Should generations differ in their wealth accumulation?

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Abstract

There has been much concern in recent years that younger generations are not saving enough for retirement. This conclusion is normally reached after one of two types of analysis: that which compares accumulated wealth to date with the wealth accumulation of previous generations by the same age, or that which projects future retirement resources and compares this with some benchmark for what is considered 'adequate' where that benchmark is normally derived based on what current retired generations have achieved. In this paper, however, we ask whether these frames of reference are appropriate. If different generations face different circumstances, perhaps they would optimally accumulate different levels of resources. Using a simple structural model of savings over the lifecycle we show how key differences in the circumstances facing different generations in particular, in terms of their income profiles, retirement timing, life expectancies, rate of return on savings and the generosity of the state pension system can affect optimal private wealth accumulation. These differences need to be acknowledged in the debate around the adequacy or otherwise of working age individuals' retirement saving.

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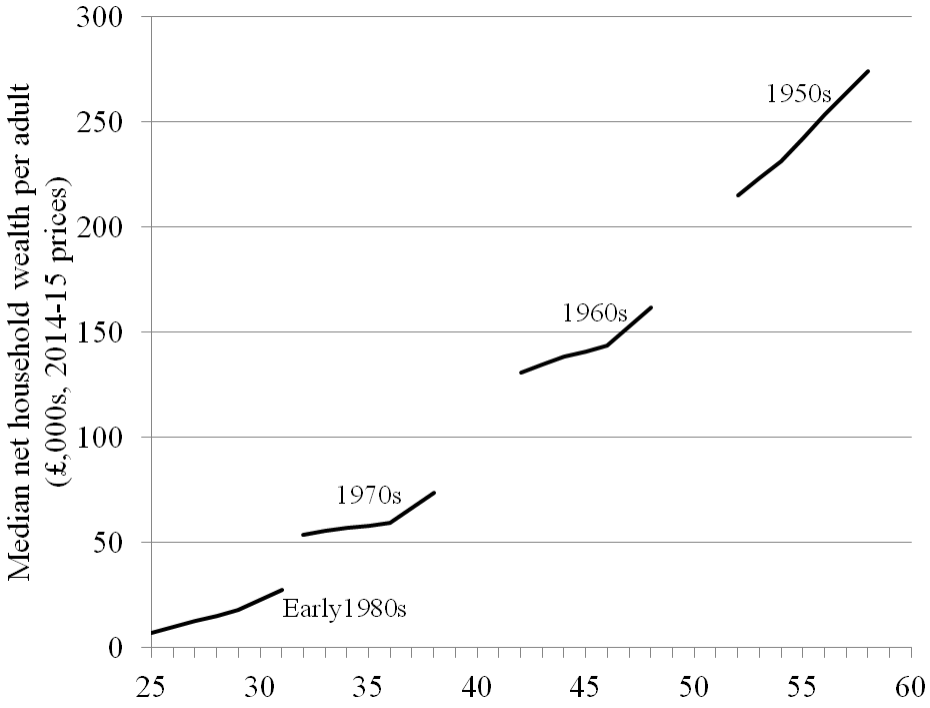
1 Introduction

There is currently concern that working age individuals in the UK are not saving enough for retirement. This has motivated a number of recent policy reforms, most notably the introduction of automatic enrolment into workplace pensions. However, despite the traction this concern has gained in the popular and policy debate, the available evidence is still somewhat lacking.

The conclusion that working-age generations are under-prepared tends to be reached from one of two types of analysis: that which compares accumulated wealth or pension entitlements to date with that of previous generations at the same age, or that which makes a projection of what incomes in retirement current working age generations can expect and compares that to some benchmark for 'adequacy' - where that benchmark is often derived based on what current retired generations have achieved.

However, there are three important challenges with either of these types of analysis. The first is an absence of historical nationally representative data on individuals' wealth holdings. It has been well established since Shorrocks (1975) that one cannot simply compare wealth held at different ages in cross-section to understand the different wealth accumulation of different cohorts. Such an analysis cannot distinguish between age, period and cohort effects. However, repeated cross section data, or better yet panel data (which enables controlling for differential mortality), on wealth has only become available in the UK in recent years (Crossley & O'Dea (2016)). Recent analysis using the the Wealth and Assets Survey (for National Statistics (2018)), a household survey providing nationally representative data on household wealth since 2006, has shown that subsequent working age generations appear to have less wealth at a given age than their predecessors (see, for example, J. Cribb & Joyce (2016) and D'Arcy & Gardiner (2017)). An example of such analysis is reproduced in Figure 1. However, the length of the WAS panel is short, and potentially impacted by the financial crisis which might be expected to have temporary effects on levels of wealth and the rate of wealth accumulation.

Figure 1: Net wealth of different cohorts



Source: J. Cribb & Joyce (2016)

The second issue is that those in working life still have plenty of time before retirement in which to alter behaviour. Making projections about future retirement income based on current accumulated wealth levels or pension entitlements is inherently uncertain. This issue is perhaps made particularly difficult by the aforementioned data constraints. We know relatively little empirically about savings profiles over the lifecycle, or how these have differed between generations in the past.

Both these difficulties - the lack of data and the uncertainty about making projections (explicitly or implicitly) into the future - are commonly acknowledged. However, we would highlight a third crucial issue that has not been sufficiently recognised: that the optimal level and timing of wealth accumulation may differ between generation.

If different cohorts face different economic, policy, demographic and social circumstances over their lifetimes, that affect either their lifetime incomes or their incentives to shift income inter-temporally, then they could be expected to choose to accumulate different levels of

private wealth. Different generations may also have different preferences - for example, rates of time preference - which would affect their lifetime savings decisions. Given this, simple comparisons between generations' accumulated wealth levels, or even between generations' retirement replacement rates, could be highly misleading.

In this paper we highlight the importance of this issue by using a simple structural model of savings over the lifecycle to simulate the potential impact of different circumstances on wealth accumulation and savings profiles. The circumstances we consider - lifetime income profiles, public pension entitlements, life expectancies, retirement ages and rates of return - are those either known to, or be expected to, differ between generations in the UK. The quantitative estimates we produce are subject to the assumptions made in our highly stylised model, but serve to illustrate the importance of this issue and the relative importance of different generational differences. For example, our cohort scenario projections suggest that wealth at age 30 should be 7% higher among those born in the 1980s than those born in the 1970s, that wealth at age 40 should be 60% higher among those born in the 1970s than among those born in the 1960s, and that wealth at age 50 should be 65% higher among those born in the 1960s than those born in the 1950s. Taken at face value this makes a substantial difference to the interpretation of empirical results such as those produced in 1 - substantially *increasing* concern over the wealth accumulation of generations born more recently.

We do not claim that our projections provide an answer for how much wealth different generations should be accumulating, not least because there are many other circumstances that differ between generations that our very simply model does not capture. However, we hope that by illustrating the potential quantitative importance of circumstances that are known to differ between generations, that the debate concerned with the wealth accumulation of working age individuals will be improved.

The rest of the paper proceeds as follows. We start in Section 2 by discussing some of the ways in which the circumstances of different generations in the UK differ, and why these

would be expected to have an effect on lifetime wealth accumulation. In section 3 we describe the stylised dynamic lifecycle model we use to provide a quantification of the importance of some of these different circumstances. In section 4 we present our main simulation results, illustrating how the level and timing of wealth accumulation might be projected to differ because of differences in cohorts circumstances. In section 6 we conclude and discuss the implications of work.

2 The circumstances of different cohorts

Different generations face different economic, policy, demographic and social circumstances over their lifetimes. Some of these differences will be anticipated, while others will be realised contemporaneously (and others may even only be obvious with the benefit of hindsight). Different generations may also have different preferences, perhaps moulded by the circumstances they have found themselves in. Many of these circumstances and preferences would be expected to affect lifetime savings decisions - for example by changing life time resources, or the price of moving resources across time, or the length of the lifetime itself.

In this section we discuss some of the key differences in the circumstances facing different generations in the UK over the past half century, and describe how and why they may affect individuals wealth accumulation. We discuss in turn: income profiles, public pension provision and life expectancies.

Income profiles

There has been a general pattern in the UK that successive generations born more recently have enjoyed higher levels of income over their lifetimes, particularly at younger ages, than generations that preceded them. Figure 2 compares median income of those born in different decades throughout their lives. Incomes are measured at the household level, after taxes and benefits have been paid, are adjusted for inflation, and have been rescaled (equivalised) to

reflect the fact that households of different sizes need different amounts of income in order to achieve the same living standards. This shows that median income at age 40 was around 27% higher among those born in the 1950s compared to those born in the 1940s, and around 60% higher among those born in the 1960s. More recently there has been considerably less growth in incomes. Those born in the early 1980s on average have no higher incomes than those born in the 1970s. However, both these generations still had higher incomes during their 20s and early 30s than previous generations.

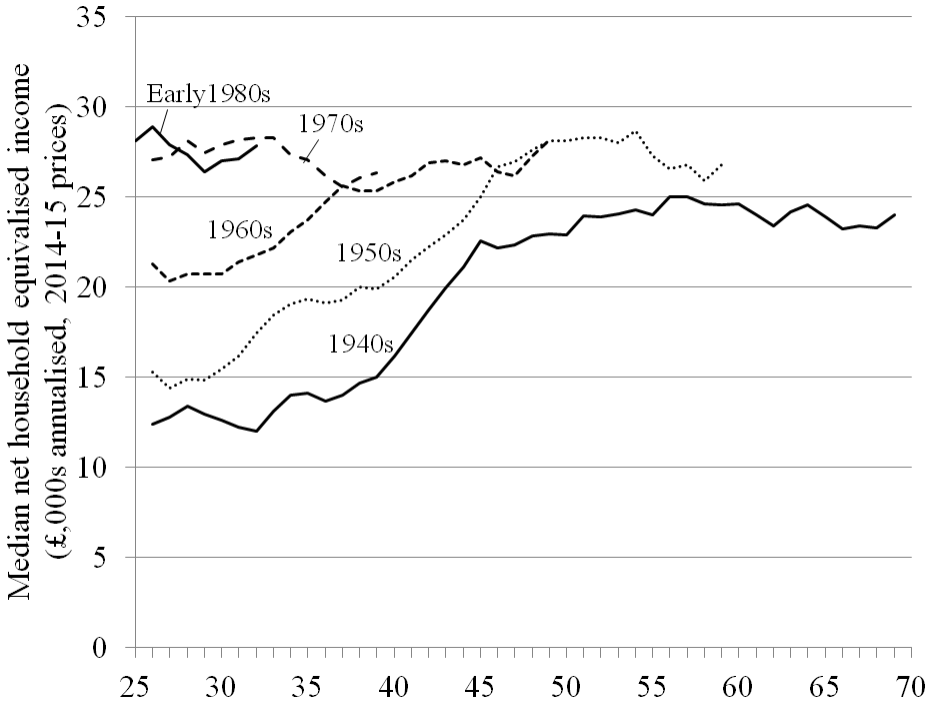
All else equal one would expect higher levels of working-age incomes to feed through into higher levels of wealth accumulation. Individuals must save in order to smooth consumption into the non-earning years of retirement, and those with higher levels of income must consequently accumulate higher levels of wealth in order to maintain their higher levels of consumption.

The profile of income over the lifetime is also potentially important for the profile of wealth accumulation. Intuitively one might expect savings rates, and accumulated wealth levels, to be greater at younger ages among generations which have (all else equal) flatter age profiles in income.

Public pension provision

The public pension system in the UK has changed substantially over the past half century, in complicated ways that have affected different generations at different points in their lives. One particularly large reform was the introduction of the State Earnings Related Pension Scheme (SERPS) in 1978. This allowed individuals to earn entitlement to an additional state pension payment that was related to an individuals working life earnings increasing the level of public provision, and in a way that differed across the income distribution. This earnings related pension entitlement was then gradually eroded over time, with reforms to the SERPS rules and its replacement by the State Second Pension in 2002. In 2016 another radical reform was implemented with the introduction of the New State Pension. This

Figure 2: Median net household income, by date of birth cohort



Source: J. Cribb & Joyce (2016)

removed any remaining vestiges of the earnings-related nature of the public pension, and reduced the generosity of pension provision for most groups.

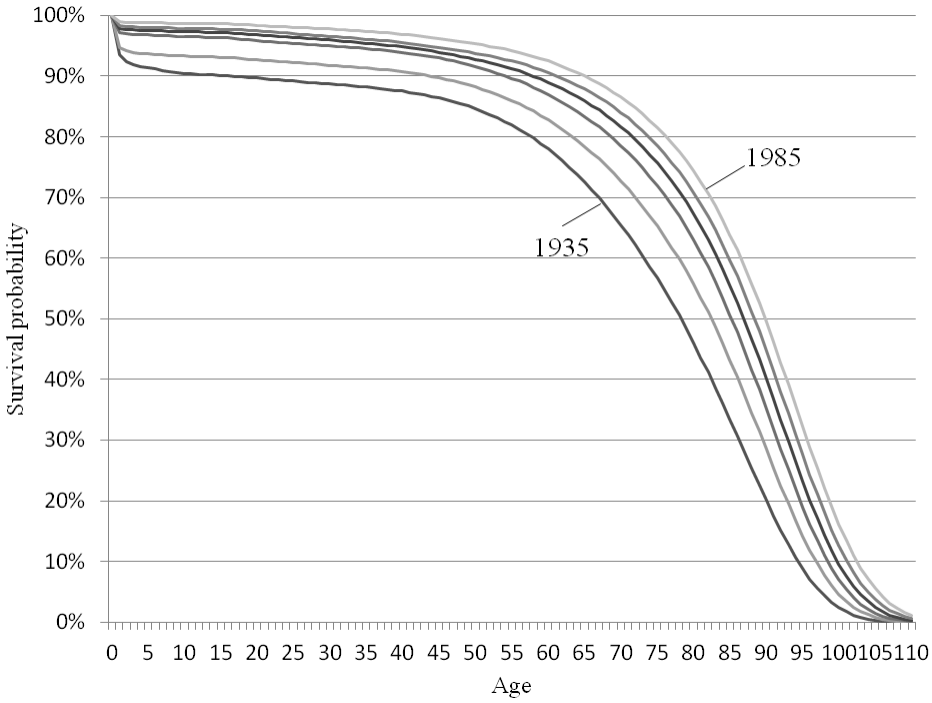
Unfortunately given the repeated and large changes to the UK public pension system it is difficult to quantify the different entitlements of different generations. It is also impossible to know the extent to which individuals understand the implications of the different reforms, and have accurate expectations about what their public pension entitlements are likely to be in future.

Issues of individuals knowledge and expectations aside, the optimal degree of private saving undertaken to smooth consumption over the lifecycle will depend on the level of any public pension provision. A greater public pension would, all else equal, imply that a given level of consumption can be achieved with lower dissaving from private wealth, and therefore that individuals need accumulate fewer private resources for retirement.

Life expectancies

Differences in survival probabilities for men from different birth cohorts are illustrated in Figure **??**. This shows the survival curve for men born in 1935, 1945, 1955, 1965, 1975 and 1985, calculated using Office for National statistics 2014-based life tables for England and Wales. It is clear that there are substantial differences in projected mortality rates. For example, a man born in 1935 on average had a 46% chance of reaching age 80. For men born in 1955 their chance is projected to be 63%, while for men born in 1980 it is projected to be 74%.

Figure 3: Male survival curves, by 10 year date of birth increments



Source: Authors' calculations using Office for National Statistics 2014-based life tables for England and Wales

Longer lives, all else equal (in particular, holding retirement age constant), implies that individuals have more years out of the labour market at the end of life. This means that to smooth consumption over this period they would need to accumulate a greater stock of wealth during working life. Life expectancies could therefore be expected to have an important impact on private wealth accumulation.

3 Model

To quantitatively illustrate the potential effects of these different economic circumstances on the private savings decisions of individuals we use a simple structural lifecycle model of savings. A brief description of the model is provided in this section. In summary, individuals in the model make one choice - how much to save in a risk free asset - in the context of circumstances that differ between generations: earnings, public pension provision, life expectancy, retirement age, and the return on saving. With the exception of mortality there is no uncertainty in the model.

Our model clearly does not capture the complex environment and choice set that faces individuals in reality, and involves many simplifications. However, we believe it is a useful tool to illustrate the extent to which differences in some circumstances may affect private savings behaviour.

3.1 Preferences and the environment

Lifetimes Individuals are modelled from the age of 26 until death. (In the model description that follows age is denoted by the subscript t.) Mortality is uncertain, with cohort-specific survival probabilities, but happens with certainty for all cohorts by age 110.

Preferences Preferences are assumed to be the same across cohorts. Individual utility in each period (one year in the model) is assumed to exhibit constant relative risk aversion:

$$u(c_{i,t}) = \frac{c_{i,t}^{1-\gamma} - 1}{1-\gamma} \tag{1}$$

Individuals aim to maximise the expected discounted sum of lifetime utility, where β is a geometric discount factor indicating the rate of time preference, and S_t is the survival probability at age t :

$$U = \sum_{t=0}^{T} \beta^t S_t u(c_{i,t}) \tag{2}$$

Employment and earnings Individuals are assumed to start working at age 20 and to remain in the labour force each year until the known cohort-specific retirement age K_g. Earnings are given by a cohort- and education-specific deterministic process that is a function of age:

$$\begin{aligned} ln(e_{i,t}) = \ & f_{ed,g}(age_{i,t}) \quad \forall t < K \\ e_{i,t} = \ & 0 \qquad\qquad\quad \forall t \geq K \end{aligned} \tag{3}$$

Public pensions From the retirement age K_g individuals receive a public pension payment. This is assumed to be a cohort-specific deterministic function of individuals' final earnings:

$$\begin{aligned} p_{i,t} = \ & 0 \qquad\qquad\quad \forall t < K \\ p_{i,t} = \ & f_g(e_{i,K-1}) \quad \forall t \geq K \end{aligned} \tag{4}$$

Choices Each period individuals decide how much to consume and (by implication) how much to save in a risk-free asset. The risk-free asset has a constant (cohort-specific) rate of return over the agent's life. This gives the inter-temporal budget constraint:

$$a_{t+1} = (a_{i,t} + e_{i,t} + p_{i,t} - c_{i,t})(1 + r_g) \tag{5}$$

Borrowing is not allowed at any age:

$$a_t \geq 0 \tag{6}$$

3.2 Model solution

The maximisation problem faced by individuals (with subscript i suppressed for ease of notation) is:

$$V_t(a_t; ed, g) = max_{c_t}\big(u(c_t) + \beta s_{t+1} V_{t+1}(a_{t+1}; ed, g)\big)$$

$$s.t. a_{t+1} = (a_t + e_t + p_t - c_t)(1 + r) \tag{7}$$

There is no analytical solution to this maximisation problem. We solve the model by backwards induction to obtain the decision rule for each individual and then simulate wealth holdings at each age using this.

4 Simulation results

We turn now to our simple illustrative projections of how the level and timing of private wealth accumulation might be affected by the different circumstances of different generations. These simulations are produced by combining the model presented in Section 3 with different assumptions on life expectancies, income profiles, public pension entitlements, retirement ages and interest rates. We start by illustrating the effects of varying each factor independently, holding all else equal. We then combine different assumptions across the different dimensions to get an overall picture of how the wealth accumulation profiles of different generations might be expected to differ.

4.1 Varying circumstances individually

Table 1 summarises the variants for each circumstance that we examine the effects of changing. For each circumstance that shown in bold is the one we assume when we are examining how the model output varies as a result of changing some other circumstance. In all simulations we assume a discount factor β of 0.99 and a coefficient of relative risk aversion of 1.5. The results of the simulations are set out in Figure 4.

Table 1: Summary of characteristics varied in simulation exercises

Circumstance	Variants
Income profiles	We use data on median net household equivalised income (before housing costs) by age and generation published in Cribb, Hood and Joyce (2016). We assume that median income at future ages grows at the same rate as it did for the preceding generation at the relevant age. To provide a degree of smoothing we then estimate cubic age profiles in log income for each generation. This yields six estimated income profiles, one relevant to each 10-year generation 1930, 1940, **1950**, 1960, 1970 and 1980.
State pension	We consider two different levels of state pension income: **£6,000 per year** and £8,000 per year.
Life expectancies	We consider the effects of using survival probabilities for men born in 1935, 1945, **1955**, 1965, 1975 and 1985. These are taken from Office for National Statistics 2014-based cohort life tables.
Retirement ages	We consider the following possible retirement ages: 65, 66, **67**, 68, 69 and 70.
Rate of return	We consider the following real rates of return on assets: 0%, **1%**, 2%, 3%, and 4%.

Income profiles

The different income profiles we examine are based on data for the 1930s to 1980s generations (combined with assumptions about future income growth, particularly for generations born more recently who are still early in working life). The first panel of Figure 4 indicates that these have a significant impact on the simulated asset accumulation profiles. Someone with a 1980s income profile would be expected to accumulate nearly three times as much wealth by age 65 as someone with a 1930s income profile, 1.75 times as much as someone with a 1940s income profile and 40% more wealth than someone with a 1950s income profile.

State pension

The level of the state pension also has economically important implications for the level of private saving that individuals would want to do to smooth consumption over their lifetimes. Moving from a state pension of 6,000 per year to 8,000 per year which is similar to the difference between the level of the old Basic State Pension and the new State Pension would

(in our baseline model) imply that individuals need to accumulate 14% less private savings by retirement.

Life expectancy

The life expectancy variants that we examine are those applicable to a man born in the middle of each 10-year generation. Changes in survival probabilities have the anticipated effect individuals who are expected to live longer would choose to accumulate more wealth (all else equal) as they expect to have more years of retirement over which to smooth consumption in the absence of income. The magnitude of the effect is sizeable: around a 24% increase in assets on the eve of retirement between someone with the survival probabilities of a man born in 1985 and someone with the survival probabilities of a man born in 1935.

Retirement ages

Retirement in our stylised model (the point at which labour income ceases) happens exogenously at a fixed age. However, in reality individuals may respond to their different circumstances - in particular, their different life expectancies - by changing the length of working life. We therefore examine the implications of changing the retirement age, considering each age from 65 to 70. Comparing these two extremes, simulated asset holding is around 6% lower when the retirement age is 70 (since there are fewer years without employment income that require withdrawals from assets in order to smooth consumptions).

Unsurprisingly changes in the retirement age affects the profile of wealth accumulation far more than changes in the other circumstances we consider, with peak asset holding moving in line with the retirement age. For example, comparing assets at age 65, these are simulated to be 32% lower among someone retiring at age 70 than at age 65, even though peak assets are only 6% lower.

Rate of return

Finally, for illustrative purposes we also examine how the projections of our model would be affected by different rates of return (note that we hold the discount rate constant). These make a striking difference to the level and profile of optimal wealth accumulation. In particular, moving from a real return of 0% to 4% approximately doubles desired asset holding at age 65, as the price' of individuals delaying consumption into the future is considerably more favourable.

4.2 Projections for different generations

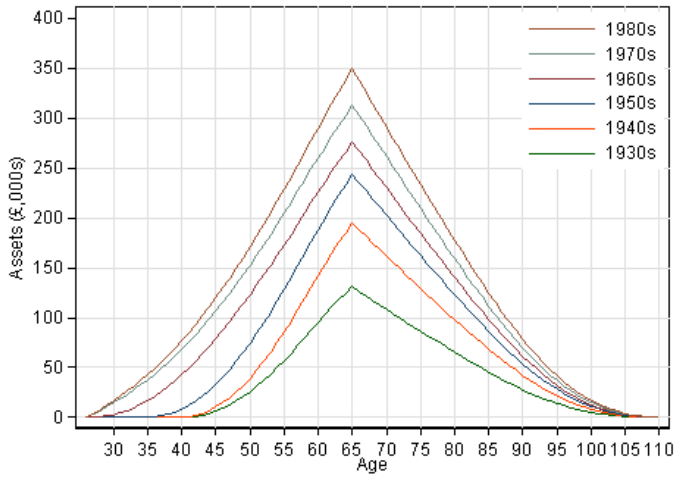
We turn now to illustrating the effects of different combinations of circumstances, which could be thoughts of as proxying the situation faced by individuals in different generations. The combined assumptions we consider are set out in Table 2. The model projections are presented in Figure 5.

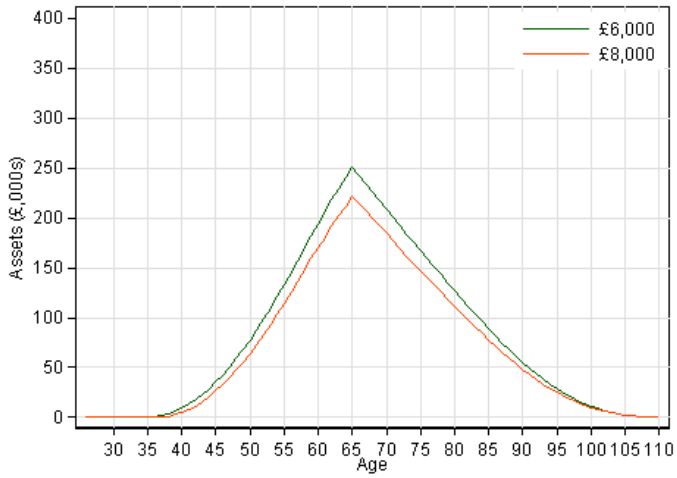
The implications are stark given our simple model and the differences in circumstances between generations that we model, one would expect very different levels of wealth accumulation for different generations. Generations born more recently would be expected to hold significantly greater sums at all ages, and by the time of retirement (which happens later), than previous generations. For the most part this is driven by the different income histories assumed, though the longer life expectancies also induce individuals to accumulate more wealth as this is not entirely offset by our assumed extension of working life.

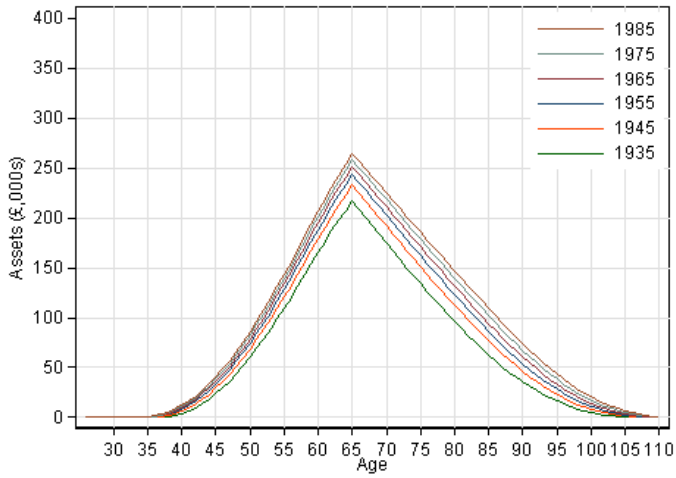
Table 2: Summary of characteristics assumed for each generation

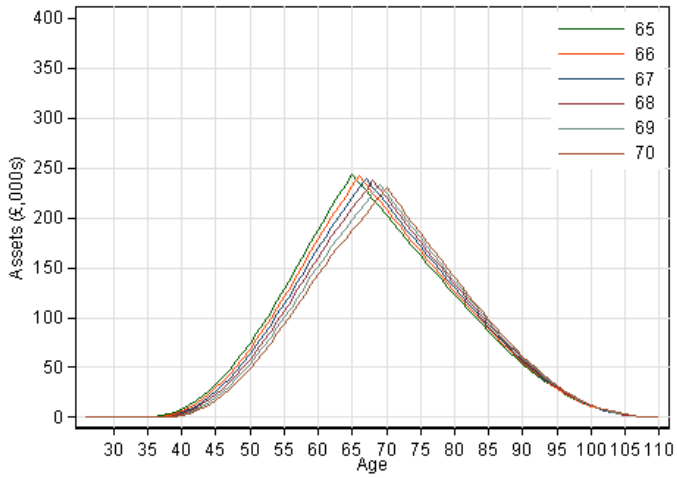
Circumstance	1930s	1940s	1950s	1960s	1970s	1980s
Income profiles	As per generation					
State pension	£4,536	£5,850	£6,500	£6701	£7,148	£7,752
Life expectancies	As per man born at generation midpoint					
Retirement age	65	65	66	67	68	69
Rate of return	1%	1%	1%	1%	1%	1%

Figure 4: Simulation results - varying circumstances independently









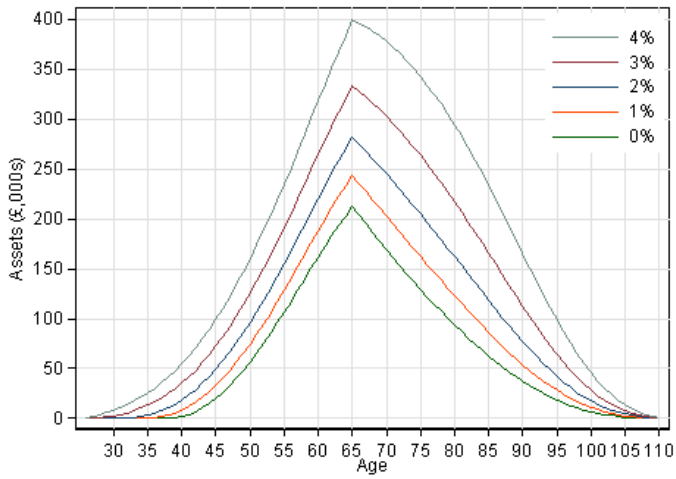
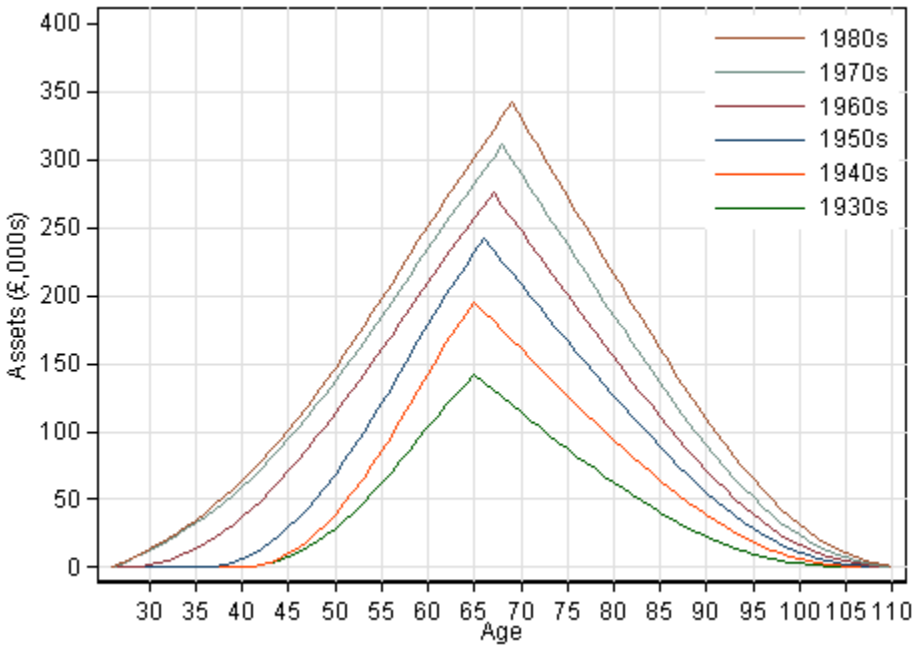


Figure 5: Simulation results - illustrative cohort analysis



5 Conclusions

In this paper we have used a stylised structural model of savings over the lifecycle to demonstrate how differences in the circumstances facing different generations can affect optimal private wealth accumulation.

Income profiles, which are known to have differed between generations in both level and shape, have striking implications for the level of wealth individuals in different generations would want to accumulate in order to smooth consumption over their lifetimes. Differences in life expectancies are also quantitatively important, and would not be completely offset if individuals were to change their retirement decisions in line with legislated increases in the UK state pension age. Asset returns and state pension entitlements are also potentially important, though it is harder to quantify how these have differed between generations.

This analysis shows that, even before acknowledging the possibility of different preferences between generations, simply comparing the accumulated wealth levels of different generations can be misleading. For example, our cohort scenario projections suggest that wealth at age 30

should be 7% higher among those born in the 1980s than those born in the 1970s, that wealth at age 40 should be 60% higher among those born in the 1970s than among those born in the 1960s, and that wealth at age 50 should be 65% higher among those born in the 1960s than those born in the 1950s. Depending on the conclusions one is attempting to draw, this clearly shows that the wealth of previous generations is not necessarily an appropriate benchmark or point of comparison when assessing the wealth holdings of different generations.

We do not claim that our cohort scenario projections are the right answer for how much wealth different generations should be accumulating there are many other circumstances that differ between generations that our very simply model does not capture. In particular, the decline in the availability of the defined benefit pensions, which were on average more generous than the defined contribution pensions that took their place, might be expected to reduce optimal private wealth accumulation in generations born more recently as compared to those who preceded them, as the implicit rate of return to pension saving declined. However, the scale of the differences projected in our simulations indicates that the differences in the circumstances of different generations must be acknowledged in any debate around the adequacy or otherwise of current working age individuals accumulation of wealth for retirement.

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