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Full Length Article

Pensions in an ageing society – Strains and pains of becoming older together☆

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ABSTRACT

I focus on three issues central to the economic impacts of changing demographics brought about by trends in life expectancy and in fertility. First, how might people adjust to longer lives when the scope of the state to devote funds to pensions and to health care will come under strain? Second, how great might the strain on the public finances be and how might it be alleviated? Third, how might individuals handle the effects of uncertainty when the ability of the state to offer insurance against risks might be reduced? I focus on the issues for the UK – a country with a set of challenges which is in many ways typical of rich countries. I argue that attempts to offset demographic change and the strains it brings by consistently high immigration or by trying to boost fertility rates of the domestic population are likely to either have undesirable effects in the long run or be ineffective over almost any horizon. Instead, a combination of market forces, and policies which take account of long run fiscal sustainability, will allow ageing populations to adjust.

Introduction

This paper focuses on the economic challenges to households and to governments of providing adequate resources for lives which are likely to be longer than for previous generations and where the demographic structure reflects both greater life expectancy and lower rates of fertility.

The issues created by longer lives and by choices to have fewer children are a consequence of what are largely positive developments. Most significant have been improvements in health, but there have also been greater opportunities for women which is one factor behind falling birth rates. So while the consequences of those positive developments create some challenges it is misguided to consider them unwelcome. In concentrating on the economic challenges one should not lose sight of this.

These economic challenges are both micro (directly facing households) and macro (facing governments but indirectly rebounding on households). The challenges arise very clearly in the provision of resources for older ages, and it is largely the pension issues that this paper will address.

Three central pension questions will be analysed: How do individuals – with the help of the state – finance their way through longer post-retirement lives? Can the state make that affordable when older populations generate a wide range of pressures on government spending relative to tax revenues? How do people handle uncertainties when institutions that used to take much of the risks that affect pensions – defined benefit pension schemes and the state through its pension provision – are less able to do so?

These issues affect a large number of richer countries. They are significant for the UK, though the UK is not amongst the countries where the economic strains seem likely to be the greatest. Countries where the rise in life expectancy has already been unusually fast – for example Japan – and those where the decline in fertility rates have been exceptionally rapid – for example South Korea and Italy – face a degree of ageing that looks set to be much more rapid and to go further than for the UK. Italy and South Korea have old age dependency ratios that, according to UN central projections, look set to rise two or more times as fast by 2070 than in the UK; Japan already has a much higher older-ages dependency ratio than the UK and it is also set to rise faster. Nonetheless, as described in the paper, the UK looks to face economic challenges which are serious but whose nature is typical for developed economies. This paper focuses on the UK but the main points it makes have relevance across most of the developed world which faces demographic changes which are similar, though in many cases more extreme.

Section 2 briefly considers the demographic shifts in the UK and

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gives an overview of the fiscal issues this generates. Section 3 focuses on private pensions and the implications of a decline in defined benefit pensions and its replacement by defined contribution schemes. Section 4 looks at the allocation of risk between the state, pension providers and households in an environment where demographic changes have materially affected the way in which that risk can be allocated. Section 5 widens the analysis to consider changes in the aggregate population. A final section draws overall conclusions, arguing that attempts to boost fertility are unlikely to succeed while consistently high immigration as an alternative means to prevent ageing of the population will be unsustainable. The hope that alternative pension arrangements can create risk sharing between generations offers little prospect of providing offsets from strains brought about by ageing. But the scope for working lives to stretch longer into old age for a substantial proportion of the population offers a feasible and gradual adjustment to changing demographics.

The demographic and fiscal backdrop

Fig. 1 shows past, current and projected future UK demographic structure. In the fifty years between 1974 and 2024 there was a moderate rise in that part of the total population aged above 65 which increased from around 14% to 18%. The rise in life expectancy was substantially offset by a steady rise in the UK's population. Between 2024 and 2074 the share of the population of over 65s is projected to rise much faster, from 18% to 27%. The ratio between those aged between 15 and 65 and those older is projected to fall over the next fifty years from around 3.4 to just over 2.

The projected demographic structure is highly dependent upon shifts in life expectancy, fertility rates and net immigration. All three are difficult to be confident about over a fifty-year horizon. So the projection in Fig. 1 is, at best, an unbiased forecast of an uncertain future. To get an idea of that uncertainty over a time horizon of 50 years or more I looked at UK estimates of life expectancy at birth for males in the year I was born which was as at the start of the 1960 s. That life expectancy was estimated at close to 68 years. Now, some 65 years later, my life expectancy is not 3 years but close to 20 years. In 1960 it was considered a very remote possibility that a male would live into their late 80 s, even factoring in what was then considered likely to be medical advances boosting survival rates. Much of what has happened to life expectancy over the past 65 years was unforeseen.

There is currently no sign that the UK fertility rate is about to reverse its steady decline, and should it move towards the European average it will fall further. Life expectancy has levelled off in recent years but shows no signs of being on a declining trajectory. Absent a significant fall in life expectancy or of a very large rise in fertility then it is only very high levels of immigration sustained over decades that could prevent the UK old age dependency ratio (defined as the relative sizes of the population over 65 to those aged between 16 and 64) from rising substantially. Here we have taken the rather arbitrary, though conventional, line between "working age" and "old age" as 65, and using the term "dependency ratio" also implicitly assumes that all the "old aged" are dependents. In fact all of these lines are blurred and not fixed which is one reason why adjusting to the changing demographics may not be as difficult as the standard measures of old age dependency imply. I return to these points below and also consider whether large scale immigration can offset the pressures from an ageing society. In passing it is important to note that the demographic projections in figure 1 already assume relatively high and sustained levels of net immigration into the UK throughout the next 50 years – running at over 300,000 a year and generating all of the significant rise in the UK's population projected over this half century.

What happens to life expectancy will also have a substantial impact of how dependency ratios evolve. As noted above, the rise in life expectancy over the past 65 years has exceeded what was then considered plausible. Fig. 2 illustrates the difference this can make. It shows high and low alternative profiles for life expectancy at age 65 relative to the assumed path in figure 1. On the higher path, with life expectancy 4 years greater by 2074, the number of people aged 16–64 relative to those over 65 falls from 3.4 in 2074 to 1.93; on the central expectation it falls by less down to 2.1. If life expectancy is some 5 years lower than in figure 1 by 2074 the dependency ratio would be higher again at around 2.3.

The change in demographic structure will generate strains on the UK pension system. But the pressure will in no way be exceptional amongst developed countries, both because the ageing of the population is not projected to be unusually severe in the UK and also because pension spending today is not, in relative terms, unusually high and so its future

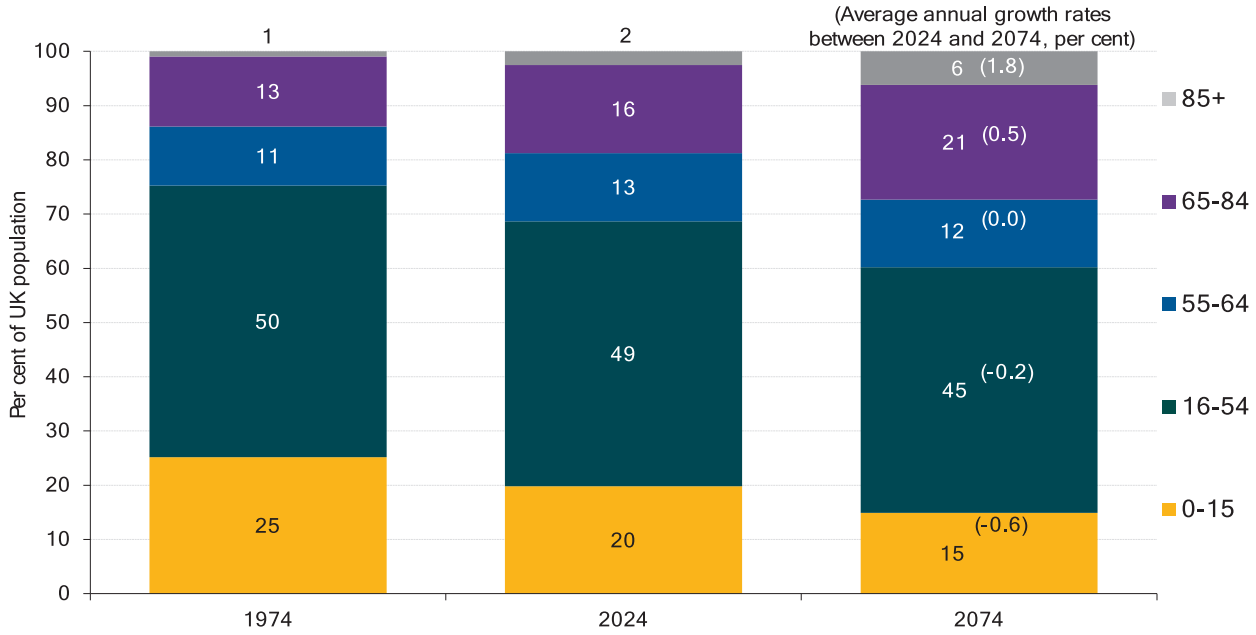


Fig. 1. UK population structure over a 100 year window. Note: estimates are from the Office for Budget Responsibility (2024). Average annual growth rate is for the share of the population.

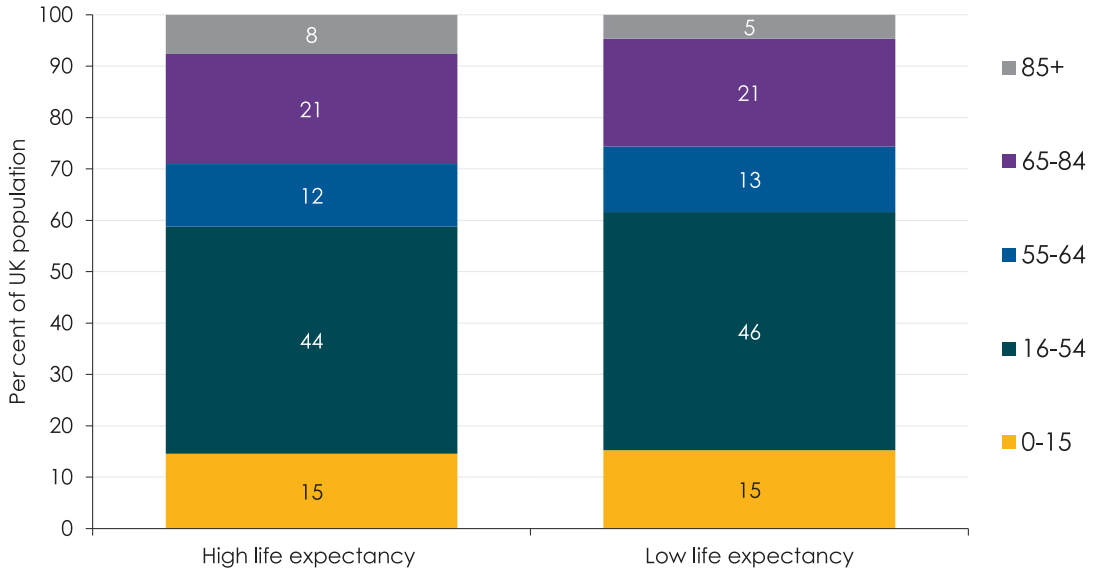


Fig. 2. Population structure in 2074 under different life expectancy scenarios. Note: Authors calculations, consistent with Chapter 2 of OBR *Fiscal Risk and Sustainability Report* 2025. In the high life expectancy scenario, life expectancy at 65 reaches 29 years, around four years higher than in our central projections. In the low life expectancy scenario, we assume life expectancy is around 5 years lower at 65 than in our central projection).

growth will not take it to levels that will be outliers amongst richer countries. Fig. 3 gives a snapshot of pension spending across countries showing how much of it is on state pensions and how much pension income comes from private (overwhelmingly funded) schemes. The UK sits towards the lower end of overall spending on pensions at 10.5% of GDP. And an unusually high proportion of that is income generated from private pensions reflecting past contributions into pension funds. But this does not mean that the fiscal pressures generated by demographic change are small. Even with likely future rises in the age at which state pensions will be paid, there is still projected to be a substantial increase in government spending on state pensions. Fig. 4 shows that such spending is projected to rise steadily from around 4.5% of GDP in 2024 to around 8% fifty years ahead.

A rise in government spending of around 4% of GDP spread over 50 years does not in itself look to pose a severe fiscal problem. And were that to be the only fiscal impact of an ageing population that might be true. But ageing has much larger fiscal impacts. On the spending side these reflect the high levels of health-related government spending for the very elderly. On the tax side the revenue generated by those beyond typical retirement age falls sharply relative to those who are of working age. Fig. 5 brings together this and other information on spending and on the net balance between taxes paid and government spending by typical UK residents of different ages. The chart show that it is the young (those aged under 20) and the relatively old (those aged 70 and above) who, on average, pay less in taxes than they receive in the form of government spending. That gap becomes very substantial as people move from their mid-seventies into their eighties and beyond. There is likely to be a very substantial rise in the proportion of the population in their 80s and 90s over the next few decades and this is one of the factors underlying substantial fiscal challenges facing the UK government.

Figs. 6 and 7 show projections of overall government spending and of the level of debt that would be generated if the tax system in the UK

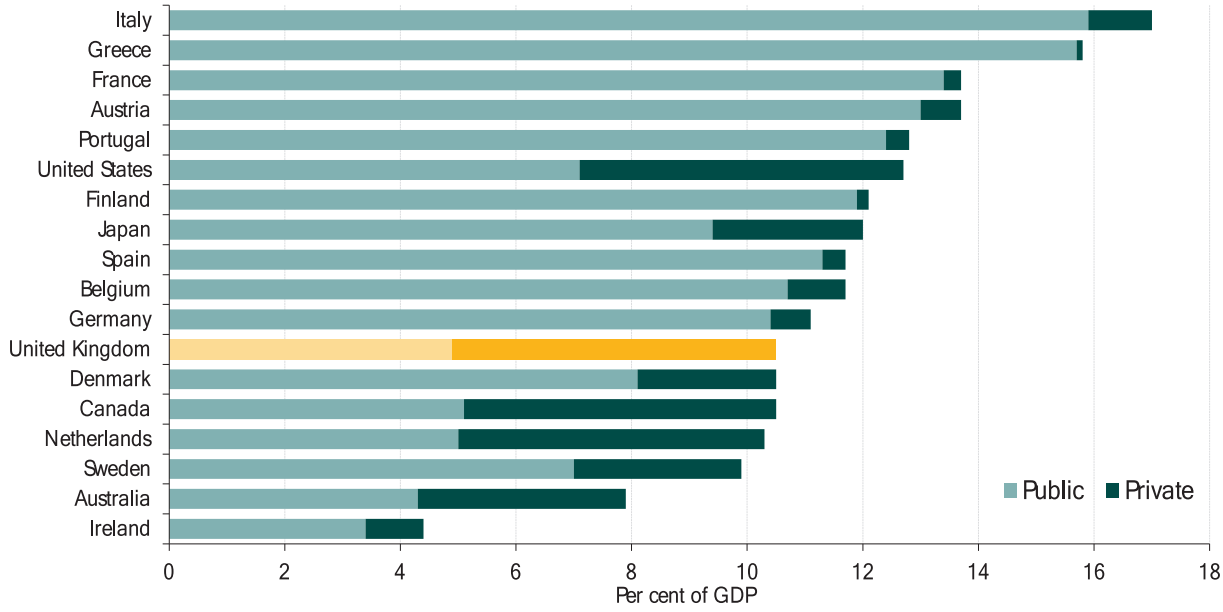


Fig. 3. Pension spending across countries. Source: OECD (2023).

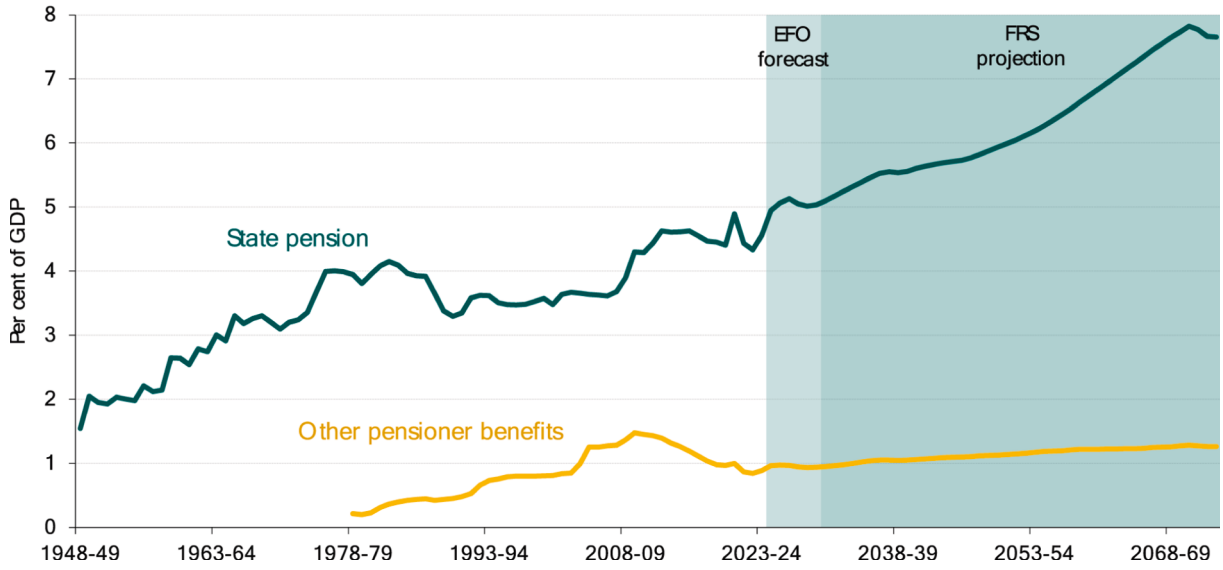


Fig. 4. Projected paths of pension and other welfare spending on pensioners. Source: OBR (2025).

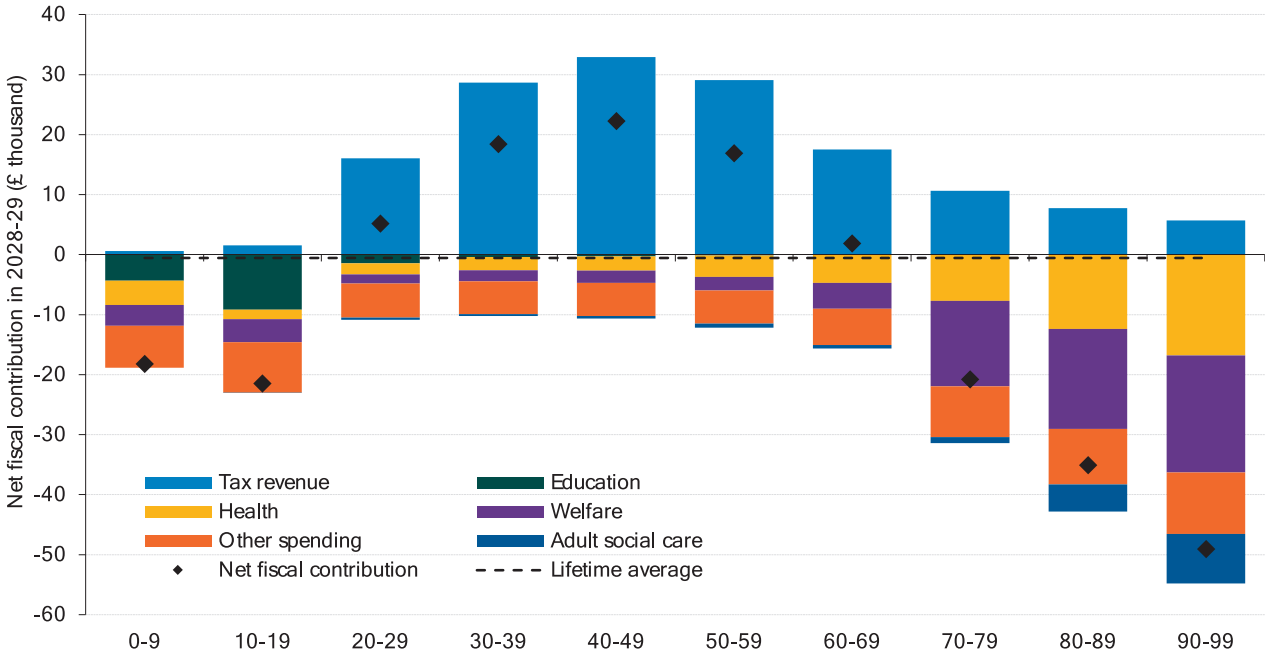


Fig. 5. Spending and taxes by age. Note: These profiles are constructed on the basis that aggregate primary spending and receipts are broadly in balance. Therefore they do not capture the fiscal impact of major economic shocks on public spending and receipts. Source: OBR (2024).

remains as it is. This is an indication of fiscal pressure that will need to be met through higher borrowing if levels of spending are maintained in line with the evolution of demand for public services and the tax system generates revenue from a population that has relatively fewer people of ages that generate taxes at or above the government spending they receive.

Fig. 6 reveals a picture of inexorably rising government spending and very gradually declining tax revenues – both as a share of GDP.

Fig. 7 shows the path of government debt that reflects the profiles for government spending and tax revenues and the borrowing required to fund the gap between the two. It shows a huge rise in the government debt to GDP ratio that increase at an accelerating rate and reaches nearly 275% of GDP by 2074. Only in the aftermath of world wars (after the Napoleonic, First and Second World Wars) has the stock of UK government debt to GDP reached these levels. In the decades after those wars ended debt did fall – helped greatly by the combination of much reduced military spending and by the return to civilian employment of soldiers. Neither of those factors are at play in the projections shown in figures 6 and 7. In fact it is more likely that military spending will be rising as a share of GDP than falling from its currently relatively low levels.

In the light of this it would seem from figures 6 and 7 that fiscal policy is on an unsustainable path in the UK. At some point the stock of debt will have to deviate from that path. That is an indication of the scale of the fiscal challenge which to a significant extent reflects plausible demographic changes. Two specific questions arise from this. First, with extreme pressure on the state, can more of pension incomes for the elderly come from private pensions? Second, will there be adjustment in the patterns of retirements and working lives that might offset some of the affordability issues with providing resources for those no longer working?

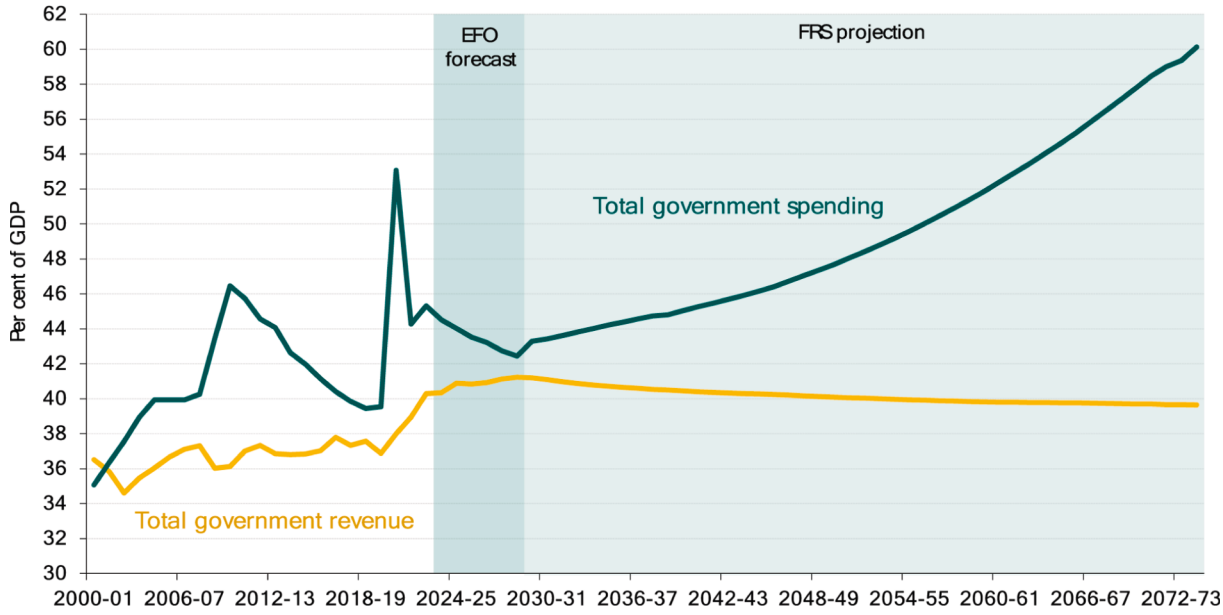


Fig. 6. Long-term projection for total government revenue and spending. Source: OBR (2024). *EFO forecast* is the near term fiscal forecast of the OBR, The *FRS projection* is from the OBR longer-term projections.

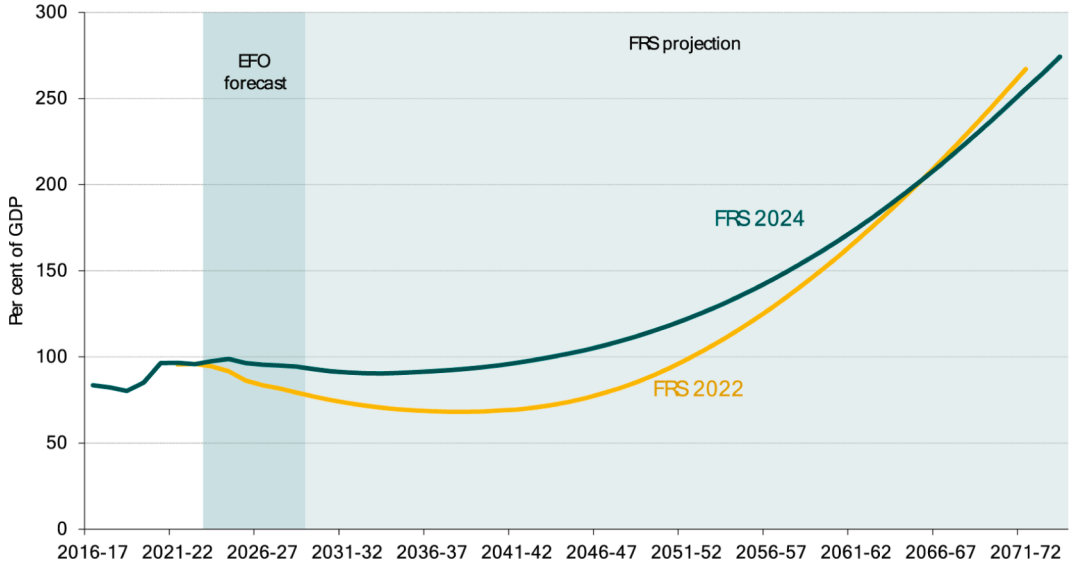


Fig. 7. Long-term projection for public sector net debt. Source: OBR (2024). The two scenarios come from the OBR Fiscal Risk and Sustainability Reports of 2022 and 2024.

Private pensions

Can private pensions play a greater role in providing retirement resources so that state spending can rise by less than in the projections described above and help ameliorate fiscal pressures that demographic changes might bring? There are reasons to doubt this. This is largely because demographic forces which have created pressure on the fiscal position have also caused changes in private pension provision. In the UK the substantial decline that is underway in the prevalence of relatively generous defined benefit (DB) pensions, where risk sits with provider and not with pensioners, is set to continue far into the future. Unexpected rises in life expectancy over the past several decades and volatile asset prices created huge cost problems for private sector employers offering DB pensions. As a result, the great majority of private sector DB schemes have closed to new members. They are being replaced with defined contribution (DC) schemes where contribution rates for employees and employers tends to be very much lower than has been the case with DB schemes.

Figs. 8 and 9 illustrate the scale of the transition underway from a largely DB private sector pension system to what will be a largely DC system which, in the absence of much higher contributions, will generate lower pensions.

It might be that DC pension contributions are invested in higher return assets which could offset lower contributions. In some ways this does not seem likely because with DC schemes asset return risk directly and transparently affects future pension payments (unlike with DB schemes where asset return risk sits with scheme sponsors and the ultimate owners of those sponsors). Risk aversion by workers over the value of their future pensions might well generate conservative (that is low risk and low return) asset allocations so that lower contributions than with DB schemes will generate significantly lower average future pensions. But in practice the equity share in DC pension assets is higher.

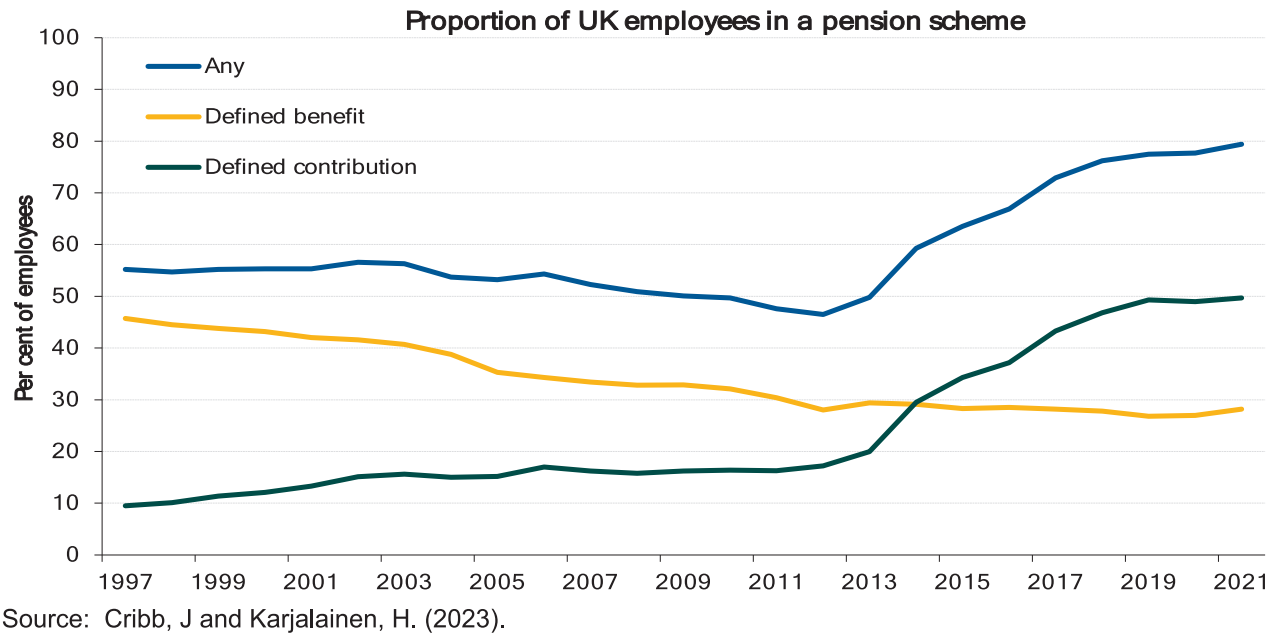


Fig. 8. DC and DB pensions members as a percent of population. Source: Cribb, J and Karjalainen, H. (2023).

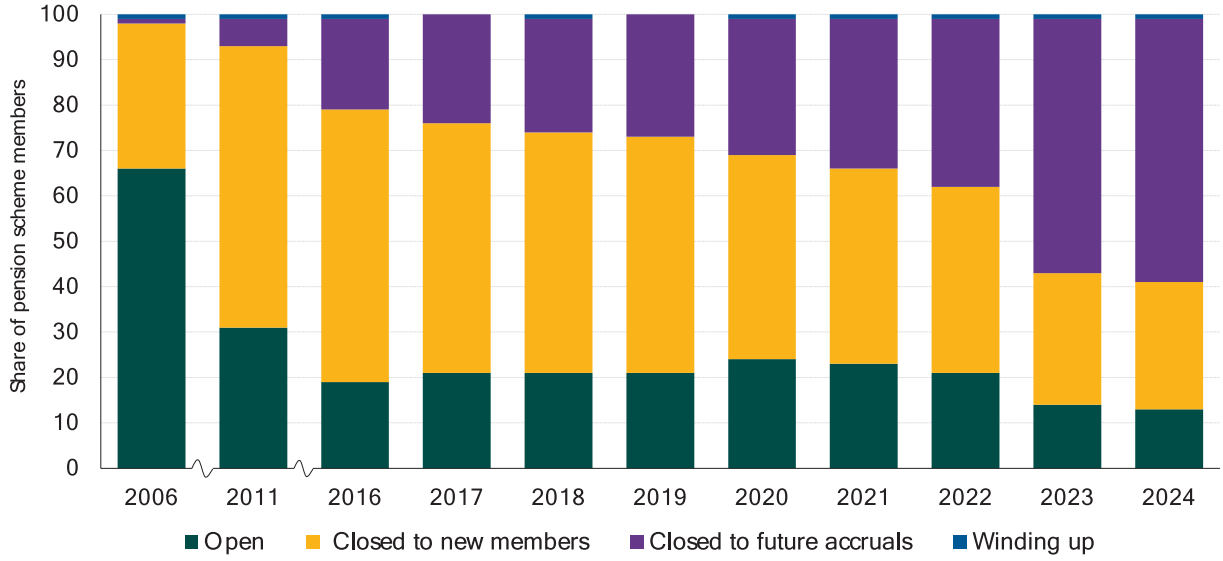


Fig. 9. Membership of private sector DB schemes in the UK. Source: Pension Protection Fund (2024).

It is now at just over 50%, significantly higher than for private sector DB schemes where only around 20% of assets is allocated to equities (Pensions Policy Institute estimates for 2024). In contrast, public sector DB schemes hold a similar share of their portfolios in equities to private DC schemes. Overall DB schemes hold around one third of their assets in equities.

But while the average returns on DC funds may now be above the average returns on assets held in DB pension funds, that does not mean that the DB pensions will prove to be less generous than those on DC pensions. In fact the opposite is likely because the risk of DB funds underperforming was largely borne by employers who had offered pension accrual rates and employee contribution rates that over many decades have turned out be more generous than the asset returns warranted. This necessitated increased contributions from employers to make up for returns on investment funds that could not match the cost of promised pensions.

Even if we put that point to one side, any higher average return on assets in DC funds comes at a price of higher risk since on average higher return assets are more volatile (Jordà et al., 2019). And as we illustrate in the next section the smoothing in such volatility by investing gradually over a long working life can still leave a great deal of risk if portfolios are heavily invested in higher return assets such as equities.

Recent analysis by the Institute for Fiscal Studies and by UK Department for Work and Pensions paints a picture of pension inadequacy for a substantial minority of households who will receive DC pensions alongside state pensions in future decades. On a replacement rate basis, pensions adequacy is judged by the ratio between pension income and working age income. On that basis and using adequate replacement rates that are assumed to vary from 80% for the lowest earners to 50% for the highest earners, around 40% of workers are on course to have inadequate pensions. A different point of comparison is with an absolute minimum adequate standard of living. On that much lower standard for what is adequate around 12% of workers appear to be on track for falling beneath a minimum level of income. But for someone

on average income that standard represents a huge fall relative to their income from work.

These calculations suggest a significant problem lies ahead for a substantial minority of workers who will rely on pension income in retirement. In some ways this paints an unrealistically bleak picture because there are non-pension savings and for many households there will be inheritances that are received before (or during) their own retirement. But against that, the replacement rate calculations do not allow for health issues that affect people disproportionately at older ages and generate medical costs, as well as the prospect for care home expenses, which make comparisons with average working age incomes inadequate. And while inheritances can be substantial, they are very unequally distributed with the largest bequests typically left to people who tend to have had higher incomes when working. Calculations by the Resolution Foundation suggest that those in the highest quintile by income are between three and six times as likely to receive an inheritance than those in the lowest quite of earners. Substantial inheritances are much more unevenly distributed.

The changing pattern of risk and its incidence

The issue of the potential inadequacy for a substantial proportion of workers of the pensions they will receive many years in the future is exacerbated by the shift in the incidence of asset price risk that is occurring as DB pensions are replaced by DC pensions. If for many people the likely pensions they will receive are relatively modest, the risk they will be lower still because asset returns turn out to be poor may be so costly that low-risk, low-return, portfolios are chosen. That reduces the average size of those pensions.

None of this means that overall risk was much lower with DB schemes than it is with DC schemes; rather it is that the risk in DB schemes does not sit directly with the recipients of the pensions. It may be that it is distributed more widely and that this spreading of risk is more efficient. But it has also proved unsustainable because in DB schemes a combination of unexpected rises in life expectancy, and low returns on assets that matched fixed liabilities, made the cost of the schemes so high that employers have closed them.

Might there be a way of reducing the risk with DC schemes by spreading that risk across different generations of investors? And might that inter-generational risk sharing increase both the attractiveness of investing in pensions and raise the willingness to invest in higher risk and return assets so that future DC pensions will be much enhanced and reduce problems of inadequacy? This is the promise of so-called Collective Defined Contribution (CDC) pension systems. Under a CDC scheme there is smoothing of asset price risk which is shared between generations through the gradual scaling back or enhancing of pensions to be paid as returns are lower or higher than average. But that scaling back or enhancement is very gradual and spread over future pensioners rather than falling on those nearing retirement and whose accumulated pension contributions might have either suddenly spiked up or down in value as they are close to drawing pensions.

In principle such inter-generational spreading of asset price risk could be very valuable. One way to assess this is to calculate what sort of retirement pensions could have been generated by an investment in equities for people born at different times and who make contributions evenly over their working lives and then annuitise their accumulated fund at retirement. Fig. 10 shows that calculation for various developed economies. In each case it is assumed that:

People work for 40 years. For the first 30 their real wage grows at 1% per annum and then declines at 2% p.a. for the last 10.
They invest 7% of their income in a DC pension and that money is invested wholly in the domestic stock market
After 40 years they buy a 20-year constant real annuity assuming the real rate of return to price annuities is 5%.

The graph is a plot of an index of their annuity given the actual rate of return on the domestic equity market for each country over the 40 years of their working life. Here there is no risk sharing between generations. There is only spreading of investment risk by feeding money into the DC pension slowly over each person's working life rather than in a lump sum investment.

The variability in pensions for people of different cohorts generated by this is quite dramatic. Fig. 10 shows that pension payments for a hypothetical DC scheme used by people would have generated very different levels of pensions (relative to incomes) depending on when people were born. It is often the case that pensions would have been two or three times as large for one cohort as for those born 25 years before or after them. Unlucky generations could receive pensions less than half those of their children or their parents.

Advocates sometimes argue that risk sharing between generations in a scheme that can be kept going for many decades generates enough of a benefit to mean that a pooled scheme can be better than the individual accounts in DC pensions. The claim is, in essence, that a CDC scheme that spreads risk across many generations can offer pensions that can be as high and as predictable as DB schemes of the past. But one cannot force the young and the unborn to remain members of a scheme that has had poor past asset returns and where part of the pension contributions of such younger workers is needed to make solid the past promises to older scheme members. If contributions from later generations are

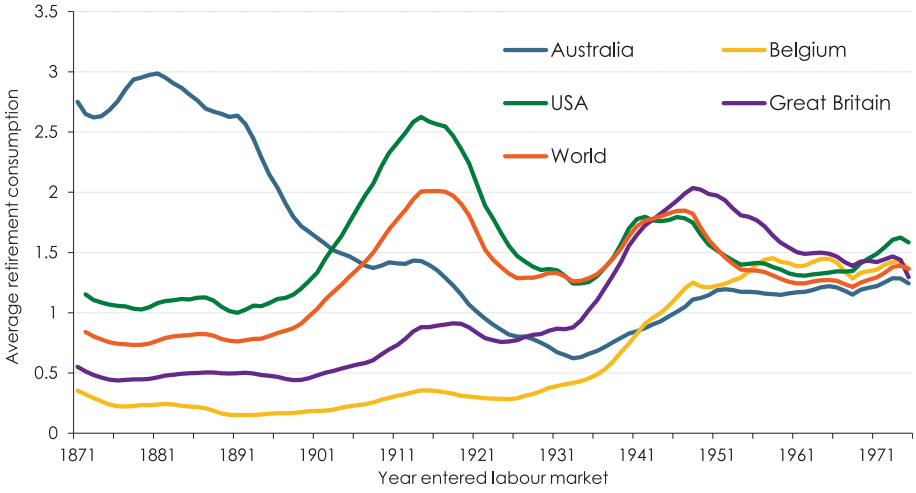


Fig. 10. Index of pension income (consumption) by year of first contribution.

needed to make good past pension promises to earlier generations they reduce the likely returns to later generations relative to joining a new scheme that had no past obligations. Only when the asset position of a multi-generation DC scheme consistently remains favourable will it clearly be in the interests of the next generation to join in and stay in such a scheme. That is a very fragile system; the supposed benefits of generational risk sharing may evaporate just at the time they are most needed.

The inability of private pension funds to force future generations of employees to make contributions places severe limitations on the ability to generate risk sharing across generations. This has been recognised in much pensions research. Bohn (2012) makes the point succinctly:

> "In the limit, if there was no attachment of workers to their jobs, the allocation of risk with pension funds would reduce to a laissez-faire allocation with no inter-generational sharing."

Bulow (1982) concluded that in a competitive labour market then if a fund has no ability to tie workers to the firm, there is no inter-generational risk sharing. Allen and Gale (1997) make more general points about the severe limitations on the ability of financial companies (which include pensions schemes) to sustain risk sharing between generations in competitive markets. Ponds (2003) and Teulings & De Vries (2006) argue in general only if there is mandatory participation in a pension scheme can inter-generational risk-sharing be feasible.

Gollier (2008) considers conditions under which a pension scheme with voluntary participation might nonetheless be able to create inter-generational risk sharing to the benefits of all. Those conditions turn out to be restrictive and, in essence, require that a scheme starts out with a large surplus of assets over those likely to be needed for promised future pensions. A succession of poor returns early in the life of a scheme – and before it had built up a large buffer against fund under-performance – would make inter-generational risk sharing unsustainable. How such a large buffer can be accumulated in the first place is itself problematic as older members have to acquiesce in receiving lower pensions.

So it appears that there are formidable obstacles to the creation of CDC schemes that are robust, sustainable and able to generate the potential benefits of inter-generational risk sharing that figure 10 suggests might theoretically exist.

Is population growth an answer to the problem?

Ageing of the population – given current work and retirement patterns and likely levels of state pensions and public health spending – brings considerable fiscal pressures, which, on current trajectories, require either substantial fiscal tightening, or else lead to unsustainable public finances. A significant part of these pressures reflects a likely rise in the numbers of the elderly relative to the population. There are no signs that a substantial and sustained rise in the fertility rate in the UK is imminent and which would significantly reduce the rise in the ageing of the population. That ageing in demographic structure illustrated in the projections described above – and the fiscal consequences they are likely to bring – are based on an assumption of continued relatively high levels of net immigration of over 300,000 a year indefinitely. Higher net migration and a higher fertility rate than that assumed in the demographic projections[1] would both raise the UK population growth rate and lessen the rise in the ratio of relatively elderly in the population. There is little evidence from across the world that policies to increase fertility rates have had much of an impact. In contrast there is little doubt that a rich country like the UK could use policies to allow a higher level of immigration. Might that be a policy which, on purely fiscal grounds, is helpful?

Higher immigration – which primarily involves arrival of those of working age who are many years away from retirement – both delays the impact of the ageing of the population and is (at the rates assumed in Office for National Statistics population projections) the driver of population growth, which generates a substantial rise in the UK population over a 50-year horizon. Some conclude from this that a faster rise in the population – either from a rise in the fertility rate or from higher net immigration than implied by the population projections shown in Fig. 1 – will be beneficial in alleviating acute underlying fiscal pressures.

But even setting aside the fact that it is GDP per capita that matters for average standards of living – and growth in population does not obviously boost it – there are serious problems with the idea that faster population growth can consistently alleviate fiscal problems. New people – either children born here or people arriving as migrants – consume public services and do so to a greater extent at older ages when their likely contribution to taxes to fund spending on public services falls away. So, even if there is a gain in the fiscal position for a while, it fades. And to hold demographic structure steady, and halt the decline in the ratio of those above (an arbitrary) line between the elderly and the working age populations, requires an *ever-rising* population.

I first illustrate this final point before considering again the lifecycle pattern of taxes paid and public services used, so as to assess whether more rapid increases in population can help solve problems of fiscal unsustainability

How many more people might be needed?

What scale of population increase could prevent the old age dependency ratio (OADR) from rising in the UK over the next several decades? I consider how this could happen in what many think is the most fiscally advantageous way: by a rise in annual net immigration of those of working age who are in their early 20 s so do not draw upon the state education sector, and remain of working age for most of the next 40 years.

I illustrate with a simple calculation by assuming that additional net migrants to the UK (over and above the 315,000 a year assumed by the ONS that underpin the population projections described above) are aged 24 on arrival. So, for 40 years they remain in the under-65 age group, where I arbitrarily draw the line in the calculation of an OADR. I calculate how many of such new arrivals would keep the dependency ratio at its 2024 level. Fig. 11 illustrates the results of that calculation. This shows that around 20 million *extra* young people would need to arrive in the UK over the next 40 years to stabilise the dependency ratio at its current level. That would imply a UK population of around 100 million by 2064

The assumption that people arrive at age 24 is central to this calculation because it means that over a 40-year horizon none of them

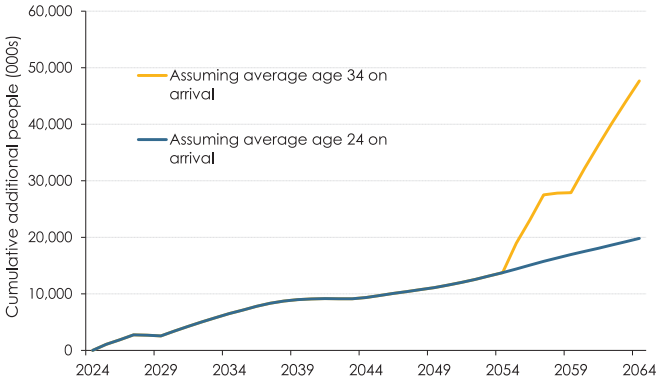


Fig. 11. Extra net immigration to stabilise the old-age dependency ratio. Source: Author calculations based on ONS population projections.

[1] The projections already assume some rise in fertility rates from recent levels even though the direction has consistently been downwards in the UK in recent years.

would have moved into the 65 plus age group used to define the dependency ratio. If instead people were to arrive at age 34 the scale of immigration some 30 years ahead needed to keep the dependency ratio constant would have to accelerate sharply as the people who arrived from 2025 onwards start to move into the over 65 group. The second line in Fig. 11 shows just how powerful this effect is. On that alternative scenario the level of net migration over the 40-year horizon would need to be at a cumulative scale of 47 million rather than 20 million when the arrivals are all assumed to be younger.

Such fiscal benefits as might exist from higher immigration depend very much on the lifecycle pattern of demands upon public services and tax revenues paid by UK residents. Not surprisingly, that pattern is very uneven across ages. Fig. 5 showed estimates of typical use of public services, and taxes paid, by age in the UK. Taxes paid, net of age-related spending on public services, are typically negative for people until around an age of 20. They then usually become positive for ages between the early 20 s and early 60 s. Below age 20, and especially above the mid-60 s, the typical UK resident pays substantially less in tax than the consumption of public services.

Of course, these are averages across widely diverse experiences of people of the same age. Those who work longer, earn more and draw less upon health services, the welfare system and social care will generate a much more favourable fiscal balance than the (less fortunate) who earn less, have worse health and draw much more on welfare support. So in estimating the fiscal impacts of a rise in the population growth from higher immigration it matters who comes.

Ultimately the benefits of higher immigration to offset unfavourable fiscal effects of an ageing population are far from clear. The higher population route to fiscal sustainability by slowing the ageing of the population is uncertain. Today's young people are tomorrow's old people, so fiscal benefits fade. And the rise in the population needed to completely offset ageing in demographic structure is very great and gets bigger over time. It could not be sustained.

More rapid population growth brings its own problems:

- Some national assets are in fixed supply – most obviously land suitable for development
- Other assets can be produced – roads, houses, schools, hospitals, factories, warehouses, offices, machines. But costly investment would be needed to just hold constant the stock of such assets relative to a rising population.
- Environmental damage is harder to limit with a larger population.

Setting aside the issues of housing pressures, congestion, and the extra challenge of achieving emissions targets that such a rise in population might bring, there would still remain questions over whether such a rise in population would bring substantial and enduring (narrowly defined) fiscal benefits.

In contrast, there is little doubt in the direction of the fiscal effects of getting people off health-related benefits where they might otherwise spend long periods out of the workforce and often isolated. Nor is there any ambiguity about the fiscal benefits of people working for longer and sending fewer years completely out of the workforce. Both of these things are fiscally beneficial. In comparison, the benefits of higher immigration to offset unfavourable fiscal effects of an ageing population are much less clear. They depend on how long migrants stay in the UK, the age at which they arrive, whether they work, and how much they earn.

Conclusions

This paper has analysed the fiscal strains generated by demographic change and the adequacy of pensions in a world with longer periods of retirement but potentially less generous private pensions. Longer lives and, more recently, lower fertility rates are likely to generate a steadily rising ratio of that part of the population who are not working and who rely heavily on pension income. In considering the implications of this the paper makes several points.

- It is misleading to see the pension problem as stemming from individuals having to take on more risk because DC pensions are inherently more risky than the DB schemes they are replacing. Raher DB schemes pushed the risk onto companies who themselves passed it through to individual investors but also back onto their workforce until they were no longer able to do so and then closed those pension schemes.
- The collective defined contribution (CDC) route to "solve" the pension issues is problematic – they carry the risk that they are inherently unstable
- Some argue that rich countries need to raise the birth rate or maintain very high levels of net migration so as to counter the impacts of an ageing population. But in many ways ever-faster population growth is a Ponzi game. The extent to which it eases fiscal strains is highly uncertain and it is ultimately unsustainable.

There is one way in which the strains created by an ageing population can be substantially eased. That is if the typical period during which people remained attached to the labour market – earning and paying some income tax – were to become extended. There are several reasons why this may happen, especially if policies are adopted that encourage it. First, a relative shortage of younger workers will naturally create market forces that encourage employers to look to older workers to fill jobs – a tendency that could be short-circuited if a misguided strategy is followed that sees faster population growth as the main way to address demographic shifts. Second, labour has become less physically onerous for the great majority of people in recent decades; it is on average less physically demanding now than it has ever been. That trend may continue. Third, employers are likely to be encouraged by a shortage of labour, and perhaps by a shift in attitudes to chronological age which catches up with what had happened to life expectancy, to tailor many jobs to what suits older workers. And fourth these other forces may mean there will be more part-time roles for older people who neither want to completely leave the work force nor work full time. These forces may also encourage a fundamental rethink about the pattern of careers over longer lives and the ways (and ages) at which people learn new skills.

Three factors mean that adaption of the patterns of work and employment can greatly facilitate a transition to a population with more people aged above 65 – an age that has come to many to divide the years of work from those of retirement from it. These are: a relative shortage of the under 65s in the labour market boosting pay as an incentive for the elderly to work; the prevalence of far less physically demanding work; employers adapting job characteristics to encourage labour from older people, in particular by offering flexible hours.

But health conditions vary enormously amongst the elderly and while it is more feasible, indeed desirable, for a large proportion of the elderly to work at older ages than in the past, there will remain a substantial proportion of the older population who cannot work. That presents a problem for governments looking to ease fiscal pressures by postponing the date at which state pensions are received. Nonethless policy actions driven by fiscal constraints may provide an element of stick to add to the carrots of greater work incentive from better remunerated and more flexible jobs. The age at which state pensions are paid will likely rise further and potentially those pensions may become means tested. But unlike the market driven forces that are created by a shortage of labour, these policy actions will not find much welcome from the elderly. That poses a substantial political problem for governments facing electorates in which the elderly are consistently becoming more significant.

Demographic strains come from the success of rising longevity and the choices people make on how many children to have in a world of more options. Those strains are a side effect of the underlying, largely positive, drivers of demographic change. Yet they are still strains. But

they do not need be addressed ***just*** through pensions policy and the tax treatment of savings; nor through measures to try to create faster population growth. Greater labour supply options for the over 60s is key. With work never less physically demanding and with some clear non-monetary benefits from remaining attached to the world of work this should be the main answer to the demographic "problem".

CRediT authorship contribution statement

David Miles: Conceptualization, Formal analysis, Investigation, Validation, Writing – original draft.

Declaration of competing interest

The author declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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