# Population Ageing: Crisis or Opportunity?

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## Non-technical Summary

Population ageing reduces the working population relative to the number of pensions by one-third over next 30 years. The challenge presented by this development is how best to support pensioners' incomes without suppressing the net incomes of the working population and capital accumulation too much. The ability of private savings and occupational pensions to meet this challenge is doubtful. There is a related issue of inter-generational equity: how do we share the burden of population ageing between generations, rather than passing it on to future generations. Given the uncertainty about future demographic and economic developments, it is important to have adaptable or self-correcting policies to address population ageing.

In contrast to exploring the economic effects of the steady fall in the aged support ratio, the previous section has demonstrated the more complicated effects of demographic changes on the housing market arising from fluctuations in the numbers in key ages and in family formation. Here we have seen the importance of the level of contemporary demographic rates, such as fertility, partnership formation and divorce, on turnover in the housing market, with consequences for the level of house prices. This is in addition to the 'scale effects' of age distribution changes on the number of households.

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*Abstract*

Population ageing reduces the working population relative to the number of pensions by one-third over next 30 years. The challenge presented by this development is how best to support pensioners' incomes without suppressing the net incomes of the working population and capital accumulation too much. The ability of private savings and occupational pensions to meet this challenge is doubtful. There is a related issue of inter-generational equity: how do we share the burden of population ageing between generations, rather than passing it on to future generations. Given the uncertainty about future demographic and economic developments, it is important to have adaptable or self-correcting policies to address population ageing.

Keywords: Ageing, pensioner income, intergenerational

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I published my first book 25 years ago on the topic of the political economy of demographic change, particularly the economic implications of changes in the population's age distribution (Ermisch 1983). In this paper I return to this subject. But there are, of course, more important milestones in the study of this subject: Keynes' (1937) short pamphlet and Reddaway's book (1939) on the economic consequences of a declining population, followed by the deliberations of the Royal Commission on Population, which was set up in 1944, but did not report until 1949.

In looking forward over the first three to five decades of this century, we should be cautious about the inferences that can be drawn from the prospective demographic changes because the economies and societies that will exist in 2030 and beyond may be very different from today's (independent of the demographic changes). Could any of the experts involved with the Royal Commission have imagined what today's society would be like, or even 1980's society? The National Health Service had only just begun when they reported, and the new welfare system based on Beveridge's ideas had just started. In terms of demographic change itself, the Commission was concerned about the impacts of declining fertility in the 1920s and 1930s, but the fertility rate had already risen during the war, and six years after the Commission reported it was to begin a sustained rise to levels not reached since the beginning of the 20th century. That is not to say that the exercise in this paper—assessing the implications of demographic changes on the assumption that society does not change dramatically—is pointless; only that it should be strongly qualified by uncertainty. There may be clues to how society will change in the prospective changes in the population, and a starting point for assessing their implication must be today's society and institutions. We should, however, remain sceptical of particular scenarios that may suggest themselves from today's perspective, focussing instead on

developing policies and institutions that have the ability to react to events rather than relying on the ability to predict them. Flexibility should be our guiding principle when dealing with the uncertainty that we face.

The paper proceeds as follows. The next section discusses the changes in the distribution of life expectancy over the past 30 years as a consequence of declining mortality. This is followed by a discussion of how the patterns of family formation and dissolution have changed over the same period and their relation to changes in fertility and the composition of families. In the third section, the consequences of past and projected changes in mortality, fertility and migration for key aspects of the age distribution of the population are presented. The fourth section is a core part of the paper. It discusses the economics of supporting an ageing population. The next section discusses the challenges for investment in children produced by changes in family formation and dissolution patterns, and the following one analyses the implications of ageing and family formation patterns for the housing market. The final section presents the main conclusions of the paper.

## 1. Declining mortality

The most obvious way that the age distribution of the population shifts toward older ages is people living longer. Figure 1 illustrates the decline in mortality in Great Britain for each sex by plotting the number per 100,000 births surviving at each age in two English 'life-tables', one based on mortality rates in 1980-82 and the other based on mortality rates in 2004-2006. Such life-tables indicate the proportion of people surviving at each age if the age-specific mortality rates in the particular years were experienced by a new born through his or her life. It shows for example that at 2004-06 mortality rates, 80% of women would survive to their 73rd birthday compared with only 70% for those experiencing the mortality rates of 25 years earlier, or putting it

somewhat differently, 80% only make it to their 68th birthday at the mortality rates of 1980-82. It also evident from the overlapping survival curves in Figure 1 that men's 2004-2006 mortality experience only achieves the survival rates of women 25 years earlier.

**Figure 1: Proportion Surviving:  Comparing 1980-82 and 2004-2006 Lifetables by Sex**
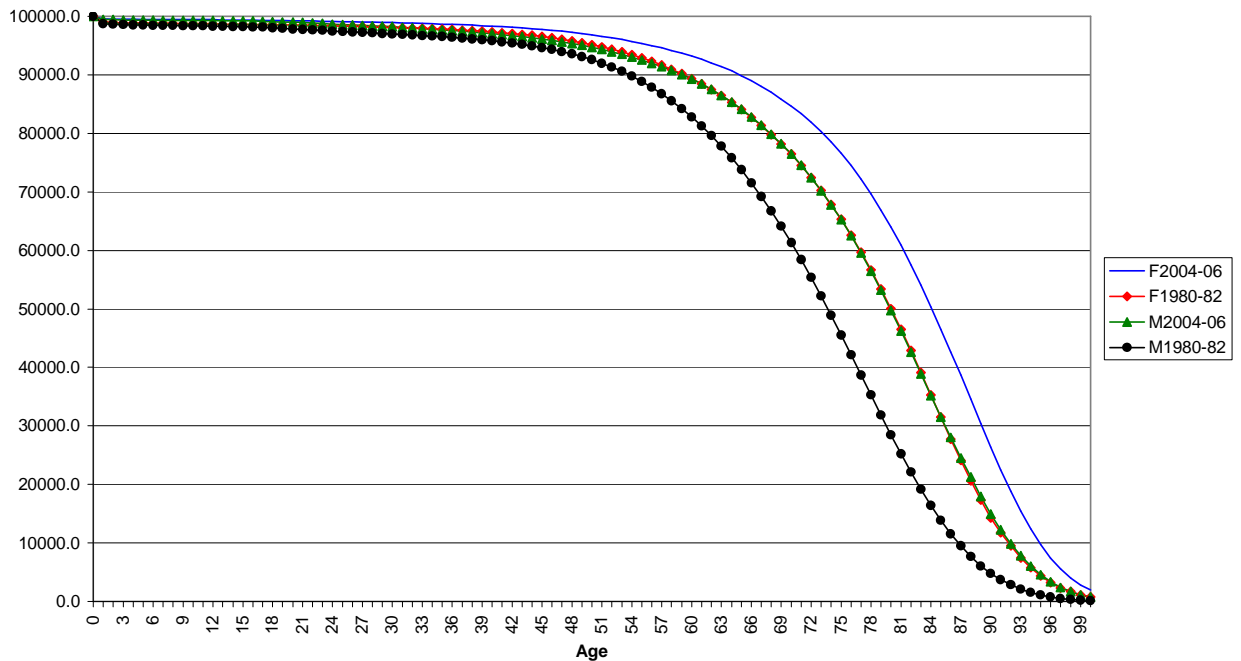


Figure 1 indicates that improvements in the chances of surviving are particularly large at ages above 60. Figure 2 presents these same data in another way. It shows the gains in the expectation of remaining life between these two life-tables at birth, age 60 and age 70 for each sex. Men have clearly made larger gains at each age than women. For example, their remaining life expectancy at age 60 has increased by 4.5 years compared with 3.2 years for women. As Figure 1 showed, women still live much longer on average. According to the 2004-06 life-table, women can expect to live 24 more years at age 60 compared to 21 more years for men. At birth, their respective life expectancies are 81.3 and 76.9 years.

**Figure 2: Gains in Expectation of Remaining Life, Comparing 1980-82 and 2004-06 Lifetables**
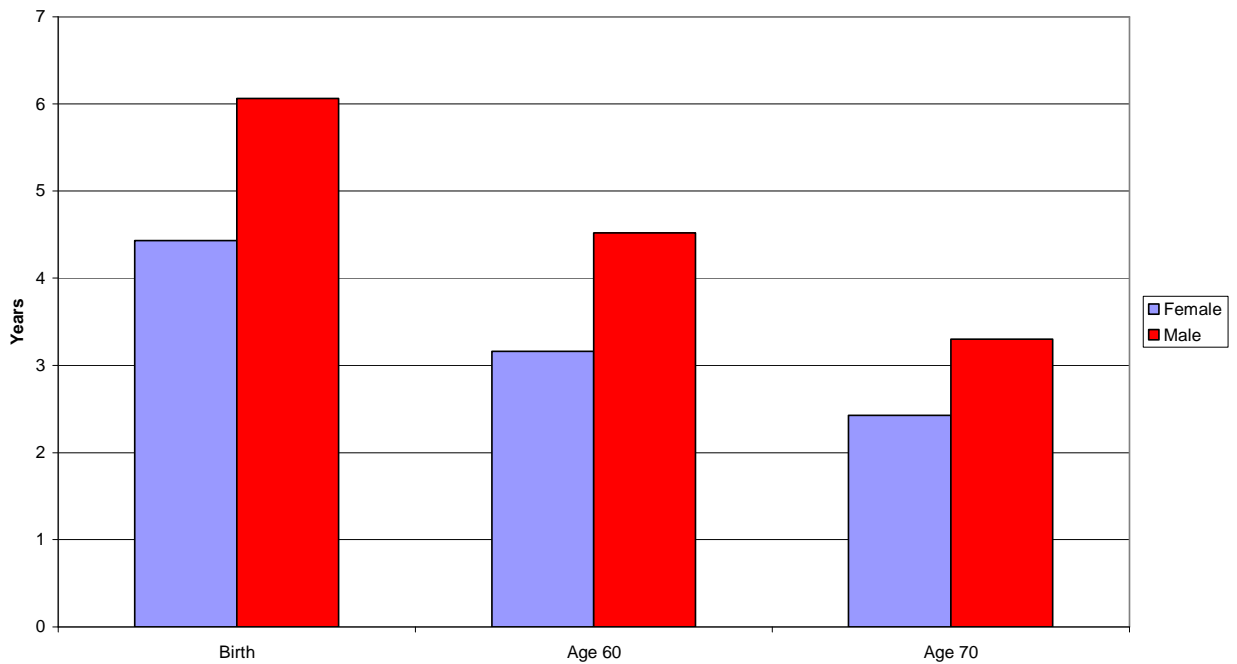


These reductions in mortality at ages above 60 clearly increase the older population relative to the entire population, as we shall illustrate later with projections of the population by age. Over the long term, e.g. 1875-1940, declining fertility made a larger contribution to the ageing of the population than reductions in mortality. But the fertility fluctuations in the past, illustrated in Figure 3, have produced bulges and hollows in the age distribution, and the baby boom of 1955-70 will soon produce a large increase in the population aged 65 and over. The next section examines fertility in the context of the new dynamics of family formation.

**Figure 3: General Fertility Rate (per 1000 women aged 15-44),
England and Wales**
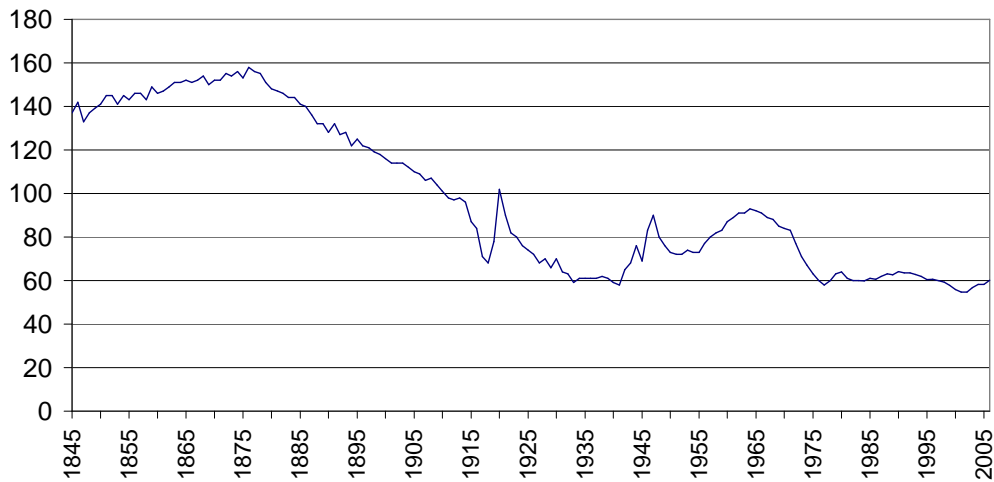


## 2. New dynamics of family formation

The 'total fertility rate' (TFR) measures the number of children women would have during their life if they experienced the current year's age-specific fertility rates throughout their childbearing years. Changes in the English and Scottish TFRs over the last 36 years are shown in Figure 4. There was a cross-over point in the early 1980s when Scottish fertility fell below English fertility, but since the late 1980s their TFRs have moved in parallel, including a significant rise since 2002. In what follows I consider Great Britain as a whole, as what I say applies to all three constituent countries. In order to put these fertility changes in the broader context of family formation patterns, I compare women born in the 1950s, 1960s and 1970s.[1] The first group were making their important family formation decisions in the 1970s, and the last in the 1990s.

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[1] I use fertility and partnership histories derived from the British Household Panel Survey (BHPS) by linking respondents' retrospective histories with their partnership and fertility experience during the panel, 1991-2005. This provides information on a range of post-war birth cohorts. See Ermisch (2006) for further details of the statistics in this section.

**Figure 4: Total Fertility Rate, England and Scotland**
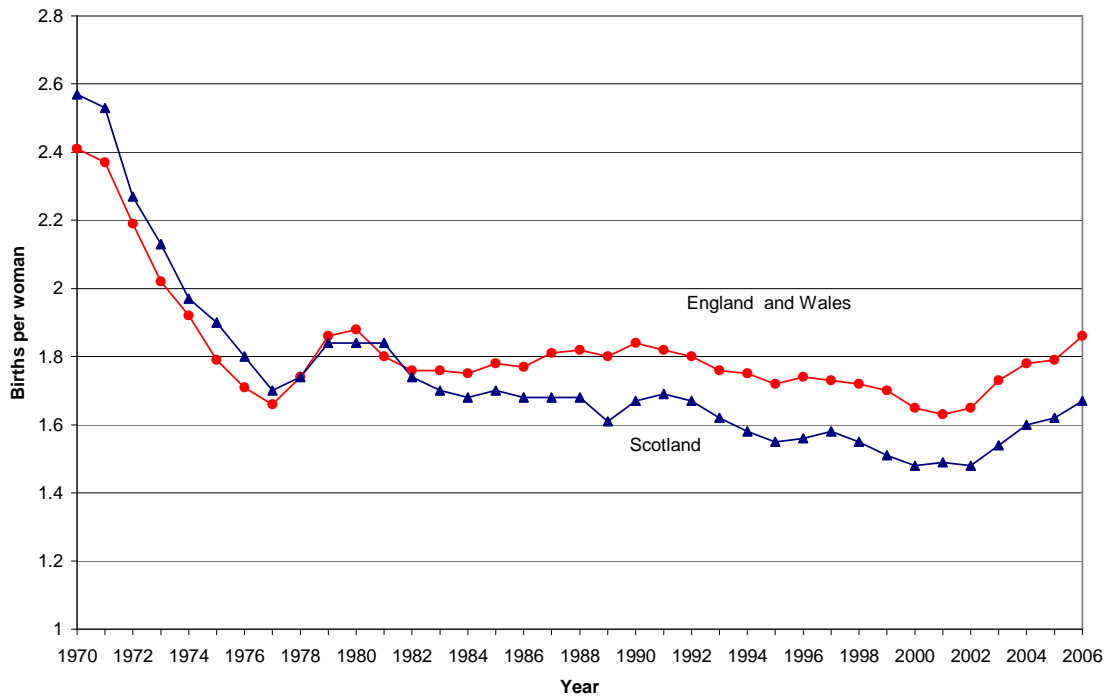


In Britain, live-in partnerships, be they formal marriage or not, have been forming later in people's lives. For instance, comparing women born in the 1950s with those born in the 1970s, the age by which one-half had their first live-in partnership increased from 22 to 25. Another big change over the last quarter of the twentieth century is that in the new millennium the vast majority of partnerships now begin as informal, cohabiting unions. These unions rose as a proportion of first partnerships from about one-quarter for women born in the 1950s to over four-fifths for women born in the 1970s. These two changes lie behind the large postponement of marriage and motherhood in women's lives. Cohabiting unions have a high dissolution rate, and it has increased over time: now one-half of the cohabiting unions eventually dissolve, with the other half turning into marriage. Divorce also became more common for successive cohorts born from 1926 to 1961.

Investigation of the social differentiation of family formation patterns, say by education level or family background, improves our understanding of the causes and

consequences of changes in these patterns. Here we compare women whose highest qualification (by 2005 or the last time they were observed in the panel) is at most GCSE/O-level (or its Scottish equivalent), which is usually obtained by the age of 16 or 17, with those with a higher qualification than that, denoting these as 'less' and 'more' educated women, respectively.[2]

There was much greater postponement of first live-in partnership for more educated women. Among the 1970s cohorts, less educated women partner, on average, 2 years earlier than more education women (median age of 24 cf. 26). More educated women also were pioneers in adopting cohabitation as the form of their first union, but by the 1970s cohorts there was little difference by educational attainment.

Despite the fact that age at first union is later for more educated women born in the 1970s, their median age at marriage was about the same as that for less educated women. This is because less educated women are more likely to dissolve their first cohabiting union (rather than marry their partner) than more educated women. It takes time to form a new union after dissolution; it will usually be a cohabiting union; and time will elapse before the couple marry, if they do so. All of this lengthens the time to first marriage.

Marriage was postponed more than childbearing for less educated women: among women born in the 1970s, the difference in median ages of marriage (32) and motherhood (26) was 6 years for less educated women.[3] This implies a rise in childbearing outside marriage, and there has indeed been an explosion of non-marital childbearing after at least 130 years of stability, rising from 9% of all births in 1975 to

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[2] There is no presumption that differences in educational attainment 'caused' the family formation differences that we observe; education is only used a convenient grouping variable, reflecting many differences in women's family background and individual orientation and lifestyles. It is also associated with other socio-economic indicators.

[3] For more educated women born in the 1970s, the median age of first birth was slightly larger than the median age at first marriage.

44% in 2006: Figure 5 shows the figures for England and Wales. Since 1995, the percentage of births outside marriage has risen even faster in Scotland, reaching 48% in 2006. In part this difference reflects a different ethnic composition of births between the two countries: in 2006, 22% of births in England and Wales were to mothers born outside the UK. When we restrict ourselves to women born in the UK, 49% of English/Welsh births in 2006 were outside marriage, similar to Scotland.

**Figure 5: Births Outside Marriage per 1000 Live Births, England and Wales**
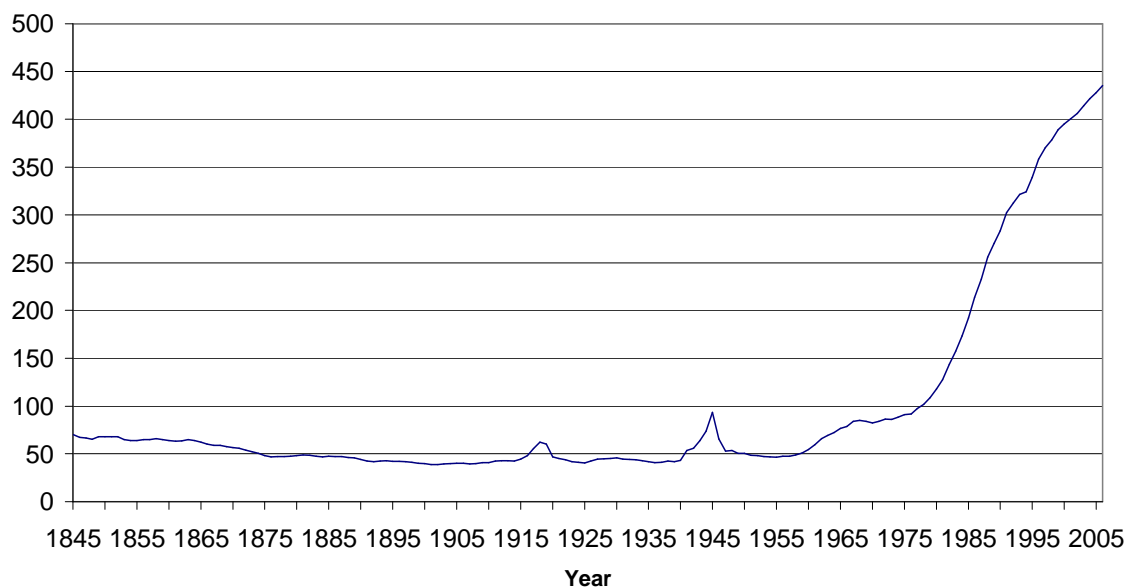


How many of these births outside marriage are to cohabiting couples? We can use the birth registration data to estimate the proportion. Births to cohabiting couples are identified as those in which the parents jointly register the birth and the parents live at the same address, and the remaining births outside marriage are assumed to be to women on their own.[4] Between 1983 and 2005 in England and Wales, there was a relatively steady upward trend in the percentage of all births to cohabiting couples according to this definition: it rose from 7% to 27%. Expressed as a percentage of

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[4] That is, those registered only by the mother or by both parents, but who give different addresses.

births outside marriage, births to cohabiting couples rose from 48% in 1983 to 64% in 2002, since which time it has stabilised. As the earlier comparison of median ages of marriage and motherhood suggest, birth rates outside marriage, either in a cohabiting union or outside a live-in partnership altogether, have risen more for less educated women.[5]

Cohabiting unions have a high dissolution rate, and, as Figure 6 shows, it has increased over time, with increase being larger for less educated women. In contrast to earlier cohorts, among women born in 1970s, less educated women are more likely to dissolve their unions than more educated ones. Also, among those born since 1960 less educated women have a divorce rate 30% higher than that of more educated women.

**Figure 6: Percentage Dissolving their First Cohabiting Union by Educational Attainment and Cohort**



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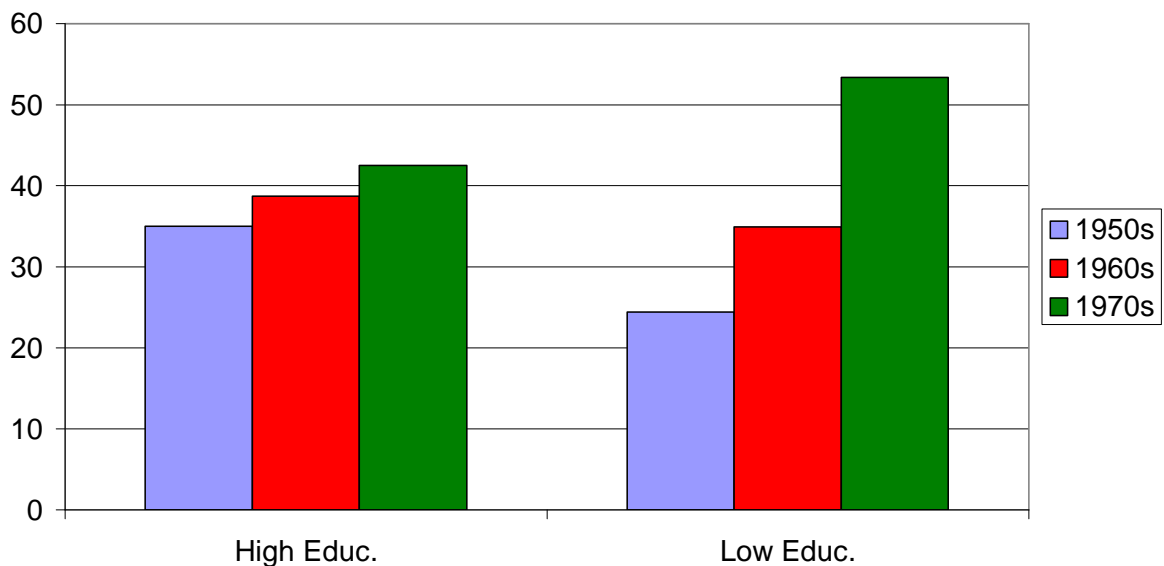
[5] Among women born in the 1950s, less educated women had a cohabiting union first birth rate 1.8 times higher than that of more educated women, and this rose to 2.8 times higher among born in the 1970s. The corresponding ratios for the birth rate outside a live-in partnership were 2.2 and 4.8.

Thus, fertility decisions are now made in an environment of considerable partnership instability. While the majority of births outside marriage are born to parents living together, these unions are not very stable (about one-half dissolve), and also in excess of 40% of marriages eventually dissolve. Focussing on unions with children, I estimate that 30% of children born within marriage will *not* live their entire childhood (to their 16th birthday) with both natural parents, and this percentage rises to 65% of children born into a cohabiting union. Furthermore, over one-third of births outside marriage are to parents who did not live together, at least at the time of birth registration.

While divorce remains the primary way that lone parent families are formed, the sharp rise in childbearing within cohabiting unions also made an important contribution to the increase in lone parenthood, because of the high dissolution rate of cohabiting unions and because the 'conversion to marriage' rate is *lower* for mothers than childless women in cohabiting unions. The patterns discussed above imply 'social selection' into lone parenthood: less educated women are more likely to (1) have a child outside of a live-in partnership; (2) have a child within a cohabiting union; (3) dissolve a cohabiting union; and (4) dissolve a marriage. Thus, lone mothers are disproportionately among less educated women.

Later in the paper we shall discuss implications of these family formation and dissolution patterns for investment in children's human capital and for the composition of households. The next section discusses projections of the population over the next two decades, which primarily reflect past changes in fertility and projections about future improvements in life expectancy, but also net immigration to the UK.

## 3. Population projections to 2031

In discussing these projections, I focus on people aged 20 and over because, at least up to 2028, these people have already been born, although they may not be currently in this country—see below. As Figure 3 showed, there have been considerable fluctuations in fertility in the past, and recent years have seen a significant rise in fertility. Since 2001, the fertility rate (births per 1000 women) in England and Wales has risen in every five-year age group but teenagers, reflecting a rise in both the inside-marriage (per 1000 married women) and outside marriage rates (per 1000 unmarried women) for every age group other than teenagers. Because the proportions that are unmarried have also risen in every age group, continuing an upward trend since the early 1970s, there has been an upward trend in the percentage of births outside marriage in every age group, particularly among women aged under 30, but also for those aged 30-39. It is, therefore, possible that we may experience higher fertility than assumed in the projections, with more of it occurring outside marriage.

The Government Actuary Department's (GAD) 2006-based principal projection assumes that, for England and Wales, the long-term average completed family size will be 1.85 children per woman (cf. 1.86 in 2006). A lower level of 1.65 is assumed for Scotland. In the shorter-term, the projections assume that the total fertility continues to increase until 2010 and then to fall slightly; that is, total fertility rates in the first few years of the projections are above those assumed for the long-term. Assumed improvements in mortality rates after 2006-07 are based on trends.

International migration is even more difficult to forecast accurately than fertility, depending on economic and political developments abroad as well as in the UK. The GAD assumes that net migration into the UK will be 190,000 per annum from 2014 onwards. Over the period 2007-12, there is an allowance for additional net migration to the UK from the accession countries which joined the European Union in

May 2004 and January 2007. The average annual level of total net immigration to the United Kingdom assumed for this period is around 215,000. This is similar to that actually experienced during 2004-06, the two years following the enlargement of the EU in May 2004, but a little above the assumption of 195,000 for 2006-07.

These assumptions produce a projected increase in what I shall call the 'working population' – persons aged 20-64 – of 3 million between 2006 and 2031, with one-half of that being between 2006 and 2012, reflecting the short-term international migration assumptions (these assumptions particularly affect the working population because of the age distribution of migrants). Dividing the working population by the number of people aged 65 and over gives what I call the 'aged support ratio'. Figure 7 shows that it falls from 3.7 'workers' per 'pensioner' in 2006 to 2.5 in 2031[6]. The assumptions about migration play an important role in these calculations. Taking the extreme of zero net migration into the UK, the UK working population would fall by 2 million between 2006 and 2031, and as Figure 7 shows, the aged support ratio falls to 2.1 by 2031.

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[6] It is projected to fall further in the 25 subsequent years, to 2.1, under the long-term fertility and migration assumptions.

**Figure 7: Aged Support Ratio, Great Brtain**
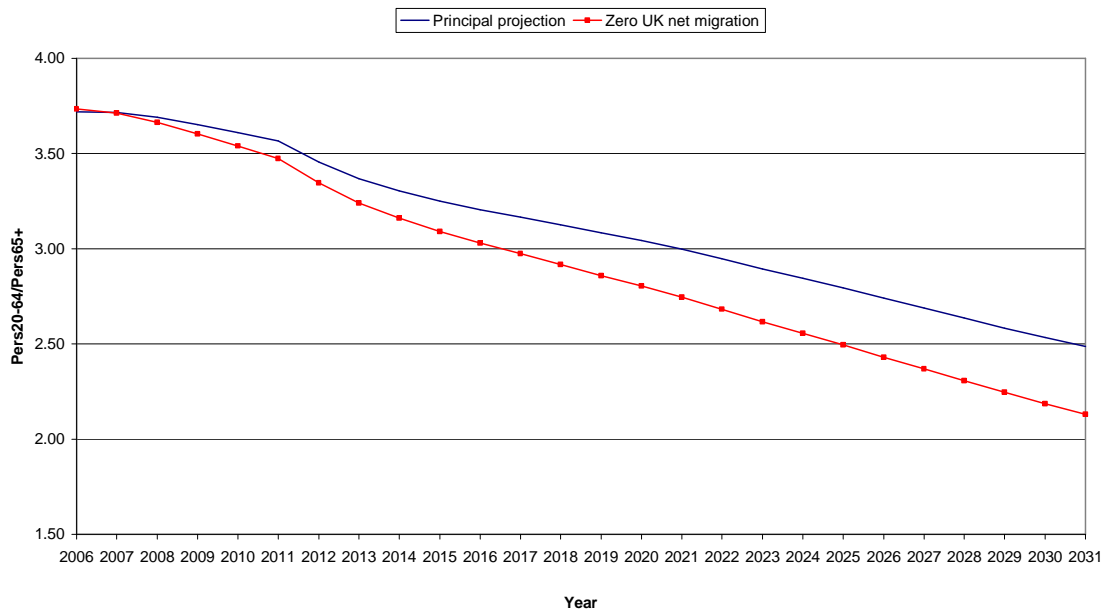


Future developments in the population age structure like those in Figure 7 are common across Europe; indeed, Britain is a relatively 'good case'. The implications of low fertility and improvement in mortality for the age structure of European populations are examined using the 2005-based UN 'medium' population projection (2006 Revision). Because it assumes a recovery in European fertility, converging to 1.85 children per woman by 2050, this projection may be considered relatively optimistic in terms of population ageing and decline. Despite this, the aged support ratio declines throughout Europe, reflecting the dramatic increase in the retired population (65 and over) everywhere. Figure 8 illustrates the decline for some major developed countries. By 2030, this ratio is around 2 workers per pensioner in Germany and Italy, below 2 in Japan.

**Figure 8: Aged Support Ratio**
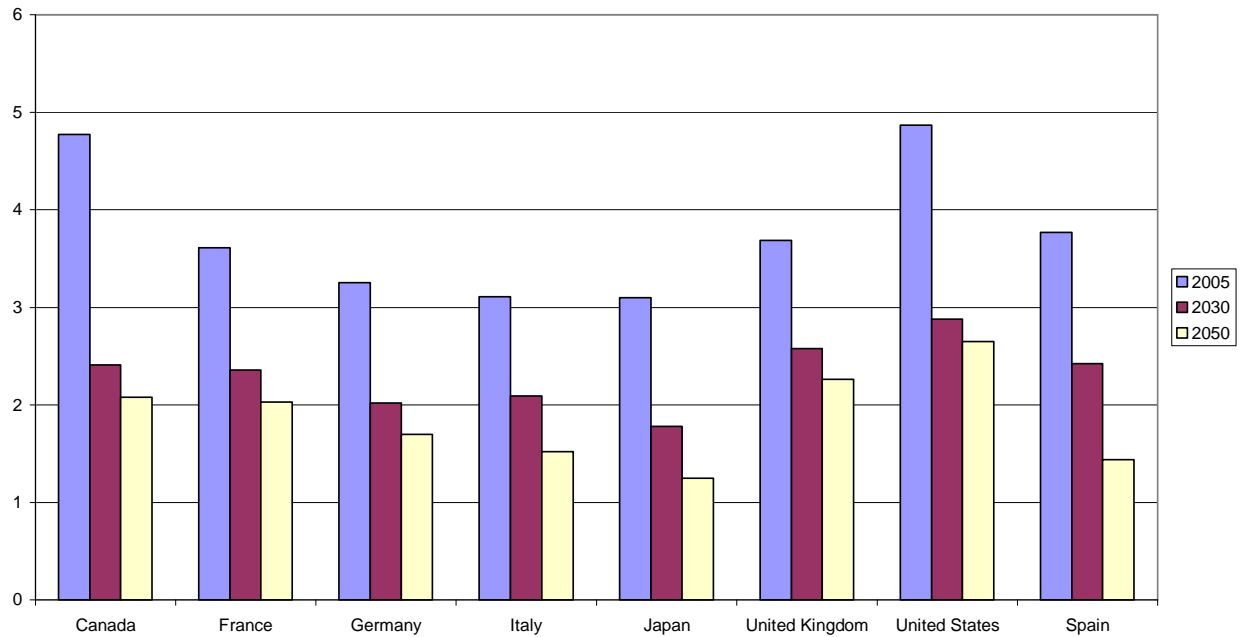**Ratio of Population Aged 20-64 to 65 and over**



Figure 9 shows the number of British people in three key age ranges. Persons aged 20-24 are important for new household formation (as well as new labour force entry of graduates), and those aged 25-29 are important for first house purchase. In both of these series you see the echo of earlier fertility waves (and assumed immigration), with the number of 20-24 year olds rising, peaking in 2012 and then declining, and the rise is prolonged for 5 years for 25-29 year olds (peaking in 2017). The number of 'very old' (aged 80 and over) rises at an increasing rate, the increase totalling 2.6 million over the projection period to 2031. As a proportion of the population aged 65 and over, the very old increase from 28% (2006) to 34% in 2031.

**Figure 9: Persons of Key Ages, Great Brtain**
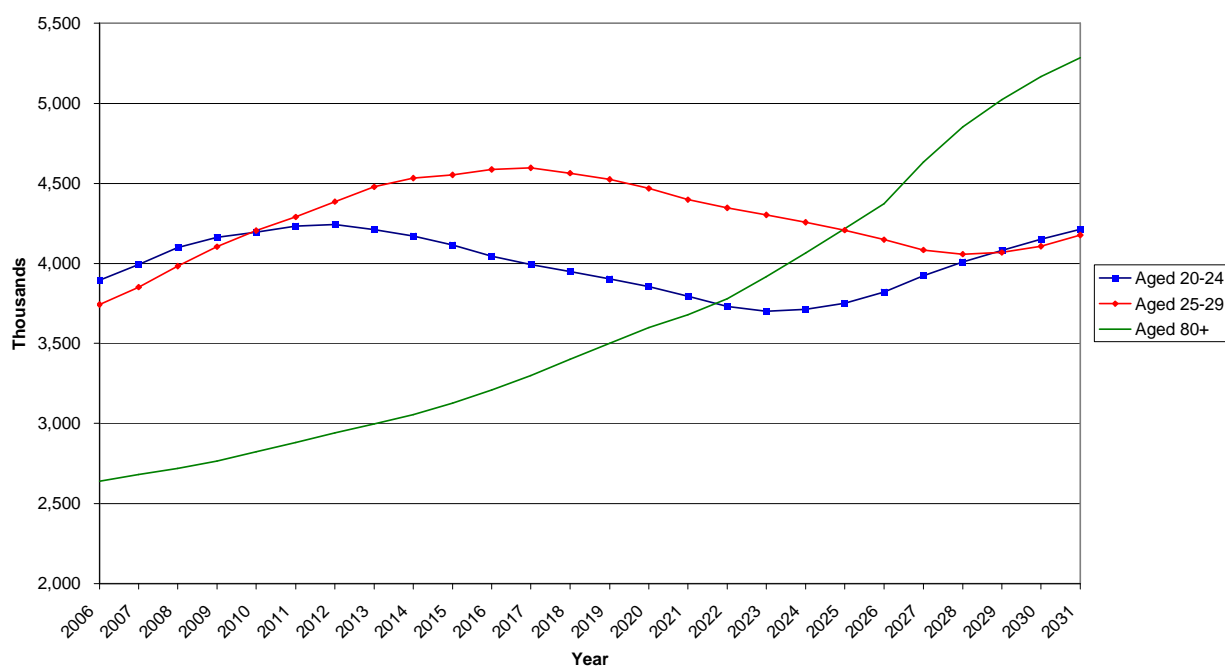


The remaining sections explore the economic implications of these projected changes. I will focus on supporting a retired population, investment in children and housing market impacts, ignoring implications for the labour market except through the effect of fiscal pressures arising from an ageing population.

## 4. Supporting an ageing population

Somehow output must be transferred from those producing it to the retired population, who are only consuming it: either through transfers within the family, retirees' private claims to the production of others (returns on capital, including funded pensions) or through government transfers paid by current taxes (unfunded pensions). The decline in the aged support ratio shown in Figure 7 means that there are fewer producers to make these transfers in the coming years. To what extent does that matter?

*Family transfers*
Affection, love and altruism toward parents could motivate transfers from adult children to parents, thereby internalising support for retirees within the family. But

Richard Smith (1996) suggests that there is not compelling evidence from English history, going back to Medieval times, that people assumed automatic responsibility for their elderly parents. He believes that it

> 'seems possible to argue with conviction that reciprocal exchange on the basis of mutual advantage is the essence of support between kin, making the family a group whose relationships are founded on material considerations and not solely glued together by what Janet Finch calls "moral imperatives and ties of affection" (p.44).

In the spirit of David Hume's 'human conventions', there might, however, be a 'social contract' involving reciprocal intergenerational exchange over the life cycle that is motivated by selfish material considerations, such that everyone is better off by obeying it. In particular, there could be an extended family network of transfers of money and 'services' covering three generations at different stages of life (Cigno 1993, 2000). Such a 'family constitution' arranges transfers to its young members (children) from its middle-aged ones and enforces 'repayment' later when the young 'borrowers' have become middle-aged and the middle-aged have become old. It specifies the minimum amount of money and services that each middle-aged adult transfers to her children and the minimum amounts she must transfer to her parent, subject to the provision that a person will receive nothing when she is old if she did not transfer the prescribed amounts to her parents when she was middle-aged. It is a *self-enforcing* family constitution in the sense that it is in the best interests of every family member to obey it and to have it obeyed.[7] The self-enforcing family constitution is therefore a type of social contract which, using David Hume's metaphor, holds together like a dry stone wall.

Extra-family institutions that support elderly parents, like the old Poor Laws or the current welfare state, discourage intra-family financial transfers but may promote

substitution by adult children of non-financial support (i.e. help) for financial support. This may account for the fact that in the 17th-18th centuries it was not uncommon for elderly parents to be receiving Poor Law support while their children lived in the same parish (Smith 1996), and it may account for the low level of financial transfers from adult children to parents in modern British society: only about 5% of parents receive regular or frequent financial help from children (Ermisch 2008).

*Private saving*
In the absence of an important role for the family in supporting transfers of resources to retired people, it is left to the market and the state to adjust these intergenerational transfers to a new demographic situation. Starting from a theoretical standpoint, compare two closed steady-state economies with different population growth rates, each made up of forward-looking people who maximize their lifetime well-being.[8] People would save more in the one in which population growth is slower and the aged support ratio is lower, thereby providing more capital (including human capital) to each member of the working population, which increases their real wages. They would have higher discounted lifetime consumption, made possible by more capital per worker and a lesser need to equip new workers with capital. A lower aged support ratio (slower population growth) presents no problems in this world, only opportunities.

This is a steady-state comparison for an economy with forward-looking consumers. In reality, Britain and other countries have experienced large past

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[7] Binmore (2005, p.87) suggests a similar intergenerational contract that can be sustained by selfish people. The minimum transfer to parents could be interpreted as adult children's 'moral duty', which is fulfilled because the constitution is self-enforcing
[8] In comparing the two economies, we can assume that the interest rate in the respective economics are at the 'golden rule' rate that maximises steady-state lifetime well being (equal to the population growth rate), because Samuelson (1975) shows that there is always a combination pay-as-you-go, funded pension scheme that can achieve the 'golden rule' interest rate.

fluctuations in fertility (Figure 3) and a downward trend in mortality, and not all (or even most) people are so farsighted. In light of the latter, you could view the UK and other countries' pay-as-you-go (PAYG) pension systems as helping to offset the effect of some people's life cycle planning myopia on their income in retirement. Within the PAYG system, real pension benefits can be maintained in the face of the decline in the aged support ratio (working population per pensioner) without increasing the national insurance (NI) contribution rate if there is compensating growth in the real wages of the working population. For instance, in Figure 7, the aged support ratio falls by one-third between 2006 and 2031;[9] if real wages grow by one-third in this 25-year period, which is likely, then real pension benefits can be maintained without changing the contribution rate. This is consistent with the Government Actuary's Quinquennial Review Update (GAD 2005), which projects a fall in the (employer + employee) NI contribution rate from 19.3% in 2004-05 to 17.7% in 2030-31 when there is price up-rating of flat rate benefit rates and earnings limits and real earnings grow at 2% per annum.

But price up-rating entails that pensioners do not share in the increase in the working population's standard of living. With 2% per annum real earnings growth, the ratio of pensions to wages falls by nearly 40% in 25 years. For example, the UK basic (flat-rate) pension would fall from 19% of median weekly earnings of full-time workers in 2007 to 12% in 2031.

It is possible that today's older workers are anticipating lower state pensions relative to earnings and are saving more to compensate. There is, however, little evidence of this yet. For example, the 2002 English Longitudinal Study of Ageing

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[9] We could also calculate the aged support ratio as the 'labour force' per person aged 65 and over, using 2005 economic activity rates for men and women, respectively, for each 5-year age group from 20-24 to 60-64 to weight the population age distribution, yielding an estimate of the 'labour force'. Using this definition, the age support ratio also falls by one-third between 2006 and 2031.

(ELSA) measures the net financial wealth (financial assets less debts other than mortgages) of the family unit in which a person lived (before the more recent rise in household indebtedness). Focussing on people aged 55-59 (on the brink of retirement), three-fourths off them had net financial wealth less than £57,300 (Marmot et al (2003), Table 3A.7). One-half had less than £17,000 and one quarter had less than £1,500, with nearly one-fifth having no net wealth. These amounts are hardly the nest-eggs needed for retirement. Furthermore, recent events in financial markets have underlined the uncertain value of financial wealth around the time of a person's retirement.[10]

What about occupational or private pensions? While most men have been members of an employer's pension scheme sometime during their working, this is not true of women (e.g. in 2002, about 35% of women aged 55-59 have never contributed to a private pension scheme compared to 11% of men of that age (Marmot et al (2003), Table 4A.16). Even those who contributed may have limited entitlements because of changes in their employers over their working life. Just after retirement, only about 30% of family income came from private pensions in 2002 (e.g. for people aged 65-69; Marmot et al (2003), Table 3A.1). Even with a good contribution record, funded Defined Contribution pension schemes present  uncertainty about the value of assets at the time of retirement similar to direct private saving, as recent events have shown. Defined Benefit ('final salary') pension schemes are not risk-free for pensioners either, and they are challenged by population ageing as well, as the number of recipients rises relative to contributors and recipients live longer. Statistics from the Pension Protection Fund (PPF) indicate that, in aggregate, these schemes currently

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[10] Of course, this ignores net housing wealth (house value less mortgage debt). Adding this to net financial wealth, three-fourths of people aged 55-59 have less than £203,900 in net wealth including housing (one-half less than £100,000; one-quarter less than £37,500; (Marmot et al, Table 3A.10). These are amounts do not provide for very large annuities for retirement from equity release schemes.

have a large deficit (discounted future pension liabilities exceed assets), with four-fifths of schemes being in deficit at the end of September 2008. Such deficits put upward pressure on contribution rates, both directly and indirectly through a higher risk-based levy to the PPF, and create major problems if the scheme is wound up or fails. Taxpayers may have to foot the bill if the PPF runs out of money through the failure of schemes, and members who have not yet retired would also suffer because the PPF only pays 90% of promised pensions and there is a pension ceiling. In sum, private solutions to supporting a larger retired population may not be robust.

Of course, if people's pensions are poor enough, then they will need to continue working to supplement their income. But this represents a fall in their welfare relative to being able to retire fully.

*State pensions*
The analysis of the previous section suggests that for a large proportion of British people retiring in the coming decades the state pension will be an important part of their retirement income. Suppose, therefore, that state pensions are increased proportionately with earnings (i.e. pensioners' relative income is held constant) so that pensioners can share in increases in the population's standard of living. Then the NI contribution rate would need to rise by one-third. This simple calculation is very close to that of the Government Actuary's when there is earnings up-rating of flat rate benefit rates and earnings limits. He projects that the NI contribution rate would need to rise to 25.4% in 2030-31 compared with 19.3% in 2004-05, an increase of 32% (GAD 2005).

How much would increases in labour force participation moderate this increase? To obtain some idea of this, I consider two relatively extreme scenarios. As previously noted, we can calculate the aged support ratio as the 'labour force' per

person aged 65 and over, using economic activity rates for men and women, respectively, for each 5-year age group from 20-24 to 60-64 to weight the population age distribution, yielding an estimate of the 'labour force'. At 2005 economic activity rates, the aged support ratio on this definition also falls by one-third between 2006 and 2031. Suppose however that 2031 economic activity rates in each five-year age group from 25 to 64 are at the maximum level that they were in 2005 for any five-year age group in 2005 (92.6% for men and 80.7% for women). Then the aged support ratio would fall by 27% between 2006 and 2031, rather than 33%. Second, suppose also that one-half of persons aged 65-69 are also economically active in 2031 (compared to about 15% now). Then the fall in the aged support ratio would reduced to 23%. Thus, even in these extremely favourable scenarios for labour force numbers in 2031, the NI contribution rate would need to rise by about 25% to enable pensioners to share in increases in the population's standard of living. This is still a large rise in contributions by the working population.

Two considerations need to be taken into account in assessing policy options regarding state pensions. First, it is important to consider the uncertainty surrounding future demographic developments as well as the broad tendencies suggested by population projections. Lee and Anderson (2004) address this issue in the context of the U.S. Social Security pension scheme. They characterise the uncertainty in terms of the probability distribution of the hypothetical immediate and permanent tax increase needed to balance the system over the very long run. For instance, they estimate this tax increase to be between 1.3% and 10.5% (of the present value of payroll) with 95% probability—a wide range.[11] As they stress, this understates the uncertainty involved because they incorporate into the forecasts 'only uncertainty that arises within the

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[11] They also show how finite horizons in pension finance forecasts can be misleading, and use a 500-year stochastic projection, effectively infinite with discounting, to mimic an infinite horizon forecast.

context of assumed structural continuity and homogeneity.' Random variations about expected values (e.g. wage growth and fertility) occur, but the expected values themselves are assumed to be constant. Their main conclusion from their stochastic simulations is the importance of formulating adaptable or self-correcting policies for addressing the long run imbalance.

Second, we need to consider whether future rises in state pension contribution rates can be sustained, as well as the equity of such rises. In doing so we must recognise that future pension liabilities under the state pension system represent just part of the future generations' fiscal liabilities. There is, for example, the existing national debt, although this is dwarfed by future pension liabilities and also, but less easy to quantify, other future government expenditure, for example on health care, which is likely to grow substantially because of the large increase in the population aged over 80 (Figure 9). It is hard to quantify what the implicit promises of the National Health Service are for the future, but whatever they are they need to be paid by the working population at that time.

*Generational accounting*
'Generational accounting' is a way to addresses these issues associated with the government's inter-temporal budget constraint. Generational accounts are defined as the present value of taxes paid minus transfer payments received (net taxes) that individuals of different age cohorts are expected, under current policy, to pay over their remaining lifetimes. Cardarelli et al (2000) have constructed generational accounts looking forward from 1996. Their 'baseline policy' assumes that all transfer payments (including pensions) are price indexed, while all other receipts and expenditures per beneficiary are assumed to grow with productivity (real wages) at 1.75% per annum. Clearly, many other assumptions must be made in order to look

well into the future, but indexing is an important policy parameter. Under the baseline scenario, government spending on personal transfers declines dramatically as a percentage of GDP, despite the ageing of the population. An alternative scenario indexes pensions and other social benefits with wages, and allows for an increase in health care expenditure to rise to the European average (as a percentage of GDP) by 2005—a rise which was in fact achieved.[12]

They calculate that under the baseline policy an immediate and permanent increase in income taxes of 6% (equivalent to a 2p in the basic tax rate) is needed to achieve inter-temporal budget balance, and a slightly larger income tax increase (8%) is needed to produce 'generational balance'—'a situation in which future generations face the same fiscal burden, as do current generations when adjusted for growth (i.e. when measured as a proportion of their lifetime earnings)' (Cardarelli et al 2000; p. F548). Should, however, all benefits increase with earnings and there is the additional health care expenditure per beneficiary assumed above, inter-temporal budget (and generational) balance would require an immediate and permanent increase in income taxes of 32% and NI contributions would also have to increase by 46% to cover the cost of the increase in contributory benefits.[13] Failure to increase income taxes today puts a considerable burden on future generations, experienced through either higher taxes, smaller transfer receipts or less expenditure on these generations. By affecting net incomes, higher taxes and NI contributions are likely to influence people's saving behaviour and therefore the economy's capital accumulation.

*Fiscal effects on the real economy*
In the most recent of a series of papers, Fehr et al (2005) bring demography (including immigration as well as fertility and mortality), fiscal policies (including pensions and

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[12] After 2005 it is assume to increase with productivity growth, like other expenditure per beneficiary.

their financing) and the economy (saving and labour supply decisions by forward-looking consumers) together in a general equilibrium model incorporating the USA, the EU, Japan and China. While the foundation of this model rests on many assumptions, it indicates some of the most important channels of interaction that need to be considered when assessing the implications of population ageing, whatever one thinks about its particular assumptions. Their simulations illustrate the potentially important role of international capital markets in moderating the impacts of ageing. Without high-saving China in the model, capital accumulation in the three other developed economies is much slower and there is virtually no increase in real wages up to 2030. Looking beyond 2030, there tends to be capital 'shallowing' (rather than deepening) and a small decline in real wages due to the high tax burden to finance the elderly population. When China is included in their model, even a China which gradually adopts Western spending habits, it is such a source of capital that capital deepening and real wage growth occurs over the next 25 years in all four regions, despite the rising burden of taxation to pay for pensions and health care. While only suggestive, these simulations underline the fact that population ageing and reactions to it are a world phenomenon, albeit with variation among countries in changes in the age distribution and in other parameters affecting economic decisions.

Policies related to human capital formation cannot be addressed in the framework of Fehr et al (2005) because it assumes exogenous changes in productivity of people's time—there is no explicit link between government investment in education or parents' investment in their children and these children's wages when they become part of the working population. The next section suggests that the young adults coming of age now and in future years may have less invested in their human

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[13] Of the 32% increase in income taxes, a 21% rise is needed to cover the increase in non-contributory benefits and 11% to cover the increase in health care spending.

capital than in the past because of the instability of families. Larger transfers of resources from today's working population to investment in children could facilitate the future payment of these workers' pensions by expanding the resource base for paying them. It is analogous to an increase in current taxes to help fund future expenditure, with the investment being in human rather than physical capital.

## 5. Investing in children
The number of children over the coming years depends very much on the evolution of fertility over these years, and the projected numbers reflect assumptions about it.[14] The focus of my discussion is not on the numbers but on how the changes in the dynamics of family formation and dissolution discussed earlier affect children.

The key aspect of these dynamics is partnership dissolution. Parents are likely to continue to care about the welfare of their children after they split up, and so expenditure on children, such as investment in their human capital, is a 'public good' to the parents. When living together, they tend to choose the efficient level of this public good, because of repeated interaction between parents within the same household. But after breaking up, the mother usually obtains custody of the children and she decides the level of expenditure on children (Weiss and Willis, 1985). The father can only influence it by making transfers to the mother, because the father cannot usually monitor the division of his transfer between expenditure on children and the mother's consumption, particularly expenditure on young children. The father must transfer more than £1 to obtain £1 more expenditure on children, because the mother spends part of the transfer on herself. This higher effective price for child expenditure when divorced encourages him to spend less on children after divorce (perhaps nothing), resulting in a lower, inefficient level of expenditure on children

overall. The inefficiency arises because the mother does not take into account the effect of her choices on the welfare of the father. The probability that a couple divorces is itself inversely related to this efficiency loss from divorce, and so parents with low education and incomes, who are expected to spend less on their children, suffer a smaller efficiency loss and so should be more likely to divorce (dissolve their cohabiting union), consistent with the evidence presented above in section 2.

The lower expenditure of money and parental time on children in families in which the parents have split is likely to mean lower investment in the children's human capital when they are young, which affects children's development and achievements. This suggests that children who have experienced a family break-up may have lower achievements than children brought up in an intact family. The impact is difficult to identify because children of the type of parents who break-up are likely to have lower achievements anyway. For example, as we have seen with regard to mother's education, single motherhood is more common among low educated mothers, who are likely to invest less in their children in any case. But, at least in the UK, there also seems to be a direct impact of single parenthood on children. Ermisch and Francesconi (2001) and Ermisch, Francesconi and Pevalin (2004) find, using comparisons of siblings (i.e. they have the same mother), that young adults who experience single parenthood as children, particularly during the pre-school years, have significantly lower educational attainments (e.g. less likely to achieve at least one A-level), with likely knock-on effects for future earnings and income. The lone parenthood experience is also associated with a number of other disadvantageous outcomes for young adults, including a higher risk of unemployment, a higher risk of having a child before a woman's 21st birthday, a higher chance of being a heavy

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[14] The principal projection has the number of children aged 0-14 rising until 2024 and then levelling off for a decade.

smoker and higher likelihood of experiencing psychological distress in early adulthood.

Thus, the changes in family formation and dissolution patterns that have accompanied the changes in fertility and the ageing of British society have been unfavourable for children born in recent years. Yet it is these children who increasingly will be called upon to support a growing retired population.

## 6. Ageing, family formation and housing markets

The most readily apparent impact of changes in the age distribution on housing markets is through household formation. Just over one-half of young women leave their parental home by their 21st birthday to form their own household (with or without a partner) or one with other unrelated adults.[15] We have also seen that one-half of women had formed a partnership by their 25th birthday. Figure 9 above shows the changes in the number of people moving through these key ages for household formation (20-24). On this basis we may expect a decline in household formation after 2012 because of age distribution changes, although the increase in the elderly population fuels growth in the number of households because there are more households per member of the older population (smaller household size), owing to the death of spouses and previous divorces.

There are, of course, other developments affecting household formation, including partnership break-up and re-partnering. Household projections must, therefore take into account projections of the marital status as well as the age distribution of the population, and also trends in the propensity of members of particular age/marital status groups to form separate households. Figure 10 shows past actual changes and official projected changes in the number of households per annum for England. Consistent with changes in the number of persons aged 20-24, these

projections show the annual net increase in the number of household peaking around 2012 (i.e. during 2011-2016), but staying above the rate of growth in the number of households experienced during the 1990s. Within the total, single person households are projected to increase in importance, from 31% in 2006 to 38% in 2029. It should, however, be noted that actual household formation is affected by housing market conditions (e.g. house prices and rents, mortgage terms), and so the evolution of the number of households can deviate substantially from the projections.

**Figure 10: Annual Average Change in Number of Households, Actual and Projected, England**
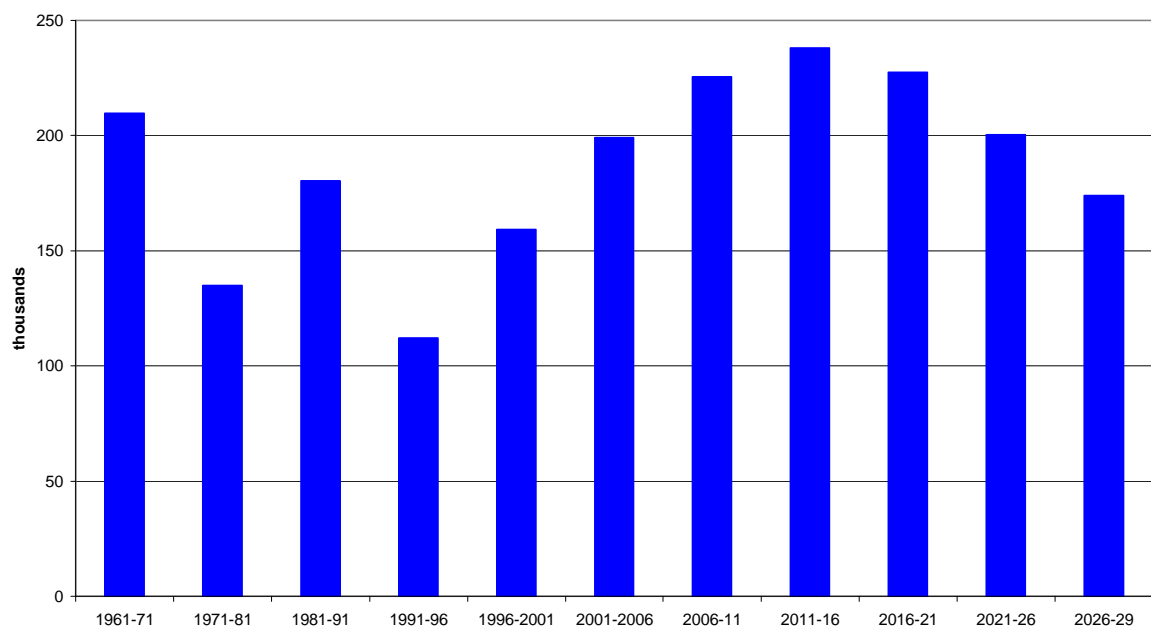


The market for owner-occupied housing is influenced by when people buy their first home. Figure 11 shows the percentage of women (in a couple or single) who are not already homeowners who become homeowners at each age—the 'hazard rate' of entering owner-occupation (e.g. 13% of women who are not homeowners when aged 28 become homeowner when they are 29). This entry rate rises steeply up to the age of 29 and then declines.[16] Changes in the number of people aged 25-29 should,

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[15] Estimates based on analysis using the BHPS and the 1958 birth cohort (NCDS).

[16] As a consequence of this pattern, 73% of British women aged 34-36 were homeowners during 2004-2006 (according to the BHPS), rising to 81% for those aged 43-45 and levelling off after that.

therefore, be indicative of the changing volume of first-time homebuyers. Figure 9 shows that this age group increases in size up to 2017, putting upward pressure on demand in the first-time buyers' segment of the housing market.

**Figure 11: Per cent of Women who Become Homeowners by Age, Great Britain (BHPS), 1992-2006**
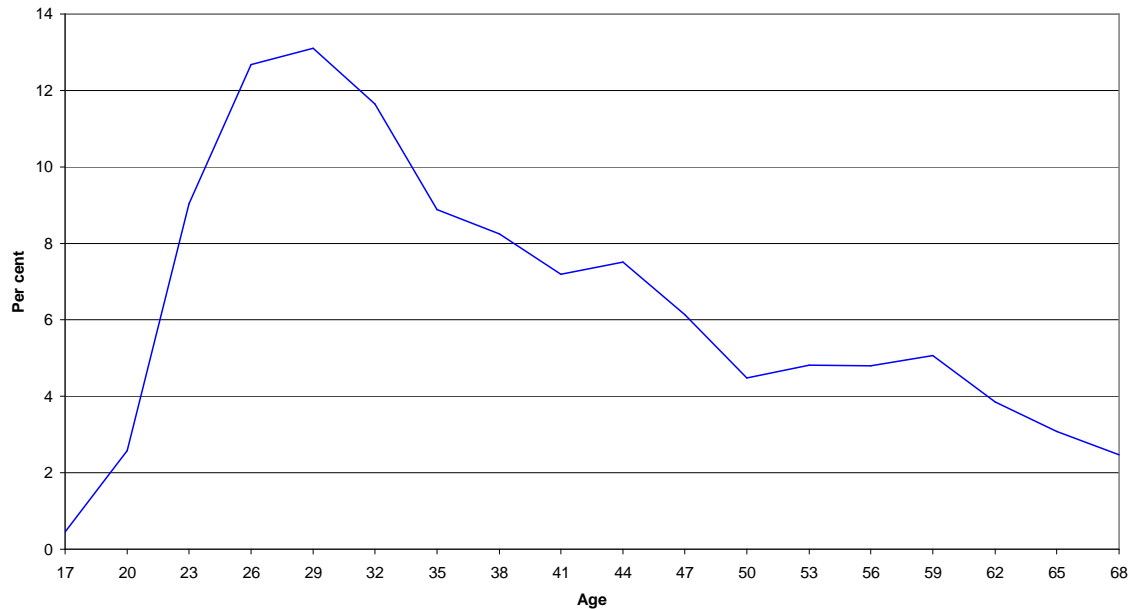


The housing market is not only affected by scale (the number of households) but by 'turnover' in household 'types'. Turnover is influenced by family formation (e.g. fertility) and dissolution (e.g. divorce) as well as by changes in households' economic circumstances (e.g. changes in household income). A helpful framework for analysing how these might affect the housing market is provided by a model in which imperfect information makes it necessary for households to search for a dwelling that meets their needs. For example, assume that there are two types of household (e.g. couples and families), and two types of house (e.g. small and large). Households are 'matched' when they reside in the appropriate type of house (e.g. couples in a small house). When children arrive, a couple becomes a family and when the leave they revert to a couple. These family formation and dissolution events can be viewed as

causing changes in household type and the need to search for a new dwelling of the appropriate type. More generally, changes in a household's economic circumstances also affect the 'type' of housing demanded.

Such a search model can be used here to explore how the rate at which such changes in household type occur (call it $\beta$) can be expected to affect key housing market variables like house prices, the proportion of households searching and expected time to sell. Comparing steady-states with different values of $\beta$, a higher $\beta$ means that there are more people searching relative to vacancies, which increases the rate at which vacant houses sell and shortens the expected time to sell. But there are also smaller gains to search, because it is more likely that a household returns to the matched state (e.g. because of a change in household income) when $\beta$ is higher. This lowers search effort, which in turn reduces the rate at which households are matched to appropriate houses, and this operates to reduce the probability of sale (increase the expected time to sell). Wheaton (1990) shows that under plausible assumptions, the former effect is more powerful, so that a higher $\beta$ increases the rate at which houses sell.

How does this affect house prices? In this matching model, it is plausible to assume that buyers and sellers have equal bargaining power and will split the gains from each transaction, and this split determines the price of a house. For a given probability of sale, a higher $\beta$ tends to lower house prices by reducing the buyer's gain from purchase, because it is more likely that things will change in the future so that he can give up searching. But a higher probability of sale raises house prices by increasing the net gains to a house purchaser. Wheaton (1990) shows that although higher $\beta$ reduces house prices for a given rate of sale, the increase in the latter associated with a higher $\beta$ dominates under plausible assumptions, and so house prices

tend to rise with $\beta$. This suggests that, by increasing the rate of change in the demand for different types of house, a higher rate of family formation/dissolution could raise house prices, and Wheaton's simulations suggest that this effect could be substantial.

I use the BHPS to examine the extent to which the arrival of a child affects a person's demand for housing. First, we study whether this event stimulates a residential move, and whether it encourages a change in housing tenure. Then, among owners, we investigate the effect of childbirth on the change in housing consumption, as measured by the change in the real value of the house in which they live.

Focussing on women aged under 45, 21% moved house if they had a child during the year compared with 14.8% if they did not have a child. Among women who were not homeowners in the previous year, 11.2% became an owner if they had a child compared with 7.8% if they did not. These comparisons do not control for other factors influencing the odds of residential movement and entry to owner-occupation, such as age and education.

When we control for household income, age, whether or not the woman is a homeowner, whether or not she lives with parents, her educational qualifications, the presence of a partner, the numbers of children of different ages, length of time in her current residence and the real house price in the region in which she lived, having a child increases the odds of moving house in the coming year by 18%.[17] With the same controls other than residential tenure and restricting the sample to women who were not owners in the previous year, the odds of becoming a homeowner increase by 30% in the year a child is born. Among women who were owners before and after a residential move, those having a child increase their real house value by 14%,

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[17] The real house price is the Halifax (existing home) house price index relative to the RPI the region the person lived in the previous year (i.e. before any move). If we do not control for the potentially endogenous residential tenure, a childbirth increases the odds of a move by 28%.

controlling for age, changes in the real house price index and changes in real household income.

This evidence suggests a strong impact of fertility on residential movement, entry to owner-occupation and the demand for housing among homeowners. The rise in fertility since 2002 is, therefore, likely to have played some part in the rise in UK house prices in recent years, albeit a small part relative to the impact of expectations of future house price increases. Furthermore, sustained higher fertility raises house prices by promoting turnover in the housing market.

Partnership formation also promotes housing market turnover. Focussing on women aged under 45 with a partner in the previous year, analogous multivariate analysis indicates that forming a partnership (marriage or cohabiting union) increases the odds of moving house by a multiple of 6, and among those who were not homeowners in the previous year, it increases the odds of becoming one by a factor of nearly 13. Thus, it appears that the formation of first partnerships, encouraged by the increase over the next decade in persons in their 20s, and re-partnering after partnership dissolution puts upward pressure on house prices.

**7. Conclusions**
Population ageing reduces the working population relative to the number of pensions by one-third over next 30 years. The challenge presented by this development is how best to support pensioners' incomes without suppressing the net incomes of the working population and capital accumulation too much. The ability of private savings and occupational pensions to meet this challenge is doubtful. There is a related issue of inter-generational equity: how do we share the burden of population ageing between generations, rather than passing it on to future generations. Given the

uncertainty about future demographic and economic developments, it is important to have adaptable or self-correcting policies to address population ageing.

In contrast to exploring the economic effects of the steady fall in the aged support ratio, the previous section has demonstrated the more complicated effects of demographic changes on the housing market arising from fluctuations in the numbers in key ages and in family formation. Here we have seen the importance of the level of contemporary demographic rates, such as fertility, partnership formation and divorce, on turnover in the housing market, with consequences for the level of house prices. This is in addition to the 'scale effects' of age distribution changes on the number of households.

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