Ageing and the UK economy[1]

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This article argues that overall living standards in the United Kingdom are set to double over the next 50 years alongside a sharp increase in the proportion of people over retirement age. While there are clear risks to this outlook, these would be present even without demographic change. Nevertheless an ageing population does appear to increase the risks to the financial welfare of individuals, especially in their old age. If people living longer do not save more when they are working, then either they have to consume less in their old age or work for longer than would have been the case had greater provision been made for retirement. This risk is heightened by general uncertainty about asset returns which becomes more important as the number of people reliant on private pensions increases.

In common with most OECD countries, the average age of the UK population is expected to rise in the current century, reflecting the maturing of the baby boom generation, lower fertility rates and increased longevity. On current trends, the average will rise from 38.6 years in 1998 to 44 years by 2040 and the number of people over 75 will increase from about 4.4 million in 2000 to 8.3 million in 2040.[2]

The economic impact of changes in the age structure of the population is likely to be widespread, depending on how people react to the welcome prospect of living longer. The potential effect on saving, the allocation of funds around the financial system and the risks that this entails are of direct relevance to the Bank of England, since they affect its core purposes.

This article provides a preliminary assessment of the effects of ageing on UK economic growth and the living standards of different age groups within the population, summarising work done within the Bank in co-operation with the Financial Services Authority (FSA). It begins by describing how average living standards in the United Kingdom might develop over the course of this century, taking account of anticipated demographic changes. It then goes on to discuss the sensitivity of this outlook to the way in which the overall level of saving in the economy might change as the population ages, taking account of the interaction between the level of saving, national income and the rate of return on assets. It is shown that demographic change might have a differential impact, benefiting some generations and not others. This arises partly from changes in the rate of return on assets. The article goes on to review some of the available evidence on the link between the rate of return and ageing, emphasising the risks inherent in asset returns. It concludes by summarising some of the key issues arising from this discussion and identifying where the main vulnerabilities lie.

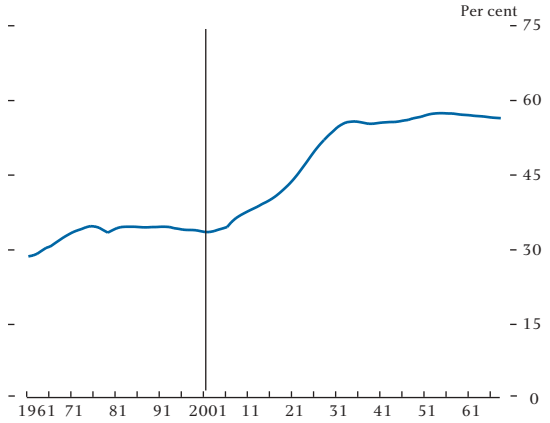
Living standards and demographic change in the United Kingdom

Chart 1 illustrates the anticipated extent of demographic change in the United Kingdom in the coming 60 or so years. It shows that, taking 60 as the retirement age, the number of working-age people per pensioner is due to fall from around three now to about two in 30 years' time and then to stabilise around that ratio.

At a simple level, such change affects living standards because of increasing 'dependence'; a rise in the number of people with a claim to the country's resources relative to those involved in producing them. But the level of living standards is also affected by the amount of productive capital available, as well as the effectiveness with which labour is used. It is possible that the impact on living standards of increased dependence will be offset by changes in saving, by longer working lives or by increased productivity. Table A shows how trends in the

(1) A more technical version of this paper is available as a Bank working paper (Young (2002)). This work has been used as background to an FSA thematic review of 'The implications of an ageing population for the FSA'. The outcome of that review was published on 20 May in 'Financing the future: mind the gap!'.
(2) Government Actuary's Department 1998 population projections.

Chart 1
Over 60-year-olds as a percentage of 15 to 60-year-olds



Source: Government Actuary's Department.

population in different age groups over recent and future ten-year periods translate into aggregate output and output per head of population under specific cautious assumptions about capital accumulation, labour participation rates and technological progress. Here capital is cautiously assumed to grow at 10% per ten-year period, less than half the growth rate seen in the past three decades, while underlying labour productivity grows at 1.75% per year, broadly in line with the average over the past 40 years and consistent with the assumptions underlying the Government's long-term fiscal projections (HM Treasury (2002)). Participation rates are assumed not to change and are set at their recent levels.

Under these assumptions, living standards, as represented by output per head of the population, are projected to grow more slowly than in the post-war years. Nevertheless, growth is fast enough that by 2061–68 the level of living standards is still two and a half times as great as in the 1991–2000 period. The projected broad increase in living standards is consistent with similar projections made for other countries. Indeed, in one of the earliest studies of the economic effects of ageing, Cutler, Poterba, Sheiner and Summers (1990) find that, while increasing dependence reduces living standards in the long run (relative to levels without a change in dependence), this would be fully reversed by only a 0.15 percentage point a year increase in productivity growth.

This comforting conclusion is dependent on a number of uncertain factors and would be adversely affected by sharp falls in either productivity growth or the rate of capital accumulation. While either is possible and therefore a source of general uncertainty, their possible link to demographic change needs to be clarified. There is very little theoretical argument or empirical evidence to link productivity growth to demographic change directly, apart from the effect on average productivity as large cohorts move through different stages of the productivity lifecycle.(1) There is, however, a relationship between demographic change and productivity through the effect on national saving and hence capital accumulation.(2) In small open economies changes in national saving are as likely to be reflected in foreign as in domestic investment. So when assessing the likely future evolution of living standards it would also be important to take account of the build-up of claims on foreign countries.

Table A
Demographic trends and living standards

	Population of age group (millions)						Effective labour supply (millions, 2000 equivalent)	Capital stock (£ billions, 1995 prices)	Output (£ billions, 1995 prices)	Output per head of population (£ thousand per head, 1995 prices)	Growth in output per head
	0–14	15–29	30–44	45–59	60–74	75+					Annualised (per cent)
1961–70	12.8	11.2	10.3	10.4	7.3	2.4	15.8	843	371	6.8	
1971–80	12.9	12.2	10.2	9.9	8.1	2.5	19.0	1,198	477	8.6	2.4
1981–90	11.0	13.3	11.5	9.3	8.1	3.7	24.1	1,451	578	10.2	1.7
1991–2000	11.3	12.1	12.9	10.4	7.9	4.2	30.1	1,795	731	12.4	2.0
2001–10	10.9	11.6	13.5	11.9	8.3	4.6	37.3	1,974	868	14.3	1.4
2011–20	10.6	11.8	12.0	13.3	9.9	5.0	43.9	2,172	997	15.9	1.1
2021–30	10.6	11.2	12.4	12.4	11.3	6.3	51.3	2,389	1,141	17.8	1.1
2031–40	10.4	11.2	12.0	11.9	11.8	7.6	59.6	2,628	1,301	20.1	1.2
2041–50	10.2	11.1	11.6	12.1	10.9	8.8	69.9	2,891	1,492	23.1	1.4
2051–60	10.1	10.8	11.7	11.6	11.0	8.4	81.8	3,180	1,709	26.8	1.5
2061–68	10.0	10.7	11.5	11.5	10.8	8.3	94.5	3,498	1,940	30.9	1.5

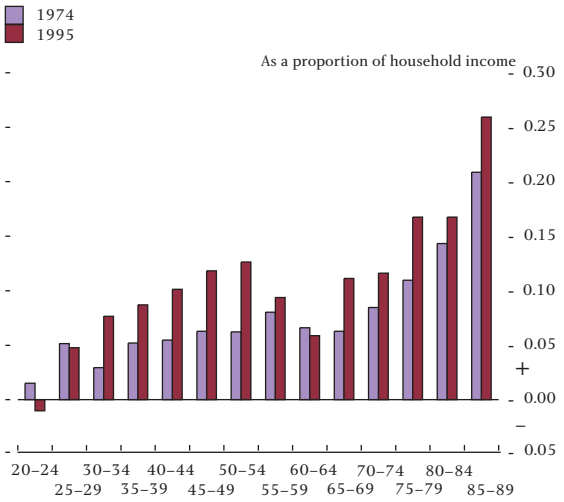
Notes to table: The 'effective' labour supply is constructed assuming participation rates of 0.75, 0.85, 0.70 and 0.1 for 15–29, 30–44, 45–59 and 60–74 year-old age groups respectively. The effectiveness of a unit of labour (normalised at one per employee in 2000) is assumed to grow at 1.75% per year. 30–44 year-olds are assumed to be 40% more productive than others. Output (GDP at constant 1995 market prices) and the capital stock (in constant 1995 prices) are averaged over each ten-year period. The future capital stock is cautiously assumed to grow at 10% per ten-year period. Future output is generated by a Cobb-Douglas production function with capital share of 0.35.
Sources: Population projections from Government Actuary's Department, capital stock and output from Office for National Statistics.

(1) Cutler *et al* (1990) is one of the few papers in the literature that try to link productivity growth to demographic change.
(2) This could also affect the rate of technological change if technological improvements are embodied in capital investment.

While overall savings levels cannot be identified simply with the saving of individuals, the link between aggregate saving and ageing is usually approached by considering saving over the individual lifecycle.(1) If, as seems logical, people tend to save most in their middle age and dissave in their old age, then aggregate saving might be expected to increase when the proportion of middle-aged people in the population increases and decline when the proportion of old people increases.

In the most readily available data, the observed pattern of saving across different age groups does not match up easily with the predictions of lifecycle theory. Chart 2 shows measured saving rates by age group in the United Kingdom in 1974 and 1995 based on data from the *Family Expenditure Survey* (FES) presented in Banks and Rohwedder (2000). Saving as defined here represents the accumulation of *financial* assets and does not take account of the accumulation of housing assets or any pension fund built up by employer contributions. It also fails to take account of wealth accumulated through capital gains on assets.

Chart 2
Saving rates by age group



One of the striking features of this chart is the high median rate of saving by the retired at a time of life when they might be expected to be running down assets. This is the so-called 'retirement savings puzzle' analysed by Banks, Blundell and Tanner (1998). They show that this cannot be accounted for by mortality risk, the removal of work-related costs or demographic factors, although it may reflect differential mortality given that those with the highest pension incomes live longest. It might also be accounted for by noting the complexities in measuring pensioner income. As Miles (1999) has pointed out, household surveys like the FES measure pensioner income incorrectly, because some of the receipts classified as income are depleting the pension fund of which the pensioner is a member and should properly be treated as dissaving.

Hussain (1998) adjusts the saving rate of pensioners for this form of mismeasurement and suggests that the 'true' saving rate of pensioners, taking account of the depletion of pension funds, is minus 8% of disposable income. From this he predicts a decline in the personal saving rate from a peak of around 12% in 2005 to a low of around 9% by 2040 as a consequence of demographic change. This can have a relatively large impact because in a closed economy a lower rate of saving reduces capital accumulation, the capital stock and hence output and subsequent saving. Young (2002) shows illustrative projections of output per head in a baseline case where the ratio of investment to output is fixed at recent levels and in an alternative case where aggregate investment responds to exogenously determined cohort-specific saving rates adjusted in line with Hussain's estimates. Living standards grow more slowly in the latter case, so that by 2060 they are about 10% lower than they would be in the fixed investment rate case. While this difference is substantial, in both cases living standards in the future are projected to be substantially higher than they are now, in line with the estimates in Table A.

Aside from the problem in estimating age group specific saving rates, there are a number of other difficulties with the forgoing illustration. In particular, it cannot be assumed that the age-specific saving rates will remain constant. As Chart 2 illustrates, the saving rates of different age groups have changed over time, reflecting different aggregate influences on saving, as well as factors specific to particular cohorts. It is also likely that demographic change will have a number of effects on saving rates and welfare at particular points in the lifecycle, depending on what is causing the demographic shift. Moreover, the approach adopted so far has ignored many of the complex interactions that can only be readily allowed for in a more general setting. In particular, a general equilibrium approach would also enable an analysis of the impact that demographic change could have on asset prices.

(1) For the United Kingdom, household saving in 2000 amounted to 3½% of GDP, corporate saving to 9% of GDP and government saving to 3½% of GDP.

Assessing the impact of demographic change

In Young (2002), a simplified dynamic general equilibrium model is used to assess the impact of demographic change. The model outlines the possible effects of ageing on the supply of labour and capital, the key factors in determining the amount of resources that the economy can produce. It also shows, when markets clear, how such changes affect real wages and real interest rates, the rewards to labour and capital that determine the living standards of different groups within the population. The model thus abstracts from many important features of the actual economy in order to focus on the essential details. In particular, it focuses on a situation where pensions are provided solely from private saving. It also ignores inflation and the possibility of capital flows between different countries, so that real interest rates are determined by purely domestic factors.

Within the model, the impact of ageing on saving and hence capital accumulation depends on the behaviour of individual households and how they respond to changing economic incentives. One possibility is that saving is chosen to spread spending evenly over the maximum possible lifetime of each household taking account of expected future incomes. The difficulty with this approach to modelling saving is that it assumes very high powers of calculation on the part of individual households and is not necessarily consistent with empirical evidence on household saving behaviour. In order to assess the extent to which the analysis is robust to different assumptions about household behaviour a second case is considered where households are assumed to follow simple 'rules of thumb'. In this case they spend a fixed proportion of their current resources throughout their lives and do not take account of the fact that they would be better off by altering the amount they save as economic conditions change. Importantly, there is no change in saving when the expected period of retirement lengthens.

Within this framework, the welfare implications of an ageing population are shown to depend upon the type of demographic shock that brings it about. Furthermore, some types of demographic shocks have opposing effects on the welfare of different generations. Consider first the effect of a baby boom. This is a temporary demographic shock with no impact on the length of life of individuals. It reduces the average living standards of the baby boom generation while improving the living standards of their parents and children. This arises simply from the fact that the baby boom generation are effectively more plentiful and this reduces the value of their labour when they are working and the value of their capital when retired.

By contrast, the impact of greater longevity is different since it affects the average length of life of all individuals. It has an adverse impact on the consumption of all generations. This follows from the assumption that people do not extend their working lives when life expectancy rises. With longer life spans but no change to labour supply, households have to spread their resources over a longer period and hence must consume less. Relaxing the assumption of fixed labour supply would change the results and tend to reduce the impact of increased longevity on consumption.

The impact of reduced fertility, a permanent demographic shock that has no impact on the length of life of individuals, is different yet again. It has little effect on individual welfare in the long run, although it does improve the reward to labour relative to that of capital by reducing the number of people of working age relative to those living off savings. This has an adverse impact on those who are old when the change in fertility occurs as they lose from lower real interest rates without benefiting from having higher real wages when they are young.

In some of the cases considered, optimal consumption in retirement is reduced relative to what it would have been without a demographic shock. These effects are compounded when households determine their consumption by following rules of thumb, since in this case they do not make the necessary adjustment to their consumption when they are young.

The model also reveals some useful predictions about medium to longer-term real interest rates and hence asset prices. The implications of demographic shocks for real interest rates are dependent on the effect on capital accumulation and the type of household behaviour assumed. In the case of a baby boom and lower fertility, real interest rates move in a qualitatively similar way in both the optimising and rule-of-thumb cases, although the magnitude of the effects is different. When households are optimisers the effects are generally small, as saving responds to changes in real interest rates and so dampens their movement. In the case of increased longevity, the two assumptions about household behaviour give different predictions about the direction of change in real interest rates, reflecting

different responses in saving. When households are optimisers, aggregate saving rises in response to increased survival rates and this depresses real interest rates mildly. But when households make no provision for increased survival, aggregate saving falls, raising equilibrium real interest rates. In all of the cases considered, the impact on real interest rates is quantitatively small (less than 1 percentage point), especially when households are optimisers. This is consistent with the wider academic literature. For example, in his analysis of the effect of ageing on the UK economy, Miles (1999) shows the real interest rate falling by 0.4 percentage points over the 30 years from the late 1990s.

Of course, the assumption that medium to long-term real interest rates are determined within any national economy is inconsistent with high levels of capital mobility within the international economy. When it is mobile, capital will tend to flow to countries where the rate of return is highest, equalising risk-adjusted rates of return where mobility is perfect. For small open economies, purely domestic demographic shocks would have no effect on the domestic rate of return and countries would export capital when the domestic saving rate was high and import it when it was low. In these circumstances, the model would be a useful description of how the global economy might respond to ageing.

Brooks (2000) outlines the implications of population ageing using a calibrated model of the world economy. His simulations show that there will be a turning point in regional saving-investment balances between 2010 and 2030 when the European Union and North America will experience a substantial decline in savings relative to investment as their populations age rapidly. This shift will be financed by capital flows from less developed regions that are projected to become capital exporters.

Empirical evidence on asset returns and demographic structure

As noted above, calibrated theoretical models generally show only modest effects of demographic change on real interest rates and, by implication, asset prices. But this prediction is sensitive to the precise specification of the model. Furthermore, this contrasts sharply with some popular claims, especially in the United States, that the increase in asset prices in the 1990s was partly caused by the movement of the baby boom generation into the high-saving part of its lifecycle. There are similar predictions of an asset price 'meltdown' when the baby boomers attempt to sell their assets on retirement, although, as Poterba (2001) has noted, this is difficult to reconcile with the view that any such effect should already be priced into asset prices determined in forward-looking markets.

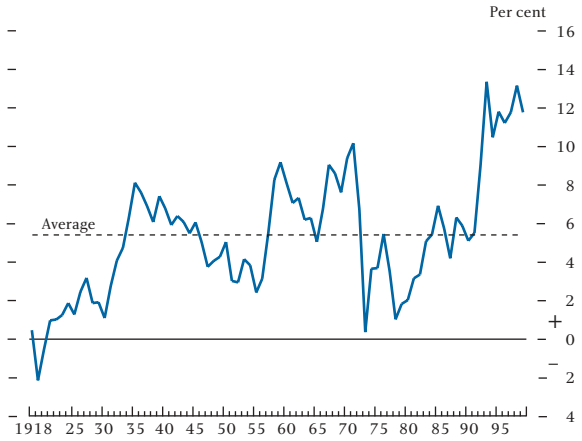
These claims can be assessed by examining whether asset price movements have been linked to shifts in the demographic structure that have occurred in the past. Mankiw and Weil (1989) analysed the relationship between house prices and the age structure of the US population. They forecast that reduced housing demand would result from ageing of the US population after 1990 and this would lead to house prices lower than 'any time in recent years'. Of course, house prices did not fall as predicted over the 1990s. This does not refute the thrust of the Mankiw-Weil analysis since other factors have undoubtedly changed so as to offset the impact of demographic changes, but it does emphasise the need for caution in making predictions about asset prices without acknowledging the wider uncertainty that exists.

Similar trends in the house-buying population were suggested as a cause of the lacklustre state of the UK housing market in the mid-1990s (Wallace (2001)), but the subsequent housing recovery again suggests that demographic trends are not the only cause of house price increases.

In a wide-ranging survey, Poterba (2001) questions whether it is possible to test for low-frequency patterns in asset prices: 'There is one Baby Boom shock in the post-war US demographic experience, and as the Baby Boom cohort has approached fifty, real stock market wealth has risen rapidly. This is consistent with some variants of the demographic demand hypothesis. Whether fifty years of prices and returns on this experience represent one observation, or fifty, is however an open question'. Despite this caveat, Poterba goes on to analyse the empirical evidence. He concludes that 'it is difficult to find a robust relationship between asset returns on stocks, bonds, bills and the age structure of the US population over the last seventy years'.

This negative result is consistent with the small effects on asset returns from demographic change generated by the theoretical models and suggests that it cannot be isolated in the data because of other influences.

Chart 3
Long-run asset returns(a)



(a) Average annual return on investments in UK equity made 20 years earlier with dividends re-invested.

Sources: Barclays Capital, Bank of England calculations.

Chart 3 shows the *ex post* annual average rate of return on equity in the United Kingdom on investments held for 20 years at a time with dividends re-invested. The well-known volatility in asset returns shown in Chart 3 draws attention to some of the key risks to which investors reliant on private saving are exposed. In particular, some savers will reach retirement age, having invested their savings at high rates of return, while others will be much less fortunate. Using these figures, a 20-year investment in 1954 in UK equities with dividends re-invested would have barely grown at all, whereas the same investment made in 1974 would have grown 13-fold. This simple illustration demonstrates the vulnerability of generations of private savers to the risk inherent in financial assets. It probably poses a much greater threat to the living standards of future pensioners than any impact resulting from demographic change.

Conclusion

Under relatively cautious assumptions about technological progress and capital accumulation, aggregate living standards could still double over the next 50 years, despite the projected marked increase in the proportion of people over retirement age. Even after allowing for the possibly depressing effect of an ageing population on saving rates and hence on capital accumulation, average material living standards should still be significantly higher. Theoretical models and empirical research suggest that demographic change tends to have little effect on asset prices, which is in any case dwarfed by their usual volatility.

Alongside this picture of improving living standards, the risks to individual welfare may have increased as a result of demographic change. This has occurred in three main ways. First, there has been a shift throughout the world from public to private provision for old age, increasing the proportion of people exposed to asset price fluctuations. Second, the size of the group exposed to such risks is growing larger as a direct result of ageing. Third, any adverse financial effects of greater longevity are most likely to be felt in old age. This third effect arises since people living longer have to spread their lifetime incomes over more years of life, implying a need for more saving when working. If this does not occur, then either consumption has to be lower in old age or people have to work for longer than would have been the case had proper provision been made for retirement. A recent report by the Financial Services Authority (2002) considers in more detail some of the key risks associated with demographic change in the United Kingdom and outlines some of their implications for consumers, financial firms and the authorities.

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