross national average salary for his age and contributing 10% towards a pension each year, compounded annually, would accumulate a pension pot in the ranges given, assuming a real investment return of 2.5% pa. It is also assumed that the benefits would be taken at 65 and so would accrue to that age. For example, a man saving for a pension from age 30 to 55 would accumulate a pot worth £299,000.

(b) Women

	End age									
Start age	20	25	30	35	40	45	50	55	60	65
20	0	22	54	89	126	162	196	230	260	285
25		0	37	73	110	145	180	213	244	257
30			0	42	79	115	150	183	214	238
35				0	44	80	115	148	179	203
40					0	43	78	111	142	166
45						0	42	75	106	130
50							0	40	71	95
55								0	37	62
60									0	30
65										0

A woman earning the same as the gross national average salary for her age and contributing 10% towards a pension each year, compounded annually, would accumulate a pension pot in the ranges given assuming a real investment return of 2.5% pa. The amounts would be less than for a man and even less if career breaks are taken into account. For example, if she worked from 25 to 35, then took a break of 10 years before resuming work at 45 for another 10 years she would accumulate a pot worth £73,000 plus £75,000 = £148,000.

The results are only illustrative since investment performance cannot be guaranteed. The contribution rate is higher than in the current AE regime but not nearly as high as some experts recommend[12]. The point being underlined is the variation in pension pots caused by differences in male-female average earnings over the life cycle. Other implications include the importance of starting pension saving early and of making contributions when earnings are highest. However, it also shows that it is never too late to start a pension because of contributions by the employer and tax relief, although there are limits to both annual contributions and the life-time size of the pot.

The way the pot is ultimately used is flexible. While buying an annuity is no longer the default option for taking pension income, this option does turn the accumulated pot(s) into a regular income, which is what a DB scheme would do, and so provides a useful benchmark. Using the pot sizes shown in Box 5, Annex B shows that an index-linked annuity, based on a pension pot worth £100,000, would generate a gender-neutral (under gender equality regulation) initial annual income of £4,329 at age 65.

For a person to have an annuity as large as the new state pension – about £8,300 – the pot size would need to be around £192,000 at the point of purchase. Based on the table in Box 5, a man on average earnings for his sex, saving 10% of it a year, could achieve this in as little as 15 years – for instance, between 40 and 55. However, a woman saving between those ages would only amass £111,000. This is a stark demonstration not only that the outcome depends on contribution levels, but also that the different patterns of male-female earning have a big impact.

While the average value of the typical pension pot is only around £35,000, i.e. very small indeed, this can be expected to grow as DC systems bed in.[13] Also, it masks the fact that people may have saved for more than one pension.

Implications: cumulation phase

The messages that need to be imparted include that saving even a small amount can add up to a meaningful pension pot over four and half decades. Particularly important are the contributions from employers (3% under the AE regime is a minimum), investment returns (the risk-reward concept) and compound interest (described by Einstein as 'the greatest mathematical discovery of all time').

Tax incentives are an important component of the propensity to save, whether through relief on pension contributions or tax-free savings vehicles. However, asking young graduates to repay their student loans and contribute to a pension, while saving for a deposit on a house, has become an increasing challenge. This calls for better explanations and targeted advice on the choices available and best courses of action.

Depending which plan the student loan falls under, repayments start at £17,775 or £21,000 (to be raised to £25,000) at 9% of salary. Added to 20% income tax and 12% National Insurance, this creates a marginal tax rate of 41%. Pension saving comes on top of this, and so for younger workers the employers' contribution and tax 'top-up' are particularly crucial in promoting the need for pension saving.

The Cridland review suggested that couples should be able to combine their pension saving, following the Swiss example. This report believes that the system of individual pots and entitlements, as now enacted in state pension policy, should be enhanced. One partner could be allowed to pay into the pension fund of another, utilising the recipient's spare headroom for both contributions and tax relief.

12. The minimum contribution (employee and employer) into a workplace pension is 2% of earnings, rising to 5% in 2018 and 8% in 2019. The 'Independent Review of Retirement Income' (Blake, 2016) recommends 15% of salary to produce a reasonable standard of living in retirement.

13. Defined contribution pensions are still relatively new and pot sizes vary widely. For persons aged 55-plus and earning between £35,000 and £50,000 a year, the average value of pension pots is above £35,000 but the median value is much lower at less than £20,000 (ONS 2010/12 and ABI). In addition many people have more than one pension pot and so the true value will be considerably higher.

Implications: decumulation phase

A key difference between defined benefit and defined contribution schemes is that the former focuses on pension income, whereas for the latter, the priority is to build up as large a pension pot, or pots, as possible. Once that is done, in a DC world, a decision has to be made about how to turn the funds into income.

The pros and cons of three options are set out in a 2015 report, written by the author of this report, Prof Les Mayhew, and colleagues at Cass Business School.[14] The options are: withdraw all, drawdown or annuitise, and the conclusion is that for most people, annuitising is not necessarily the best option.

Drawdown is preferable, in particular, where the individual has a bequest motive and other assets to fall back on.

Our research suggests that people will start to view their pension pots, home and other assets collectively as a source of retirement funds. This report draws attention to the importance of health as an enabler for individuals: to continue working to build up their pot(s); to have flexibility over when drawdown (or annuitisation) starts and unfolds; and to keep funds invested in risk-seeking assets for longer (for example to pay for long-term care).

The way individual circumstances and motives interact with the three options

Ticks indicate generally 'applies'

Option	Instant and flexible access to whole pot	Avoid higher rate tax implications	Gift or bequest opportunity	No danger of money running low	Avoid IHT implications (1)(2)
(A) Withdraw all	✓	×	✓	×	×
(B) Drawdown	✓	✓	✓	×	✓
(C) Annuitise	×	✓	×	✓	✓

1. IHT: Inheritance Tax
2. e.g. if a person with a large pot withdraws all of it but dies before spending it

14. Mayhew L., Smith, D., Wright, I. D. (2015), 'Pension pots and how to survive them', London: International Longevity Centre UK (ILC-UK); sponsored by: International Longevity Centre UK (ILC-UK)

Chapter 4: The dependency ratio and state pension age

The macro-picture places individual experiences in the context of economic and demographic trends. Without any change, those trends suggest a decline in real average earnings, a squeeze on the supply of people able to work at older ages, lower pensions and consequent problems in sectors such as health and social care. The key question facing policy makers is whether the state pension system is sustainable, or whether there will be a return to the pensioner poverty of previous decades.

In this chapter we use the concept of the dependency ratio to evaluate the system's sustainability. We know that people are living longer and that there is upward pressure on the SPA, but how long a retirement we will have depends on interactions between the SPA, longevity and economic activity (generating savings and taxes). In a 'pay as you go' system, state pensions are paid by today's taxpayers. The PAYG principle is that the cost of the state pension must be balanced by national insurance and tax payments: the current average 'contribution rate' is between 13% and 14% of gross salary.

Another policy principle, set out by the government in 2013 (Autumn Statement), is that people should expect to spend, on average, up to one third of adult life in retirement. Effectively, this means a third of adult life in receipt of the state pension. Some question the wisdom of this principle in an ageing society, but it does provide a reference point so that we can judge what conditions are needed to make it sustainable. Productivity, economic activity rates and life expectancy are important factors, and all are influenced by the health and fitness of the adult population.

The stakes are high. The Office for Budget Responsibility estimated that spending on the state pension in 2016-17 totalled £91.6 billion, with 12.9 million recipients paid an average of £7,100 each. That would represent around 12 per cent of total public spending and 4.7 per cent of national income. If the SPA remained at 65, the pensionable population would increase to 18.1m by 2040, with each extra million people above this age adding about £7bn to the annual cost.

Preventing deterioration in the dependency ratio

The dependency ratio is defined as the number of people aged between 20 and the SPA divided by the total at SPA and above. We note that population projections are built on assumptions about future births and deaths, but they also depend on immigration, which the government is committed to bringing down from 250,000 a year to 'tens of thousands'.

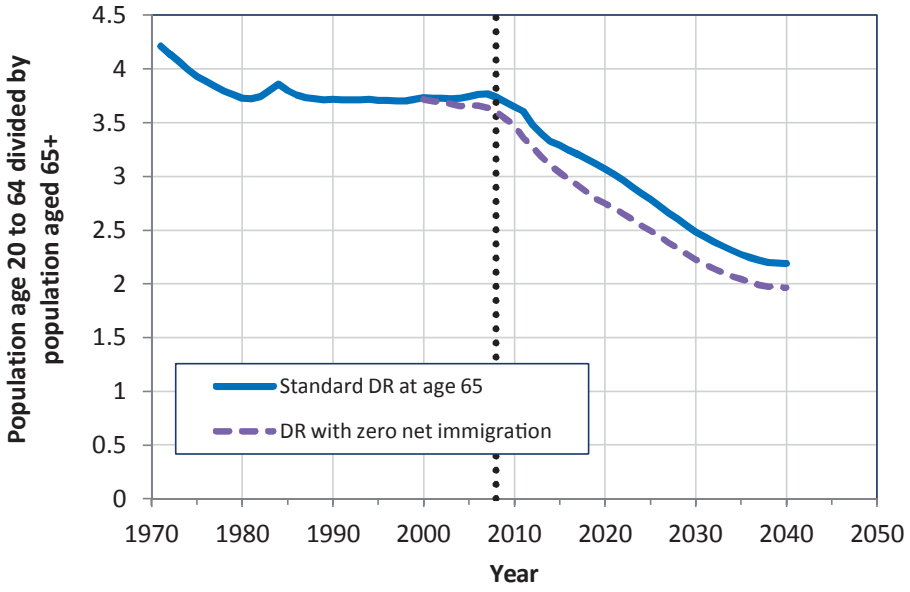
Box 6 shows how the dependency ratio has changed since 1970, and how it is expected to change based on ONS population projections to 2040. The ratio was over 4 in 1970 (i.e. there were 4 working-age adults to each person of SPA and above). It then levelled out at around 3.7 until 2007 when baby boomers started to reach 60. Since then it has fallen year on year and is expected to fall further. By 2040 it would be just above 2, absent changes in the SPA.

Population projections contain various assumptions about future mortality and birth rates. One of the ONS assumptions concerns future immigration, which has mitigated the drop in the dependency ratio. However, several possible scenarios following Brexit are not factored in. One is that EU citizens who have

settled in the UK will return home; another is that UK citizens will emigrate for economic reasons (in the 1960s and 1970s there were net outflows to countries like Australia). The chart in Box 6 shows that (absent changes in the SPA) zero net immigration could lower the dependency ratio in 2020 from 3.0 to 2.8 and by 2040 from 2.2 to 2, affecting both the labour market and the affordability of the state pension.

The next step of the analysis is to predict what the SPA would need to be to keep the dependency ratio constant. Recognising that poor health is a limiting factor in increasing the number of older workers, we also investigate a concept that we call the disability adjusted dependency ratio. This removes people who are economically inactive due to disability (as defined under the Equality Act 2010) from the numerator and adds them to the denominator.

Box 6: The basic dependency ratio



(a) Standard definition of dependency ratio

$$D_{SPA} = \frac{P_{<SPA}}{P_{\geq SPA}}$$

(b) Dependency ratio adjusted for disability

$$D^{d}_{SPA} = \frac{P_{H<SPA}}{P_{\geq SPA} + P_{ID<SPA}}$$

The numerator excludes people who are economically inactive due to disability as defined under the Equality Act 2010. They are added to the denominator and removed from the numerator.

List of variables

$P_{ID<SPA}$ = UK working age population less than state pension age (start age 20)
$P_{<SPA}$ = UK Population greater than or equal to state pension age
$P_{H<SPA}$ = UK population below state pension age who are disability free
$P_{ID<SPA}$ = Inactive UK working age equality act core disabled below state pension age

Source: ONS principal population projections and the APS

Box 7 combines population projections, cohort life expectancy, pension benefits, contribution rates, productivity and activity rates to determine what the SPAs would need to be to keep the ratios constant. Chart (a) is based on the standard definition of the dependency ratio, using the population in 2016 and the projected population in 2030. It shows that the ratio in 2016, at 3.24, is closely aligned with the current SPA of 65, as would be expected. However, using the projected population in 2030, the chart shows that the SPA would need to increase to 68 in order to maintain the same dependency ratio as in 2016 (Point P). Because of the curvature of the ratio, relatively small increases in the SPA deliver increasing improvements in the ratio.

Chart (b) repeats this analysis using the disability-adjusted definition. It shows that the value of the ratio in 2016, at 2.41, is lower than the standard value because more people must be supported. The curvature is also reduced, which means that greater rises in the SPA are needed to deliver the equivalent reductions in dependency – at older ages an increasing percentage of the population will be inactive disabled. In this case, the SPA would need to increase from 65 to 69 to maintain the 2030 disability-adjusted ratio at the same level as in 2016 (point Q).

The results show that the SPA needs to increase at a faster pace than is currently allowed for in legislation, and faster than the Cridland review recommended. This suggests that one of the trade-offs would be to abandon the one-third principle. Other potential trade-offs – in contribution rates, in the relationship between the state pension and average earnings and in the ratio itself – are set out in Annex C.

The analysis suggests there are limits to the degree to which the SPA can be raised without it becoming self-defeating. That is, a higher pension age produces diminishing improvements in labour supply, as well as pushing more people into pensioner poverty or onto means-tested disability benefits. The demographic challenge is to reduce levels of disability in the population, encourage more inactive disabled people into work and help people stay healthier for longer.

As mentioned in Chapter 2, the government's response includes a manifesto pledge to see one million more disabled people in work over the next 10 years (fleshed out by the DWP and Department of Health in 'Improving Lives: the future of work, health and disability', November 2017).

Policies to raise significantly the proportion of disabled people in work can be controversial, as would be a renewal of immigration to swell the supply of economically active adults. Measures to free up adults with caring roles so that they can work would be less so, but require enhanced public services. In the long term, more pro-active public and occupational health policies should aim to tackle conditions that can cause the early onset of disability, such as obesity, diabetes, hypertension, mental illness and muscular-skeletal problems.

How sustainable is the state pension system?

At the outset, we defined the 'dependency trap' as describing a society that is sleep-walking into a conflict between the competing needs of an ageing population for a decent pension and a working-age population that is struggling to save for retirement, with the issues compounded by inequalities in health and income.

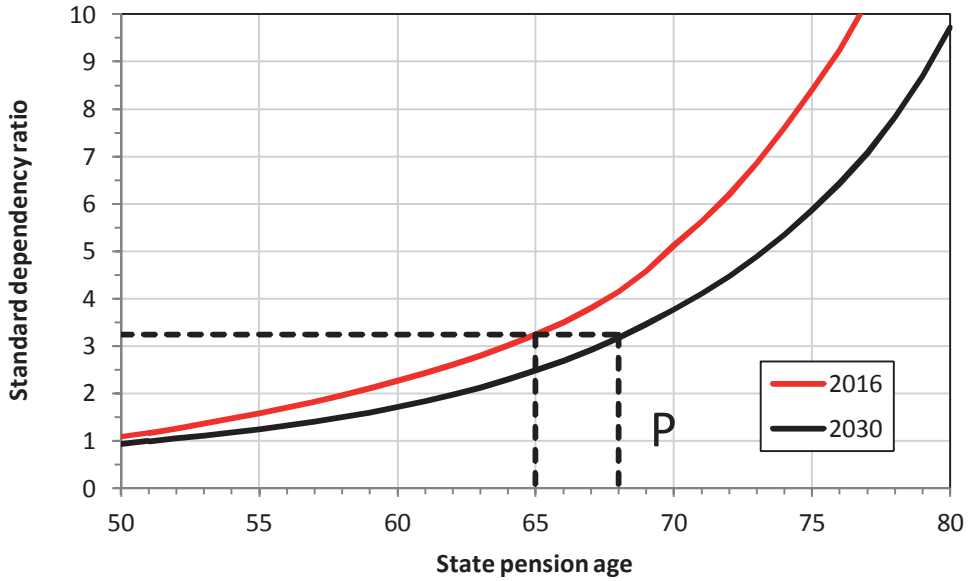
Is there a simple way of measuring whether a society is heading in the right direction? The suggestion of this research is that the one-third principle should be used as a measure of sustainability (see Box 8). For analytical purposes, let us assume that the dependency trap is sprung when the proportion of adult life spent after the SPA falls below one-third.[15]

The trap can be avoided or postponed by raising taxes (national insurance is included in this umbrella term) or increasing the number of economically active working-age adults, or reducing pension benefits. However, to increase their supply, the adult population must grow by natural increase or immigration, or economic activity rates must improve.

15. Note that the one-third principle is controversial. Jane Fuller, for example, calls it 'generous', especially if combined with guarantees about maintaining its value relative to earnings and inflation. See: Fuller, J. (2015) The Death of Retirement. A CSFI (London) report on innovations in work-based pensions.

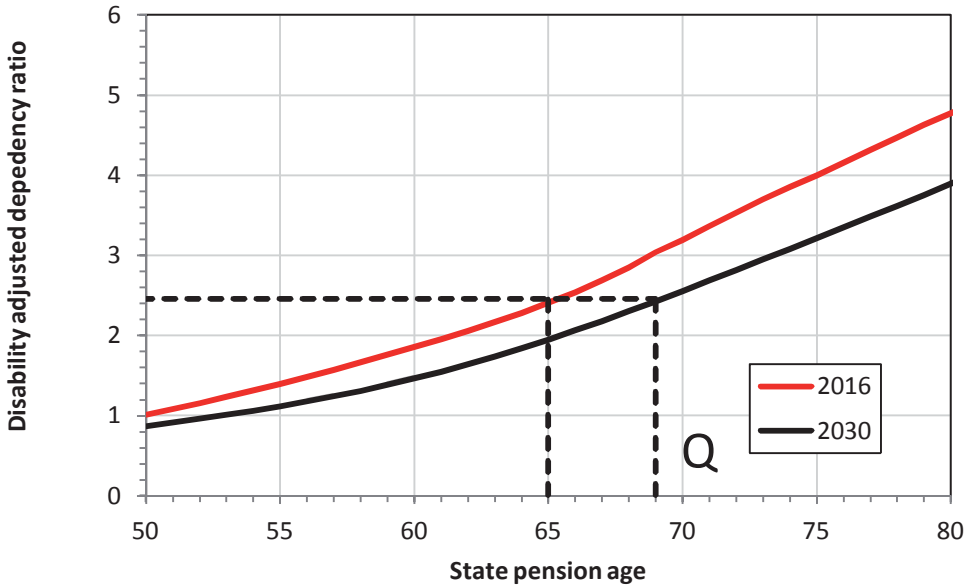
Box 7: Implied SPA based on standard and disability adjusted dependency ratio

(a) Standard dependency ratio in 2016 and 2030



In order to retain the same dependency ratio in 2030 as in 2016, the SPA should rise from 65 to 68 (point P).

(b) Disability adjusted dependency ratio in 2016 and 2030



To keep the same ratio between the healthy active population and the disabled inactive population plus those over the state pension age, the SPA in 2030 would need to be 69 (point Q). This is one year more than using the standard definition.

Box 8: The one-third principle in practice

The UK government established a link between longevity and the state pension age (SPA) in 2013, stating that people should expect to spend, on average, up to one third of their adult life in retirement. Whether this materialises or not depends on life expectancy upon reaching the SPA.

There are two methods of calculating life expectancy. The first is known as period life expectancy and is based on current mortality rates. The problem is that this fails to take account of future improvements in mortality i.e. the 'goal posts' keep shifting. The second method, known as cohort life expectancy, takes into account mortality improvements over time.

To illustrate this, the table below shows the SPA ranging from 65 to 70 for three reference years: 2016, 2030 and 2040, where P is the proportion of adult life spent in retirement and $e_{SPA(year)}$ is the cohort life expectancy of a person reaching SPA in any given year.

The table shows, for example, that the unisex cohort life expectancy of a person with an SPA of 65 in 2016 is 22.74 years, equating to 34% of adult life based on a start age of 20 (see Annex C for further explanation). Since this is greater than 33%, the one-third principle is being met. However, the higher pension age of 67, which will be in place in 2030, is estimated to be worth only 32% of adult life.

If the SPA increases to 68, it will still be worth 32% in 2040, but this crucially assumes that life expectancy will continue to improve at the indicated rate. If, by then, the SPA has climbed higher than 68 to, say, 70 for other reasons, it will be worth only 29%, so falling significantly short of one-third of adult life.

To preserve the one-third principle in each future year, the results imply that the SPA would need to be between 65 and 66 in 2016, between 66 and 67 in 2030, and 67 in 2040. As we have seen the demographic pressure is for faster rises in SPA than are scheduled. This suggests that the 2030s could see the one-third principle being abandoned.

State Pension age	$e_{SPA(2016)}$	P	$e_{SPA(2030)}$	P	$e_{SPA(2040)}$	P
65	22.74	0.34	24.26	0.35	25.30	0.36
66	21.82	0.32	23.33	0.34	24.36	0.35
67	20.92	0.31	22.41	0.32	23.42	0.33
68	19.96	0.29	21.50	0.31	22.50	0.32
69	19.12	0.28	20.60	0.30	21.58	0.31
70	18.24	0.27	19.72	0.28	20.68	0.29

Source: ONS

Key: P is the proportion of adult life spent in retirement and $e_{SPA(year)}$ is cohort life expectancy for a person reaching SPA in the given year.

If we take 2040, for example, ONS population projections show that the dependency ratio would only be 68% of its level in 2017, if the SPA remained at 65. To meet the PAYG principle, there would need to be an approximate 50% increase in contribution levels, or activity rates of well over 100%!

The government would like to avoid both tax increases and a reduction in pension benefits. Its preferred mechanism is to increase the SPA, while maintaining the pension relative to earnings and inflation. This is possible as long as rises in life expectancy align with the one-third principle and earnings go up.

However, rises in the SPA will not solve the problem if this fails to increase the supply of economically active, working-age adults sufficiently to meet the PAYG principle. This could occur if the prevalence of disability worsens, or if disability-free life expectancy at older ages does not keep pace with life expectancy; if life expectancy itself does not advance as fast as expected; or if productivity – and hence earnings – at older ages does not improve.

Disability in younger adults affects their capacity to work according to its severity and whether it affects the activities of daily living. However, even less severe types of disability can adversely affect productivity, and increase absenteeism and the probability of unemployment.

Table 1 showed that, for the 50-64 age group, there were 7.03m economically active disability-free people, 1.54m disability-free inactive people and 2.9m with disabilities, of whom just over half were economically active. Post-65, information about economic activity is less reliable, but the data show that only 60% of the population is still disability-free at this age.

It can be assumed that increasing immigration to solve any labour shortage would not be popular, given the Brexit vote. Indeed, government policy is to reduce it. In any case, immigrants will themselves become pensioners at some point. This means that improvements in activity rates will be needed, especially at older ages – and improvements in health would make this easier to achieve. The benefits would include higher earnings for older workers, allowing them to set aside more money for a DC, or private, pension to supplement the state pension.

Implications: retirement income

An important question concerns replacement income: what percentage of pre-retirement income does a person need post-retirement (allowing for lower living expenses)? The benchmarks used by the Pensions Commission, in 2005, ranged from 80% of pre-retirement earnings for a low-paid person to 50% for someone on relatively high pay. In the middle, for someone on average pay, the benchmark is two-thirds, similar to the traditional DB level.

The average state pension is worth about one-third of average wages, and so to bring income up to a two-thirds replacement rate an occupational or private pension would need to be similar to the size of the state pension. There is, of course, a huge variation in the pot sizes needed to provide adequate replacement income for the full range of earners. For lower paid people, the state pension forms a much bigger proportion of post-retirement income, but a £100,000 pot would still be needed to add about 50% to the new state pension.

The report's message is that people need a bespoke calculator – taking account of irregular contribution patterns – that can indicate whether they are on track for an appropriately sized pension pot. If not, they will need to explore other options including working for longer and monetising value in the home.

Chapter 5: 'Active Ageing' Scenario

To generate different scenarios, we combine data on population projections by single year of age with policy inputs, which consist of three components. The first is the desired replacement ratio of the state pension to average earnings: we use the current average of one third.

It is worth remembering that the UK state pension is not generous by developed world standards. The new state pension of about £8,300 a year (at £159.55 per week) is just under a third of the current average wage of £26,520 (at £510 pw) and little more than half of a year's full-time earnings on the national living wage of £7.50 an hour.

Current government policy of raising the state pension by the 'triple lock' – the highest of average pay rises, inflation or 2.5% – is set to give way in 2020 to a 'double lock' linked to earnings or price growth. For our scenarios we assume a constant replacement ratio of a third.

The second policy lever is the contribution rate, defined as the average amount to be deducted from wages to finance the forecast stream of pension benefits. It is currently between 13% and 14%. We compare the effects of those two rates on the SPA, dependency ratio and proportion of adult life in receipt of the state pension.

The third policy lever involves both labour market and health policy. To increase activity rates, particularly at older ages, barriers to work need to be minimised: a good example of this is the scrapping of the default retirement age in 2011. It will also require improvements in health, the policies for which should seek to delay or manage better long-term health conditions.

A full discussion of each policy lever is beyond the scope of this research, but the important point is to identify and head off problems before they take effect: for example, it is easier to prevent obesity than it is to cure it, and better to deal with mental health problems – another key cause of economic inactivity – early.

The model uses this information and solves for the value of the SPA that would exactly balance contributions and pension benefits for any year in the future. The final results include not only pension age, but also the dependency ratio and proportion of adult life (from age 20) spent in retirement, using the SPA as the benchmark.

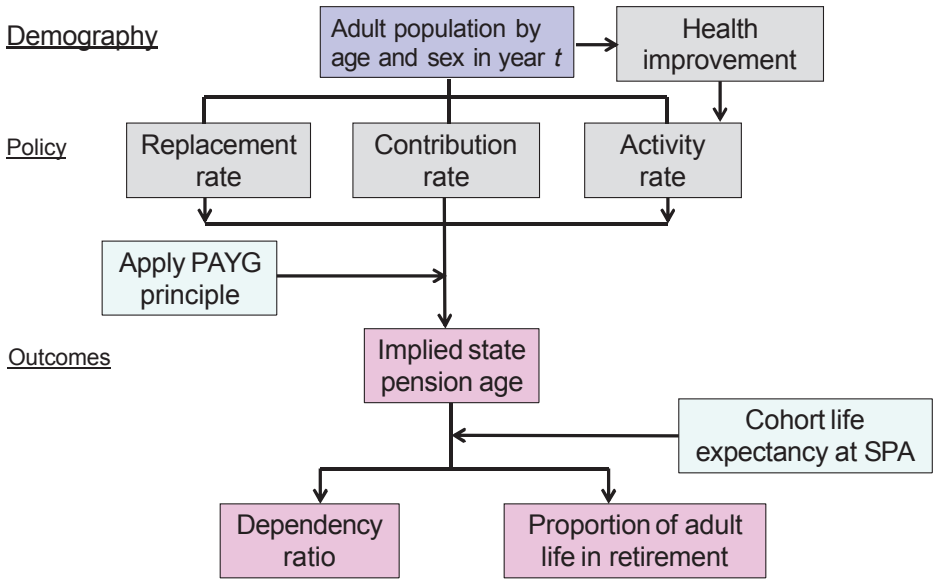
To make this as realistic as possible the model uses cohort life expectancy, rather than current mortality rates. This is important since the longevity goalposts are always shifting. Figure 4 shows how the model works.

Scenarios for different activity rates

We tested three scenarios to determine what the SPA would need to be to balance contributions in 2016, 2030 and 2040 and, additionally, what their effects would be on the dependency ratio and proportion of life spent in receipt of the state pension. All are well within the range of plausible outcomes:

A. Average activity rate remains at 80%: Workers adjust to rises in the SPA from the current level by working for longer with no overall change to the average activity rate. This outcome would be regarded as a partial success.

Figure 4: Flow diagram showing how the SPA, the dependency ratio and proportion of life spent in retirement are determined



B. Average activity rate falls to 75%. Workers do not adjust to a higher pension age. This would be seen as a policy failure, especially if accompanied by no improvement in health.

C. Average activity rate increases to 85%. Activity rates increase by 5 percentage points at every age, or there is an approximate 17.5 percentage point rise in activity rates in adults from age 50, where there is greatest unused capacity. Implied in this scenario are improvements in health and the implementation of policies that are effective in encouraging older people to work. This would be a very good outcome.

The scenarios assume that the ratio of average earnings to pension benefits is unchanged. Also included is the effect of a one percentage point difference in the contribution rate, indicating that this could be employed as an alternative to increasing the SPA.

Scenario A, our baseline, shows the SPA in 2016 at age 65 and, therefore, indicates that the model accurately replicates present policy. In general, the results show that any decrease in activity rates causes the required SPA to rise and any improvement causes it to decrease. Even with significant expansion of the older population, the SPA in the coming decades remains below 70 in all the scenarios except for scenario B in 2040, based on a fall in activity rates to 75%.

Even small rises in the SPA could potentially reduce the percentage of adult life in receipt of the pension. Scenario B, for example, shows that this proportion would decrease from a high of 0.34 in 2016 to 0.31 in 2030 due to falling activity rates, unless mitigated by raising the contribution rate to 14%.

For any given scenario, the dependency ratio is unchanged and is an outcome of the PAYG principle, with the ratio of earnings to pension benefits kept constant. If pension benefits are increased from a third of average earnings to a half, the SPA and the dependency ratio must increase since more workers are needed to support higher pension benefits.

Scenario C, which results in the smallest increases in the SPA, depends on improvements in activity rates.

Table 4: Modelling the effects of scenarios A-C on the SPA, the dependency ratio and the percentage of adult life spent in receipt of the state pension

Scenario	Description	Activity rate	Effective contribution rate	Outcome	2016	2030	2040
A	Activity rate unchanged	80%	13%	SPA	65.0	67.8	69.3
				DR	3.21	3.21	3.21
				% adult life	0.35	0.32	0.31
			14%	SPA	64.0	66.9	68.2
				DR	2.98	2.98	2.98
				% adult life	0.35	0.32	0.32
B	Activity rate falls	75%	13%	SPA	65.8	68.6	70.2
				DR	3.42	3.42	3.42
				% adult life	0.34	0.31	0.31
			14%	SPA	64.8	67.7	69.1
				DR	3.17	3.17	3.17
				% adult life	0.35	0.32	0.32
C	Activity rate improves	85%	13%	SPA	64.2	67.1	68.4
				DR	3.02	3.02	3.02
				% adult life	0.35	0.32	0.32
			14%	SPA	63.2	66.1	67.3
				DR	2.80	2.80	2.80
				% adult life	0.35	0.34	0.33

This scenario is also a good, but not exact, fit with the one-third principle. The key point is that it allows for a lower dependency ratio and so means that the system is sustainable with fewer workers per pensioner.

Finally, it is worth noting that where higher activity rates are the result of fewer people being long-term sick or disabled, with fewer people looking after them, this will have the effect of boosting activity rates, increasing the proportion of people in full-time work and reducing the cost of disability benefits. We call Scenario C the 'active ageing scenario'.

Implications: financial needs and the life cycle

The shift from a DB to a DC world means that individuals are shouldering more of the responsibility for their financial wellbeing in later life. Saving for this and utilising those funds span the whole of adult life. The choices are complex, and people depend on the financial services industry both to advise them and to provide the products that put their plans into action.

One way of looking at this is to map a person's potential financial needs to their life cycle. The rolling phases might run as follows:

Working age

1. Protection might be needed against loss of earnings e.g. insurance for the self-employed and deferred annuities to cover carers' career breaks.

2. To maximise the amount saved into pension funds over a working life, incentives (employers' contributions and tax relief) are crucially important, as are explanations of the role played by investment returns.

3. To help people monitor their progress towards savings goals requires not only delivery of an industry-standard 'pensions dashboard', but also bespoke calculators to take into account different contribution patterns.

Transition from peak earnings to retirement

4. This phase can be regarded as starting at 50, when average earnings start to decline. With the SPA rising and more people working beyond it, it could last 20 years. The inter-related factors affecting saving include: continuing to work, wage levels, continuing to save (invest in risk assets), debt reduction, home ownership (paying off the mortgage).

5. The Cridland review advocated a 'Mid-life MoT'. This implies further development of affordable advice and guidance services aimed at those aged 50-plus, which would take all the above factors into account.

Retirement

6. How to turn a pension pot(s) into income? People need help with choices between lump sum withdrawals, annuities and drawdown, or a combination of these.

7. There is scope for expansion of the market for insurance products to cover end-of-life care costs.

8. Equity release, which has an impact on both lifestyles and potential legacies, becomes an important part of the choices facing those who own their home.

Chapter 6: Discussion of main findings

Key economic messages

There are four economic messages from our analysis:

- First, if the UK is to succeed economically in the coming decades, increases in life expectancy need to be balanced by improvements in working life expectancy and disability-free life expectancy.
- Second, failure to do so could lead to renewed pressure to increase immigration as a means to expand the working-age population.
- Third, higher productivity may offset these pressures to some extent. But since earnings peak in middle age, an ageing workforce needs to be more productive and the earnings of older workers need to rise relative to the average.
- Fourth, while a growing population will lead to greater GDP it may not translate into improved GDP per capita, and under some scenarios living standards could fall. Higher life-time earnings are needed both to deliver improved standards of living and to pay sufficient taxes to maintain the value of the state pension.

Demographic messages

The UK's population is due to grow from 66m to 76m between now and 2045, and the trend towards higher life expectancy is set to continue. With fewer people of working age relative to those above it, the dependency ratio would fall to around two workers for every pensioner without remedial action. Net immigration has totalled around 3m since 2000, but the government's plan to limit it has the potential for a further adverse impact on the dependency ratio. The demographic problem must be managed using all the policy tools available.

To date the government's preferred response has been to increase the SPA, rather than to increase taxes or reduce pensioner benefits. From a fiscal perspective, an increase in the SPA from, say, 66 to 67 would, in theory, save about £5 billion a year, but the actual saving would be only around 75% of this because it is partially offset by a rise in the number of people receiving working-age disability benefits.

As for how many people could work until much later in life, the number of disability-free, economically inactive adults declines sharply after 70. This limits the reservoir of people who are able to fill the labour gap.

At present, public policy is for up to a third of adult life to be spent in receipt of the state pension. While arbitrary, this provides a benchmark since it combines longevity, taxation, pension benefits and productivity. This report finds that a one-third target will not be sustainable unless there are improvements in economic activity rates.

Two further findings are that there are limits to increasing both the SPA and activity rates. It is worth emphasising that in some districts of the UK, healthy life expectancy at age 50 falls short of the SPA, and many inhabitants already face the prospect of their retirement falling well short of one-third of their adult life.

Although there is evidence of progress in improving the activity rates of older workers, a step-change improvement is needed, as indicated in the 'active ageing scenario'. The demographic pressures are such that both economic activity and (related) savings rates must rise to prevent individuals facing a big drop in living standards beyond the SPA.

Adequacy of private pensions

The UK has a multi-pillar pension system: pillar one is the state pension; two is occupational pensions – DB and DC schemes; three is private pensions in which anyone can invest, and it is also the main option for the self-employed. Under pillar one, the state pension regime introduced in 2016 provides a 'single tier' pension, set above the basic level of means-tested support. This entails phasing out the additional earnings-related state pension (known as SERPS or the Second State Pension).

Even though the new single-tier state pension is higher than the old 'basic' one, the replacement value (compared with pre-retirement income) is low compared with other developed countries – hence the need for adequate second and/or third pillars to supplement it. The government is tackling the problem by requiring employers to automatically enrol employees into a DC pension fund and to make contributions.

According to the DWP's 'Automatic Enrolment Review 2017: Maintaining the Momentum', published in December, nine million individuals have been automatically enrolled into a workplace scheme by their employer, with nine out of every ten of them continuing to save. Many were previously saving little or nothing for retirement.

While the opt-out rate from AE pension schemes remains low, so are contribution levels (although they are set to reach 8% of salary by 2019-20). A related issue is that the life-cycle pattern of average earnings does not deliver sufficiently large pension pots for many people, especially women.

The strength of the UK pension system is its flexibility. A person can start taking benefits before the SPA and funds are relatively portable between jobs. Relatively new pension 'freedoms' (of access and without mandatory annuity purchase) offer potential bridges to cover falling economic activity between 50 and the SPA. But those with low contribution rates and interrupted saving patterns will not accumulate pension pots large enough to make a significant addition to the state pension in later life. This underlines the need for saving to start early, and to continue with as little interruption as possible.

According to this research, it is necessary for average earnings to peak later and the subsequent decline to slow down, if pension savings are to increase. This is already happening with the peak earnings age advancing by about three years in the last ten, but productivity also needs to be higher. Contributing more and working for longer is the logical response to the rising SPA and increasing longevity.

Where this is not possible, two alternative ways to supplement pensions are, first, for working partners to be allowed to contribute, with tax relief, to their non-working partners' pension fund and, second, to monetise property – an important source of financial independence in later life. Developments in value-for-money equity release products are an important factor here.

Health prospects

The current legal position is that the SPA for women is due to increase to 65 by November 2018, to 66 for both sexes by October 2020 and to 67 by 2028. John Cridland, who led the 2016-17 review of the SPA, recommended it should rise from 67 to 68 by 2037-39, seven years earlier than previously timetabled by the government. It is estimated that these changes will affect about 5.4m people aged under 45.

This research finds that even Cridland's tighter timetable may be hard to deliver because it requires demanding increases in economic activity rates, especially among older adults, to sustain the PAYG principle. To achieve a significant rise in activity rates, there needs to be accompanying improvements in health – especially in disability-free life expectancy from age 50 onwards.

A large body of evidence shows that inequalities in health are a root cause of persistent variations in both life expectancy and healthy life expectancy in many districts of the UK, where many will not be able to work even to the current SPA.

A strategically important finding is that by delaying the onset of a limiting illness, the proportion of remaining adult life spent in ill health is significantly reduced. For example, a person acquiring a long-term illness at age 20 can expect, on average, another 43 years of life, at age 50 it is 26.3 years and at age 65, 17.7 years.

Contracting a long-term illness at any age is bad for the individual but also for society because it affects employment, leads to higher healthcare costs and accelerates dependency. Early last century clean drinking water, improved sanitation, greater health and safety at work, affordable housing and cleaner air were instrumental in advancing life expectancy. The health benefits that derived from these improvements generally pre-dated the big advances in healthcare, with the exception of mass vaccination against infectious diseases.

In the modern period, these examples cannot be relied upon to produce further improvements. This is because there has been a transformation in the way people die. Most deaths today are from chronic diseases, rather than infectious ones or other causes including accidents at work.

We know that nearly all chronic disease is associated with middle to old age and that it affects various strands of society differently. Where exposure to harm is the result of lifestyle rather than ambient risks, it is more difficult to tackle via public policy, although there is scope to do so. Tobacco smoking, for instance, still causes about one in six deaths and shortens lifespan and disability free life expectancy by as much as 10 years.[16] Given the greatly reduced incidence of smoking, a complete cessation would add, on average, about two healthy life years.

Obesity – a growing trend – also reduces healthy life expectancy. It is linked to poor diet and a lack of exercise, including the consumption of high levels of sugar in processed food. The government has started to take action on the sugar issue.

The negative outcomes of unhealthy lifestyles are disproportionately associated with the poorest in society. This suggests that, for long-term impact, more resources should be focused on encouraging healthier lifestyles.

Implications for the private sector

Responsibility for the recruitment, retention and remuneration of older workers lies with employers – as do the pay and benefits that contribute to all employees' wealth and savings.

Employers also have an interest in promoting better health to reduce absenteeism and improve productivity. Some make a virtue of their 'staff wellbeing' programmes – the British Heart Foundation is one of the organisations that produces case studies.

Responsibility for the delivery of private savings and pensions rests mainly with the financial services sector. A key problem for savers is uncertainty about the eventual size of their pension pot(s), in particular the combined value of the various schemes to which they may have contributed in their working lifetime.

This indicates the urgency of delivering not only a pensions dashboard, but easy-to-understand information about other savings, and about debt. It is beyond the remit of this report to cover the debate about financial advice and guidance. However, financial services companies have been innovating with budgeting tools, prompts to save and warnings when overdrafts are triggered. Pension providers, such as Nest, the government-backed AE pension fund, also have simple pension calculators on their website. So-called 'robo-advisers' have made progress in automating the know-your-customer process and using that information to guide choices of savings product – for instance, by level of risk appetite.

16. Doll, R., R. Peto, J. Boreham, and I. Sutherland. (2004). Mortality in relation to smoking: 50 years' observations on male British doctors. *BMJ* 2004; 328:1519

There is also a lack of clarity over how to turn DC pension savings into income and how to find the best deals for, say, annuities. An important aspect of this is an explanation of the advantages and disadvantages of staying invested in riskier assets. Other factors to be taken into account include home ownership, legacies and capacity to work/earn into old age, as 1.2m adults aged 65-plus already do.

This means that the financial services sector needs to offer savings products that are better adapted to the circumstances of individuals at different stages of their adult lives. Important factors are potential career interruptions, part-time working and care responsibilities – as well as overall household wealth.

In later life, funding sources may include tax-free lump sums, inheritance windfalls, profits from downsizing and equity release, as well as pension income. Benefits could be deferred, capped at certain ages, disability-linked or life-long, assuming that costs are actuarially fair and charges transparent.

The DC world has switched responsibility for maintaining living standards in old age to the individual. This means each person has to manage the interactions between the capacity to work, earn and save for the majority of their adult life; and then decide how best to deploy whatever sums or assets they have accumulated. Beyond taxpayer-funded safety nets, including the state pension, the private sector has the primary role in helping those individuals – in all their different circumstances – fulfil these daunting tasks. Because of the long-term nature of pension-saving (and the fragmentation of careers), the role of the financial services sector is more challenging than that of employers.

This report advocates an 'active-ageing' scenario, which would result in a population whose (sometimes competing) interests – old/young, poorer/richer, women's/men's pensions – are in better balance. It would also increase living standards and GDP growth.

This would involve improvements in health and working life expectancy, and in supply side conditions including job creation, family-friendly policies, occupational health and productivity. The greater lifetime earnings that this scenario would deliver need to be deployed in savings, protection and retirement-income products that help individuals shoulder the responsibilities of a DC world.

Annex A: Definitions of inactivity and disability under the Equality Act

Changes introduced in 2013 brought the Labour Force Survey (LFS) into line with the Government Statistical Service (GSS) harmonised standards for questions on disability. This enabled the LFS estimates to be consistent with the definitions used in the 2010 Equality Act. This research is based on the current harmonised definition.

i. Determination of the inactive population

To decide whether someone is active or inactive, respondents aged 16-plus to the LFS give their employment status as employed, self-employed, unemployed, on a government training scheme, an unpaid family worker or inactive. The inactive categories relating to the inactive sick and disabled using LFS nomenclature are as follows:

1. Inactive – seeking work, unavailable, long-term sick or disabled
2. Inactive – not seeking work, would like work, long-term sick or disabled
3. Inactive – not seeking work, would not like work, long-term sick or disabled

ii. Determination of disability status

LNGLST: Health problems lasting or expected to last more than one year

Do you have any physical or mental health conditions or illnesses lasting or expected to last 12 months or more?

(1) Yes

(2) No

(3) Don't know (spontaneous only)

(4) Refusal (spontaneous only)

LIMACT: Does the health problem limit activity?

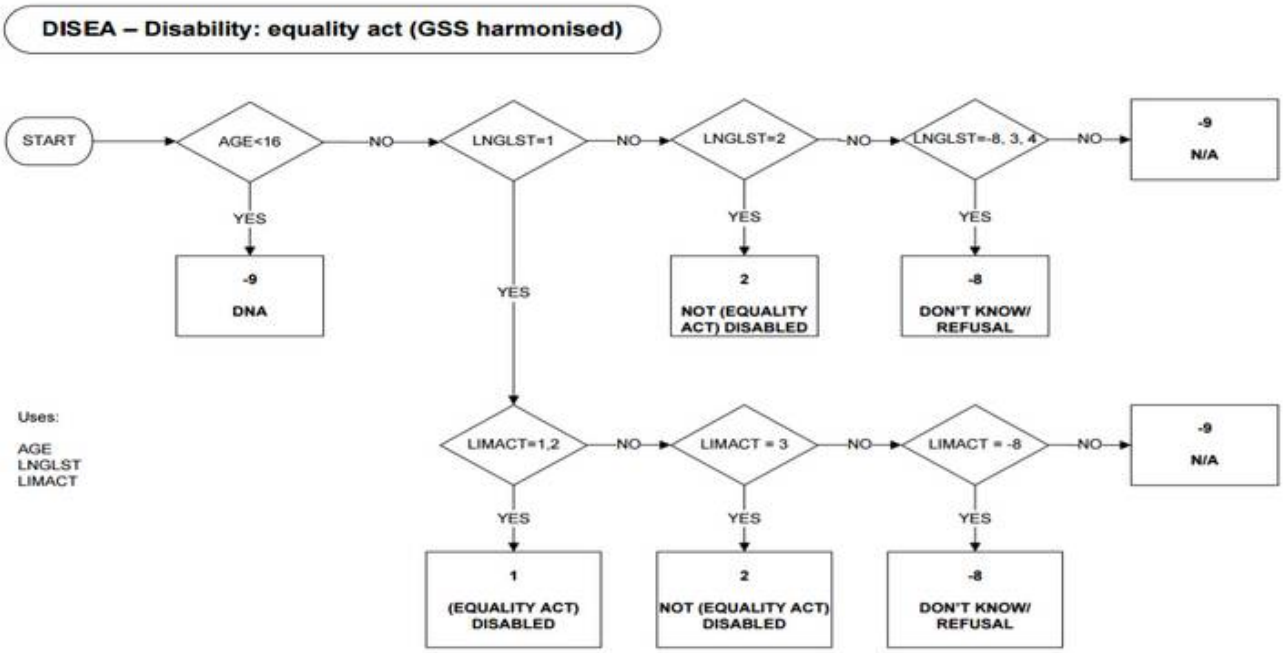
Does your condition or illness reduce your ability to carry out day-to-day activities?

(1) Yes, a lot

(2) Yes, a little

(3) Not at all

Figure B1: Decision tree showing the determination of whether a person is disabled under the Equality Act (2010) using Government Statistical Service (GSS) harmonised definition based on the Labour Force Survey



Key:
DISEA: Disability: Equality Act (GSS harmonised)
LNGLST: Health problems lasting or expected to last more than 1 year
LIMACT: Does health problem limit activity?
GSS: Government Statistical Service

Annex B: Annuity values based on pension pot size

An annuity is a sum of money, either fixed or increasing, that is paid regularly to the policyholder, typically for the rest of their life. It is usually purchased at the time of retirement using the accumulated funds in a pension pot.

The important point about annuities is that they provide income security until death. If a person lives to an old age, the annuitant benefits; whereas if they die earlier than expected, the insurer benefits. Thus, the person is effectively insuring themselves against running out of money due to living longer than expected and, in addition, protecting themselves against poor investment returns.

Under gender equality regulation, gender is no longer a relevant consideration when pricing annuities. To create a unisex annuity rate, our population at age 65 is made up of equal numbers of males and females, so the mortality rates reflect the entire population.

Assuming a long-term risk-free (real) interest rate of 0% per annum[17], an indexed linked annuity initially paying one pound per annum to a person at 65, denoted by $\overline{a}_{65}$, is given by the discounted value of the expected future annuity payments such that:

$$\overline{a}_{65} = \int_{t=0}^{\infty} v_{0\%}^{t} \times {}_{t}p_{65}\,dt = \int_{t=0}^{\infty} {}_{t}p_{65}\,dt \approx \left(\sum_{t=1}^{\infty} {}_{t}p_{65}\right) + \frac{1}{2} = e_{65} = 23.1010$$

where $v_{0\%}^{t}$ is the current discounted value of a payment of 1 made at some future time t, ${}_{t}p_{65}$ is the probability that a person of 65 will survive to age $(65+t)$ using the ONS life tables that allow for mortality improvements. Because we have used a real rate of interest of 0% pa, the price of the annuity at age 65, $\overline{a}_{65}$, is equal to the future life expectancy at that age, e_{65}.

Further, because the mortality table used is unisex, the future life expectancy at 65 is an average of male life expectancy of 21.9 years and female life expectancy of 24.3 years, after taking longevity drift into account.

Hence, a pension pot of £100,000, at age 65, can purchase an annual inflation-proofed annuity that will provide an initial annual income of:

$$\frac{100{,}000}{23.1010} = £4{,}328.82$$[18]

Applying this formula to the accumulated illustrative pension savings for men and women set out in Box 5, the following annuities would be payable. These amounts are not guaranteed: they depend on market rates at the time of purchase and on the type of annuity purchased.

17. In practice, insurance companies may use a slightly higher interest rate when pricing annuities (which, in itself, would lead to a slightly higher level of annual annuity income). However, this will be offset by additional loadings in the annuity price for expenses, profit and the longevity risk transferred to the company. Thus, an assumed (real) interest rate of 0% per annum seems appropriate here.

18. Under the gender equality regulations, the same amount must be offered to both males and females. Prior to 21 December 2012, males could be offered a higher annuity of $\frac{100{,}000}{21.8955} = £4{,}567.15$ reflecting their lower future life expectancy, whereas females would be offered a lower annuity of $\frac{100{,}000}{24.2516} = £4{,}123.44$ reflecting their higher future life expectancy.

(a) Men

	End age									
Start age	20	25	30	35	40	45	50	55	60	65
20	0.0	1.2	2.9	5.1	7.6	10.2	12.9	15.5	17.9	19.8
25		0.0	2.0	4.2	6.7	9.3	12.0	14.6	17.0	19.7
30			0.0	2.5	5.0	7.7	10.3	12.9	15.3	17.3
35				0.0	2.9	5.6	8.2	10.9	13.2	15.2
40					0.0	3.1	5.8	8.4	10.8	12.8
45						0.0	3.2	5.8	8.2	10.2
50							0.0	3.1	5.5	7.5
55								0.0	2.9	4.9
60									0.0	2.4
65										0.0

(b) Women

	End age									
Start age	20	25	30	35	40	45	50	55	60	65
20	0.0	0.9	2.3	3.9	5.5	7.0	8.5	9.9	11.3	12.3
25		0.0	1.6	3.1	4.7	6.3	7.8	9.2	10.6	11.1
30			0.0	1.8	3.4	5.0	6.5	7.9	9.2	10.3
35				0.0	1.9	3.4	5.0	6.4	7.7	8.8
40					0.0	1.9	3.4	4.8	6.1	7.2
45						0.0	1.8	3.3	4.6	5.6
50							0.0	1.7	3.1	4.1
55								0.0	1.6	2.7
60									0.0	1.3
65										0.0

Units: £000s p.a

Annex C: Trade-offs between the SPA, dependency ratio, one-third principle and replacement value of the state pension

(a) PAYG pension systems

In a PAYG system the challenge is to balance revenues and pensioner benefits taking one year with another. The levers available to do this are tax (or contribution rates), pension benefits, the SPA, average earnings (i.e. labour productivity) and labour supply. Mathematically speaking:

$$P_{<SPA} \times w \times c \times a = P_{\geq SPA} \times p$$

Where

w = Average earnings before tax

c = Tax or contribution rate

a = Activity rate or proportion of people economically active

p = Average value of the state pension

The problem is to find the value of the SPA, in this case the 'unknown', such that this equation is in equilibrium for different values of tax (i.e. contribution) and activity rates. That is:

$$\frac{P_{<SPA}}{P_{\geq SPA}} = K = f(w, c, a, p)$$

Where K is a constant

We call the ratio $\frac{w}{p}$, i.e. average earnings divided by the state pension, the 'earnings-pension multiple'. One divided by this quantity multiplied by 100 is more commonly known as the pension 'replacement ratio'.

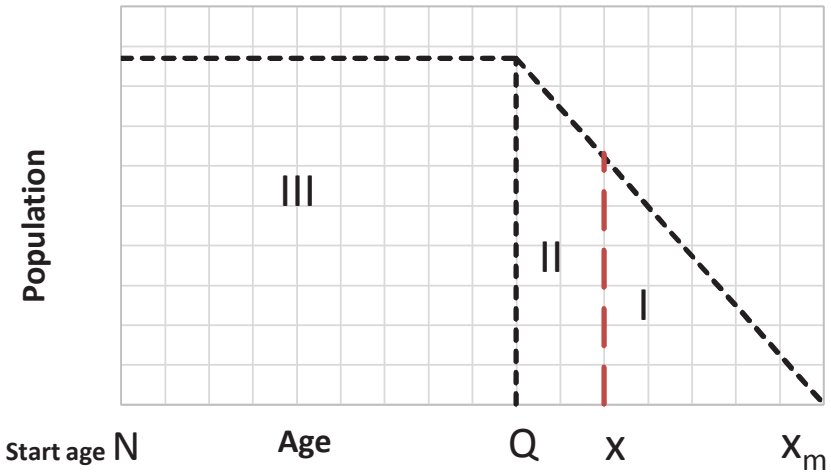
A constant earnings-pension multiple indicates that pension benefits relative to earnings are unchanged over time; an increasing multiple means that earnings are increasing faster than the state pension, and a falling earnings-pension multiple means the opposite. In a system in which pension benefits are linked to earnings, pensioners will automatically benefit from rises in productivity. Since pension benefits are currently linked to both consumer prices and earnings, whichever is the higher, the tendency will be for the earnings-pension multiple to fall over time (i.e. state pensioners will be better off relatively speaking).

(b) Determining SPA under conditions of fiscal balance

Consider Figure C, which is a stylised diagram of the UK population showing the number of adults by age. To determine the SPA, the dependency ratio age and the proportion of adult life spent in retirement, only three demographic parameters are required: Q, N and X_m. Q is defined as the 'pivot age' which can be thought of as the age of onset of mortality in the population, N is the age at which adulthood is assumed to start (in this case age 20), and X_m is the oldest age to which anyone survives. The SPA is denoted by X.

In PAYG terms, the inflow of funds equals the population contained in areas (III) and (II) of the chart which are under SPA multiplied by the average wage times the activity rate times the contribution rate. The outflow of funds is given by the population above SPA denoted by X contained in section (I) of the chart multiplied by the average value of the state pension.

Figure C: Stylised chart of the UK adult population



Although it is assumed that the start of adulthood is fixed at age 20, Q and X_m can change over time usually as a result of improvements in mortality. We estimate Q and X_m using linear regression in combination with single year of age ONS population projections. These provide very accurate and efficient replacements for the population quantities (I), (II) and (III) in each projection year and significantly simplify the calculations.

Based on this reduced number of parameters, we determine fiscal balance occurs, i.e. outflow equals inflow, when:

$$(x_m - x)(1 - \frac{x}{x_m})x = \left[(2 - \frac{x}{x_m})x + 2N\right]\theta$$

Where $\theta = a \times c \times \gamma$

a = Economic activity rate, a parameter that can be used to adjust for disability

c = Contribution rate or tax

γ = Average earnings as a multiple of the state pension

And

x_m = maximum age which varies by year

N = is the number of years from when adult age is assumed to begin to pivot age Q

x = SPA

Balance is achieved when x is equal to:

$$x = x_m\left[1 - \frac{1}{(1+\theta)}\right]\sqrt{\theta(1+\theta)(1+\frac{2N}{x_m})} + Q$$

Using the above we can determine the SPA, which balances inflows and outflows for any combination of contribution rates, pension benefits and wages.

(c) The proportion of adult life spent in retirement

To determine the proportion of adult life spent in receipt of the state pension, we need to know the cohort life expectancy of that individual taking into account future improvements in mortality rates.

We use ONS forecasts of cohort life expectancy by single year of age to determine what proportion of an individual's future adult life will be spent in receipt of the state pension post SPA.

The approach adopted follows closely that of the Government Actuary, published in March 2017[19], which is as follows:

$$p = \frac{e_{spa}}{e_{spa+} + SPA - a}$$

Where

e_{spa}	=	Life expectancy at SPA
p	=	Proportion of adult life in receipt of SPA
SPA	=	State pension age
a	=	Assumed adult start age

19. State Pension age periodic review: A report by the Government Actuary. https://www.gov.uk/government/publications/state-pension-age-periodic-review-report-by-the-government-actuary

Illustrative tables of results

The following tables show how the results are presented for a single point in time (in this case 2016): (a) the impact on the SPA of different combinations of the replacement ratio (expressed as an earnings-pension multiple) and tax, or contribution, rates; (b) the impact on the dependency ratio given the SPA in (a); and (c) the impact of the SPA in (a) on the proportion of adult life spent in receipt of the state pension. Column headings show the ratio of earnings to pension values, and row headings the contribution rate. The circled numbers show, approximately, the current situation, with an SPA of 65, a contribution rate of 13% and, potentially, 35% of adult life in receipt of the state pension.

(a) SPA

	Earnings-pension multiple										
Contribution rate	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**	**5**	**5.5**	**6**
0.10	80.1	76.2	73.1	70.5	68.3	66.4	64.7	63.1	61.7	60.4	59.3
0.11	79.2	75.2	72.0	69.4	67.1	65.1	63.4	61.8	60.4	59.1	58.0
0.12	78.4	74.3	71.0	68.3	66.0	64.0	62.2	60.7	59.3	58.0	56.8
0.13	77.6	73.4	70.1	67.3	**65.0**	63.0	61.2	59.6	58.2	56.9	55.7
0.14	76.9	72.6	69.2	66.4	64.0	62.0	60.2	58.6	57.2	55.9	54.7
0.15	76.2	71.8	68.3	65.5	63.1	61.0	59.3	57.7	56.3	55.0	53.8
0.16	75.5	71.0	67.5	64.7	62.2	60.2	58.4	56.8	55.4	54.1	53.0
0.17	74.9	70.3	66.7	63.9	61.4	59.4	57.6	56.0	54.6	53.3	52.2
0.18	74.3	69.6	66.0	63.1	60.7	58.6	56.8	55.2	53.8	52.6	51.5
0.19	73.7	69.0	65.3	62.4	59.9	57.9	56.1	54.5	53.1	51.9	50.8
0.20	73.1	68.3	64.7	61.7	59.3	57.2	55.4	53.8	52.5	51.2	50.1

(b) DR

	Earnings-pension multiple										
Contribution rate	**1**	**1.5**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**	**5**	**5.5**	**6**
0.10	12.5	8.3	6.3	5.0	4.2	3.6	3.1	2.8	2.5	2.3	2.1
0.11	11.4	7.6	5.7	4.5	3.8	3.2	2.8	2.5	2.3	2.1	1.9
0.12	10.4	6.9	5.2	4.2	3.5	3.0	2.6	2.3	2.1	1.9	1.7
0.13	9.6	6.4	4.8	3.8	**3.2**	2.7	2.4	2.1	1.9	1.7	1.6
0.14	8.9	6.0	4.5	3.6	3.0	2.6	2.2	2.0	1.8	1.6	1.5
0.15	8.3	5.6	4.2	3.3	2.8	2.4	2.1	1.9	1.7	1.5	1.4
0.16	7.8	5.2	3.9	3.1	2.6	2.2	2.0	1.7	1.6	1.4	1.3
0.17	7.4	4.9	3.7	2.9	2.5	2.1	1.8	1.6	1.5	1.3	1.2
0.18	6.9	4.6	3.5	2.8	2.3	2.0	1.7	1.5	1.4	1.3	1.2
0.19	6.6	4.4	3.3	2.6	2.2	1.9	1.6	1.5	1.3	1.2	1.1
0.20	6.3	4.2	3.1	2.5	2.1	1.8	1.6	1.4	1.3	1.1	1.0

(c) P

	Earnings-pension multiple										
Contribution rate	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
0.10	0.15	0.19	0.23	0.27	0.29	0.32	0.35	0.36	0.39	0.41	0.42
0.11	0.16	0.20	0.24	0.28	0.31	0.34	0.36	0.39	0.41	0.42	0.45
0.12	0.17	0.22	0.25	0.29	0.32	0.35	0.38	0.41	0.42	0.45	0.47
0.13	0.18	0.23	0.27	0.31	**0.35**	0.38	0.39	0.42	0.44	0.47	0.48
0.14	0.19	0.24	0.28	0.32	0.35	0.39	0.41	0.44	0.45	0.48	0.50
0.15	0.19	0.25	0.29	0.34	0.36	0.39	0.42	0.45	0.47	0.50	0.51
0.16	0.20	0.25	0.31	0.35	0.38	0.41	0.44	0.47	0.48	0.50	0.53
0.17	0.22	0.27	0.32	0.36	0.39	0.42	0.45	0.48	0.50	0.51	0.53
0.18	0.22	0.28	0.32	0.36	0.41	0.44	0.47	0.48	0.51	0.53	0.54
0.19	0.23	0.29	0.34	0.38	0.42	0.45	0.47	0.50	0.51	0.54	0.55
0.20	0.23	0.29	0.35	0.39	0.42	0.45	0.48	0.51	0.53	0.54	0.55

Key:
SPA = state pension age
DR = dependency ratio
P = proportion of adult life in receipt of the state pension

About the author

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