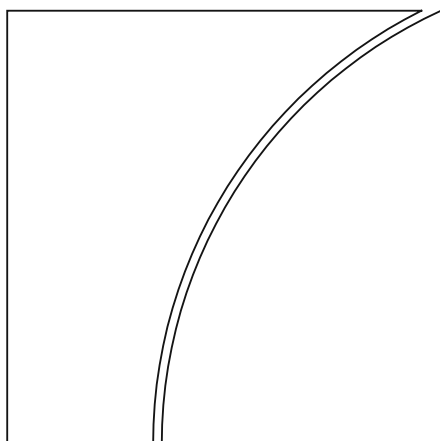




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Demographics will reverse three multi-decade global trends

by Charles Goodhart and Manoj Pradhan

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Foreword

The 15th BIS Annual Conference took place in Lucerne, Switzerland, on 24 June 2016. The event brought together a distinguished group of central bank Governors, leading academics and former public officials to exchange views on the topic “Long-term issues for central banks”. The papers presented at the conference and the discussants’ comments are released as *BIS Working Papers* 653 to 656.

BIS Papers no 92 contains the opening address by Jaime Caruana (General Manager, BIS) and remarks by Kevin Warsh (Hoover Institution and Stanford Graduate School of Business).

Demographics will reverse three multi-decade global trends

Charles Goodhart*

Manoj Pradhan[†]

Abstract

Between the 1980s and the 2000s, the largest ever positive labour supply shock occurred, resulting from demographic trends and from the inclusion of China and eastern Europe into the World Trade Organization. This led to a shift in manufacturing to Asia, especially China; a stagnation in real wages; a collapse in the power of private sector trade unions; increasing inequality within countries, but less inequality between countries; deflationary pressures; and falling interest rates. This shock is now reversing. As the world ages, real interest rates will rise, inflation and wage growth will pick up and inequality will fall. What is the biggest challenge to our thesis? The hardest prior trend to reverse will be that of low interest rates, which have resulted in a huge and persistent debt overhang, apart from some deleveraging in advanced economy banks. Future problems may now intensify as the demographic structure worsens, growth slows, and there is little stomach for major inflation. Are we in a trap where the debt overhang enforces continuing low interest rates, and those low interest rates encourage yet more debt finance? There is no silver bullet, but we recommend policy measures to switch from debt to equity finance.

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Introduction

The global economy over the last 35 years has experienced three significant trends; a decline in real interest rates (supporting asset prices), a drop in real labour earnings in advanced economies (AEs), and, perhaps most startling of them all, a meteoric rise in inequality within countries alongside a drop in inequality between them. All three trends have been researched extensively, but individually, locally and independently from one another.

We argue that such an analysis is the wrong approach. Instead, we believe all three trends need to be examined together in a global context. Specifically, we argue that demographic developments over the last 35 years have driven falling real interest rates, inflation and wages, and rising inequality within countries as well as some of the falling inequality between AEs and emerging market economies (EMEs).

Can demographics really explain all three trends? If we include the integration of the gigantic labour forces of China and eastern Europe into the global economy, then global demographic dynamics do help to explain all three trends. But if that is correct, then the demographic reversal that the global economy will witness over the coming decades will also reverse the fall in real interest rates and inflation, while inequality will fall.

We approach the critical role of demographics differently from previous studies in three specific ways. First, we attach a great deal of importance to the role of China, both in the past and future. Second, we argue that the political economy of the social safety net in AEs will play a critical role in driving our results. Third, in an extension of our first point, we take what we think is a truly global approach to the discussion of demographics, looking collectively at the global labour supply and the global prices of labour and capital. By contrast, much of the literature that looks at demographics in an international context examines local demographic dynamics of two (or more) economies and then discusses spillovers to and from neighbouring economies.

We make our argument in five parts. The first section details the extraordinary demographic dynamics we have seen over the last 35 years and their impending reversal. The second and third sections explain our main propositions – why real interest rates will rise thanks to ageing, and then why wages and inflation will rise, while inequality will fall amidst a political confrontation between the elder cohorts and the prime working age population. Section 4 looks at contrasting evidence from other research as well as from the experience of Japan and north Asia. Finally, the last section looks at the prospective changes that could mitigate (or overturn, as some may argue) some of the effects of ageing – ie the rise of India and Africa, greater participation of the elderly, and debt.

1. The demographic sweet spot... slowly turning sour

1.1 The demographic sweet spot...

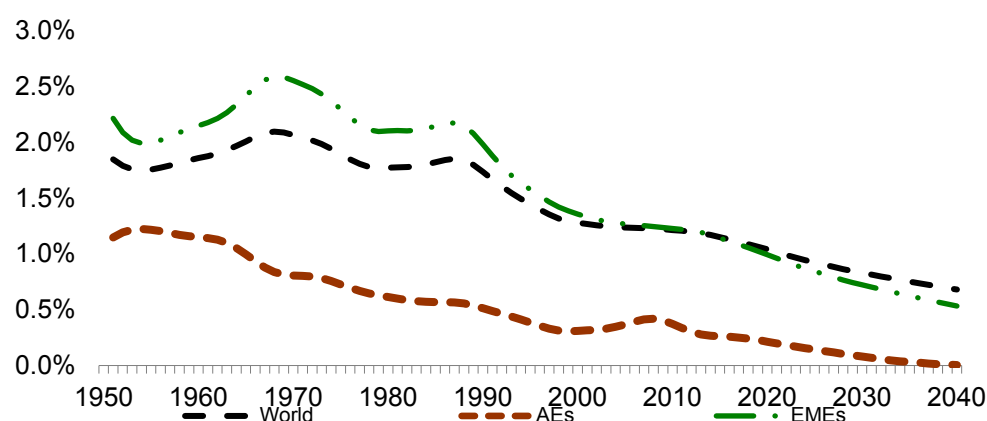
The demographic sweet spot of the 1970s and 1980s started with falling birth and fertility rates. World population grew fast, at nearly 2% per year until about 1990 (Graph 1). Then, as birth rates and fertility rates in both AEs and EMEs fell (Graph 2), world population growth slowed to about 1.25% per year until about now. World

population growth in 2040 will, however, be higher either than in AEs or our categorisation of the EMEs, because there is yet another category of countries – defined as the least developed regions and countries, mostly in Africa¹ – where population growth is predicted by the UN to remain much higher through 2040.

World population growth will slow even further

In per cent

Graph 1



Source: UN World Population Database.

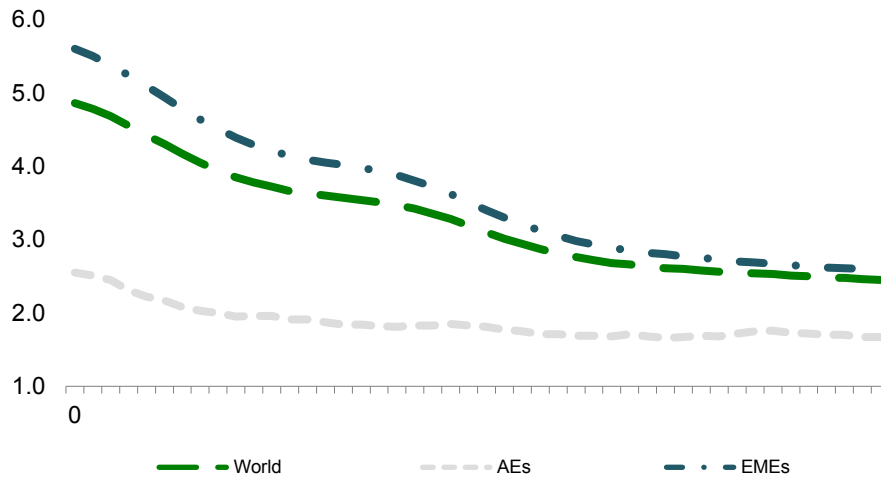
But the fall in the dependency ratio was the critical factor that created the sweet spot for the global economy. The combination of fertility and longevity were responsible for pushing dependency ratios lower. In addition to the decline in fertility, which came earlier, it is the increase in longevity (Graph 3) that has created quite an impact. This combination of an earlier fall in fertility and, later, a rise in longevity pushed the dependency ratio lower to create the demographic sweet spot. How? Put simply, the ratio of those of working age rose sharply relative to the dependent young (since the birth rate was falling) and to the old (since the population was still growing fast and longevity was slower to increase as much).

¹ The least developed countries, as defined by the United Nations General Assembly in its resolutions (59/209), included 49 countries in June 2013: 34 in Africa, nine in Asia, five in Oceania and one in Latin America and the Caribbean.

Fertility rates falling worldwide¹

Births per woman

Graph 2



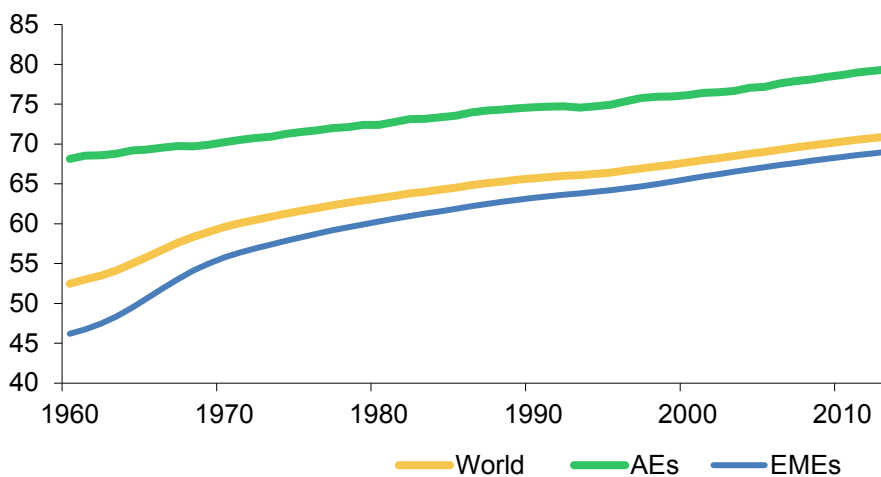
¹ AEs include high-income countries (both member countries of the Organization for Economic Co-operation and Development (OECD) and non-OECD member countries); EMEs includes low- and middle-income countries.

Source: World Bank.

Life expectancy: up sharply in EMEs, slower in AEs¹

Years

Graph 3



¹ AEs include high-income economies (OECD and non-OECD); EMEs include low- and middle-income economies.

Source: World Bank.

... made sweeter by China

The sweet spot was made much sweeter by China and eastern Europe beginning in 1990. We begin with China. Most studies on interest rates and wage dynamics in the United States and other AEs mention China, albeit not as the prime driver of these dynamics. We believe, however, that China plays a greater role than such studies have indicated in regards to recent trend developments in labour.

China has played a well known role in lowering global real interest rates. Its share of world trade (an average of exports plus imports) increased from slightly less than 2% in 1990 to almost 12% by end-2014. The asymmetric integration of China into the world economy is what really affected these dynamics. China's economic markets joined the global economy, but its financial markets did not. China's labour force joined the global economy with a capital/labour ratio that was well below global standards, but its financial border was closed, thus allowing its domestic real interest rate to remain very low in order to drive capital accumulation at home.

Imposing strict capital controls and pegging the currency allowed monetary policy to remain extraordinarily easy for a long time in order to maximise internal growth. As a result, there was a shift of overall investment out of the rest of the world and into China. Furthermore, the savings ratio was boosted in China through corporate/state-owned enterprises (SOEs) and household savings, especially owing to the lack of a social safety net and the collapse of the family safety net as the "one child" policy took hold. Thus, despite an already high investment ratio, the savings ratio climbed even higher, creating a savings glut that channelled back into the US Treasury bond market. On both counts, real interest rates outside China fell as ex ante investment fell relative to ex ante savings.

And then there was eastern Europe. Over a similar time span, communism collapsed in the USSR and eastern Europe. As in China's economy, prior to the fall of communism and their subsequent participation in the global economy, these countries had been more or less isolated. In these countries, labour was abundant and quite well educated, but capital and management were limited. A fruitful combination ensued: the West supplied much of the management, while the East supplied the labour.

The numbers associated with this integration are staggering. Counting just the potential workforce, the working population in China and eastern Europe (aged 20–64) was 820 million in 1990 and 1,120 million in 2014, whereas the available working population in the industrialised countries was 685 million in 1990 and 763 million in 2014 (Graph 4). That represents a one-time increase of 120% in the workforce available for global production.

1.2 Do these demographic developments explain our three trends?

We argued earlier that demographic developments over the last 35 years help explain the fall in real interest rates thanks to a pickup in ex ante savings over investment. Expanding on that, if the supply of labour (relative to capital) rises, its price (the wage rate) will fall. This is highly important in regard to the developments that have taken place over the last 35 years. With supply increasing, not only will wages be lower, but the marginal productivity of labour will also be less. That is exactly what we saw in AEs as real wages there fell consistently. The two combined to raise inequality within the AEs. Declining real wages and a smaller share of labour in national output naturally meant that inequality rose. Thus, we attribute rising inequality, along with

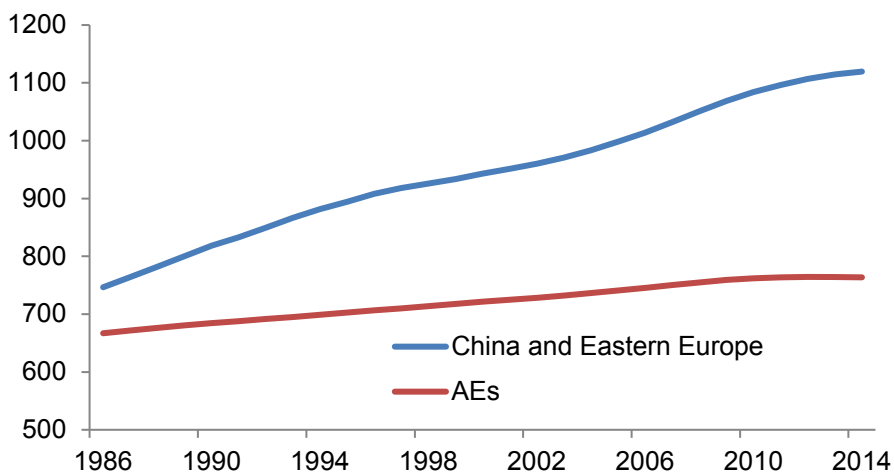
falling real interest rates, inflation and real earnings, to demographic dynamics in the global economy.

In equilibrium, the wage rate should equal the marginal productivity of labour. As the effective labour supply cheapens, managers spend less effort, and invest less in capital, in order to raise productivity, to hold down unit labour costs. A contrary effect is that the less productive firms and sectors in industrialised countries will succumb first to competition from China and eastern Europe, leaving the higher productivity firms/sectors in operation in those countries.

The positive labour supply shock from China and eastern Europe

Working age populations (20–64), millions

Graph 4



Source: UN World Population Database.

1.3 The sweet spot will now turn sour

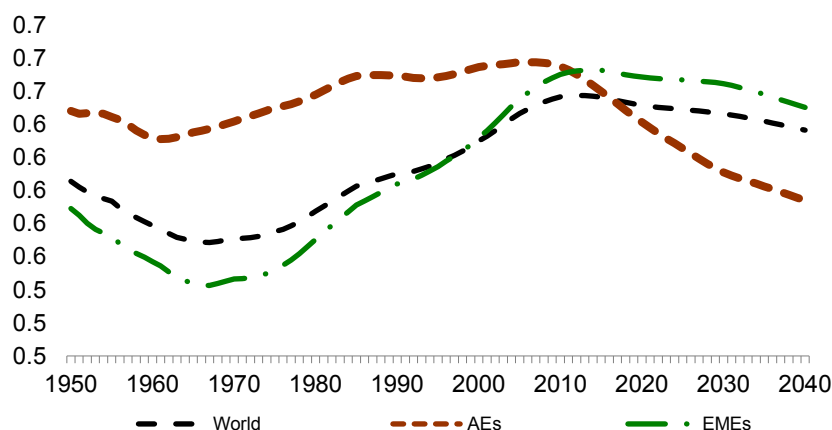
World population growth is projected to slow down further. Global population growth has already fallen – currently standing at about 1.25% – and it will decline further to about 0.75% per year by 2040, according to the United Nations (Graph 1). Within this, population growth in developed economies has fallen from over 1.0% per year in the 1950s to below 0.5% around now, and may fall to near 0% by 2040.

The declining projections thus indicate that the sweet spot is disappearing and will quickly turn sour. In particular, the dependency ratio – the ratio of workers to the elderly in the population – will worsen rapidly. We are at a point of inflection, and the rate of decline is predicted to steepen for AEs, EMEs and especially China and Germany, about now (Graph 5). The result of this is that the total working age population in the world, having grown fast between 1970 and 2005, will now grow much less rapidly. In the AEs and North Asia, not only will the working age population show outright declines, but the ratio of workers to the elderly will worsen sharply.

Working age population rose in AEs and sharply in EMEs, but should now begin falling

Working age population / total population

Graph 5



Source: UN World Population Database.

What's more, the aged need more labour-intensive care, taking up even more of a dwindling supply of labour. As societies age, the demand for medical services will naturally rise. However, age-related medical conditions rely on labour far more intensively. Dementia, for example, will require more patient care via carers. Unlike the illnesses we worry about the most today, age-related illnesses do not sharply diminish patients' lifespans. In AEs where labour is relatively expensive, a shift towards further labour-intensive patient care will add to the labour supply and wage pressures.

What will the macroeconomic implications of this change be? We move on to those next, starting with our most controversial inference.

2. Our key proposition: ageing will raise the equilibrium real interest rate

We argue that ageing will lower both desired savings and desired investment, but desired savings will fall by more. The resulting imbalance will require the real interest rate to rise for the market to clear. Just as the real interest rate has fallen since the 1980s thanks to a decline in desired investment borne out of the demographic sweet spot we described above, real interest rates will reverse course along with demographic trends and the resulting changes in savings and investment dynamics.

This is clearly our most controversial proposition, and much of the pushback we receive is based on the argument that demographics will lower potential output growth, and hence real interest rates. We agree wholeheartedly with the first argument regarding output growth. But we disagree that it will also lower real interest rates. Indeed, there is much less reason to believe the two are connected than many believe. We discuss first the path to determining the equilibrium real interest rate and

then delve into some of the dynamics that will drive savings lower but keep investment from falling by as much or more.

2.1 What determines the equilibrium real interest rate?

The role of growth in determining the equilibrium real interest rate is exaggerated

It is commonly assumed that an intrinsic relationship exists between potential output growth and the equilibrium real interest rate. Laubach and Williams' (2001) popular model uses the Ramsey framework to impose a long-term factor that is common to both potential output growth and the equilibrium real interest rate. That assumption, more than anything else, drives their estimates of the equilibrium real interest rate over their estimation period. However, this assumption does not find adequate support in the data.

In an empirical study designed to investigate the determinants of the equilibrium real interest rate in the United States, Hamilton et al (2015) finds that the only significant relationship of US real interest rates is that they are co-integrated with real interest rates in the rest of the world. Growth plays a part, as do many other factors, but shows no dominant relationship in determining the equilibrium real interest rate using data from 1858–2014.

The focus needs to be global, not local – and needs to explicitly factor in China

Rather than looking for explanations of falling real rates in any one country at a time, the focus needs to be on global factors. Ex post, savings have to equal investment in a closed economy, ie the world. So, if one points to a particular country, say China, where savings have exceeded investment and there is a current account surplus, then by definition there is another country (or countries such as the United Kingdom or United States) where savings have been below investment and there is a current account deficit. What we need to look at is the ex ante desired savings versus investment dynamics on a global scale, and think of the equilibrating price as a global price.

Most of the demographics studies that we have seen take one of two routes. One set of studies looks only at national demographic trends and tries to explain wages and consumer price changes through local dynamics. Studies about Japan are the classic example here. The other set includes a model of two or more countries with differing demographic trends that determine local prices, which then impact the domestic and foreign economies. We think both could go a step further and consider truly global labour force dynamics that set global prices. And nothing we have seen pays more than lip service to what we believe is the crucial factor – China.

The right approach needs two looks at ex ante savings and investment dynamics

Rather than use growth as the determinant of the equilibrium real interest rate, we use the standard classical theory that in the medium and long run (after the temporary effect of central bank policy on local real short-term rates dissipates), real interest rates move to adjust differences in ex ante savings and ex ante investment, falling when desired savings are greater than desired investment, and vice versa. So the declining trend in real interest rates over recent decades, from 1980–2015, is prima facie evidence that ex ante savings have exceeded ex ante investment over this period.

Cyclically too, much of the perceived link between growth and interest rates, we suspect, comes from observing a decline in both growth and interest rates during economic slowdowns and connecting the two. The decline in real interest rates cyclically also has more to do with the behaviour of ex ante investment relative to ex ante savings and, in particular, to the greater amplitude of the swings in investment relative to those of savings. As desired investment falls sharply (while desired savings tend to remain more steady) towards the trough of the cycle, so do interest rates. Similarly, an increase in desired investment relative to savings during expansions leads to higher interest rates. These relationships are then mistakenly assumed to hold over the structural horizon.

2.2 Demographics will push both savings and investment lower – but which one will fall more?

The main problem is that demographic changes normally have the same directional effect both on ex ante savings and on ex ante investment. Slower population growth will lower the savings ratio, but will equally lessen the need for more capital, houses, equipment, etc. However, this doesn't tell us whether the capital/labour ratio will fall or rise, thereby raising or lowering the marginal productivity of capital. With both ex ante S and ex ante I moving in the same direction, assessing the likely balance between the two becomes problematic.

2.2.1 Why savings will fall

The behaviour of household savings according to the life cycle hypothesis in the presence of a social safety net, and the impact of ageing on China's savings explain why savings will fall.

The life cycle and the social safety net

If all retirement consumption was provided by prior savings, then the age-related profile of consumption should be downwards sloping, since younger generations benefit from higher life-long earnings. The life cycle hypothesis suggests that the consumption of an individual should be constant over time. Myopia, and an underestimation of longevity, would cause an even greater downwards slope to age-related consumption. But, actually, the data (Graph 6) show that age-related consumption is flat, or even rising, with age. This must, and does, imply a considerable transfer from workers to the old.

We argue there are two reasons for this. First, spending on medical services increasingly dominates the spending patterns of the elderly, especially in the final years of life (Graph 6 shows a sharp upward spike in consumption in AEs). Much of this is provided for free by the public sector (NHS in the United Kingdom; and Medicaid and Medicare in the United States). Second, most AEs have a safety net to prevent those elderly who do have not the personal resources to afford medical attention from falling into destitution.

Our key political economy assumption is that the safety net will remain in place, keeping savings from rising proportionally with longevity. While there is bound to be some scaling back on commitments, the pension and health care safety net will more or less remain in place. This will be incorporated into the savings habits of individuals, keeping them from saving more in anticipation of retirement.

Almost inevitably, health expenditures will rise further (Graph 7), while the retirement age simply hasn't kept up with longevity. Both health expenditures and expenditures on public pension transfers (Graph 8) will continue to rise along with the ageing of AE societies. So far, measures to enforce participation in the labour force by raising the retirement age have not materialized, except in a handful of places which have enforced a modest increase in retirement age. Longevity, on the other hand, has gone up significantly thanks to medical advances and might go up further if the science of ageing makes rapid advances. As a result, the gap between longevity and the retirement age has been increasing in line with increases in longevity.

China's effect: excess savings from the past will dwindle with ageing

Everything about China is enormous; its demographic dynamics have been and remain remarkable, and the consequential movements in its savings and investment ratios have been extraordinary. As China's labour force dynamics change direction, the savings-investment balance within and even outside China will change as a result.

Demographics will ensure that China's extraordinary savings will fall. Prior to modern times, the (relatively few) old in China were cared for in the extended family. But the one-child policy, extended for too long, has meant that support has gotten more and more scarce for the aged. With an insufficient social safety net, personal savings rose to plan for retirement. Add to this the incentive on the managers of state-owned enterprises to retain, rather than pay out, profits, and the explanation of these extraordinary savings ratios becomes clearer.

What will happen in the future? Although a higher proportion of the old work in Asia than in Europe or North America, increasing longevity will increase the dependency ratio, in China and elsewhere (Graphs 9 and 10).

The result will be a decline in the personal sector savings ratio and in China's current account balance; indeed, this has already begun (Graph 11).

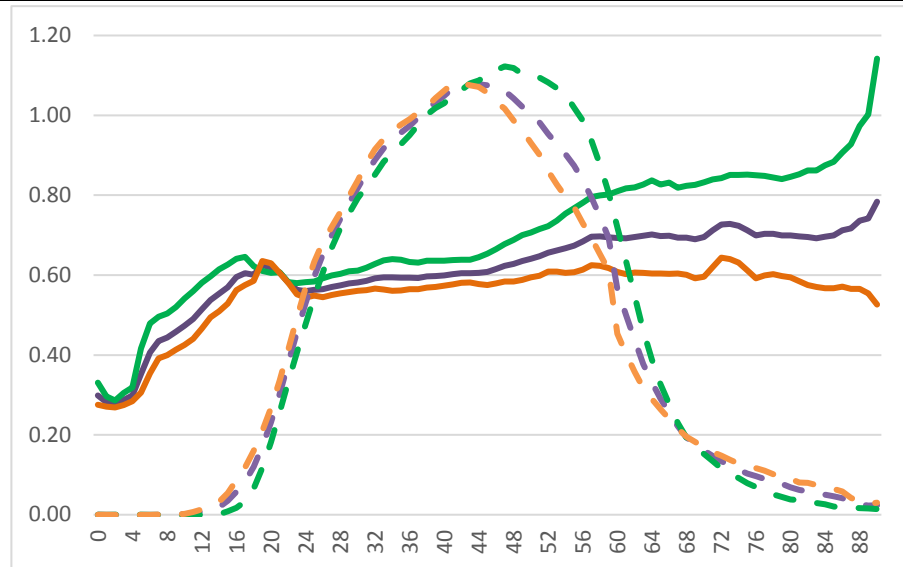
China's ageing will also reduce excess savings among oil exporters. The economic impact of China on the world economy has been great. One dimension of this has been to impart upward pressure on the price of raw materials including, notably, oil. Much oil has been produced in relatively sparsely populated countries (Saudi Arabia and the Gulf and Norway). With China's growth declining, and with the need to shift from fossil fuels to renewables, the net savings and current account surpluses of the petro-currency countries are likely to erode.

Indeed, all those countries which have had current account surpluses (large net savings) are either ageing rapidly (China and Germany), or are likely to see their relative advantage reduce (the petro-currency countries).

Consumption rises over the life cycle¹

Annual per capita normalised flows of incomes, in dashed lines, and consumption, continuous lines.

Graph 6



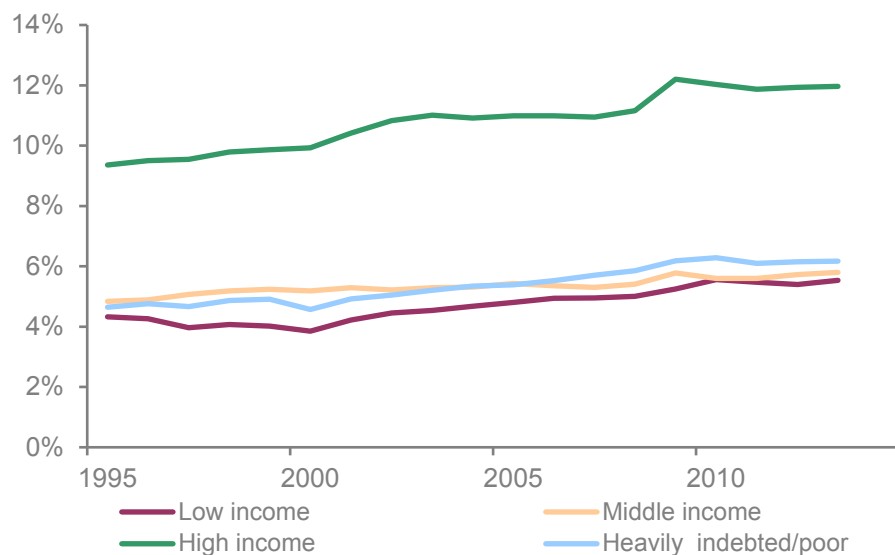
¹ Values are normalised by dividing the simple average of labour income for individuals 20–49 years old.

Source: National Transfer Account.

Health expenditure rising globally

Health expenditure as a percentage of GDP

Graph 7

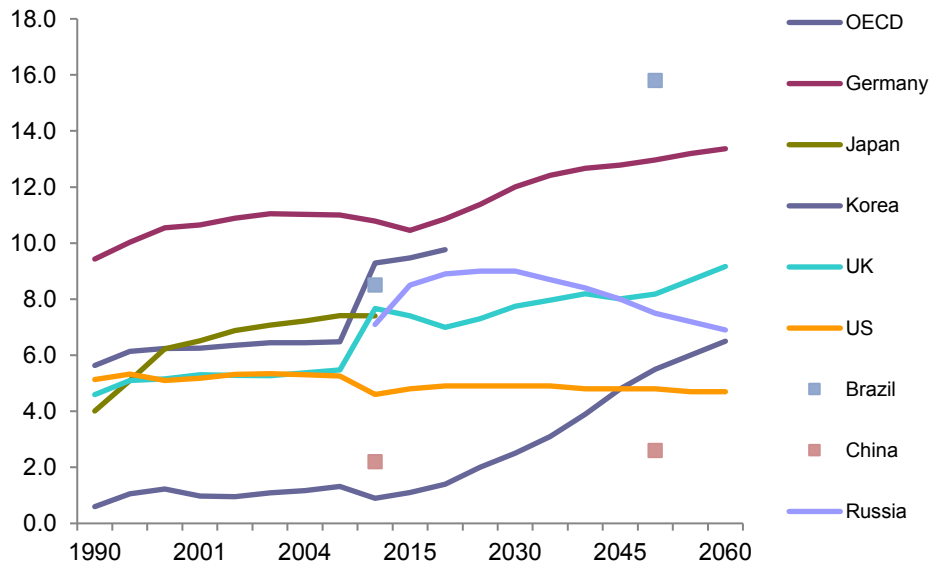


Source: World Bank.

Public expenditures on pensions will continue to rise

Public expenditure on pensions as a percentage of GDP

Graph 8

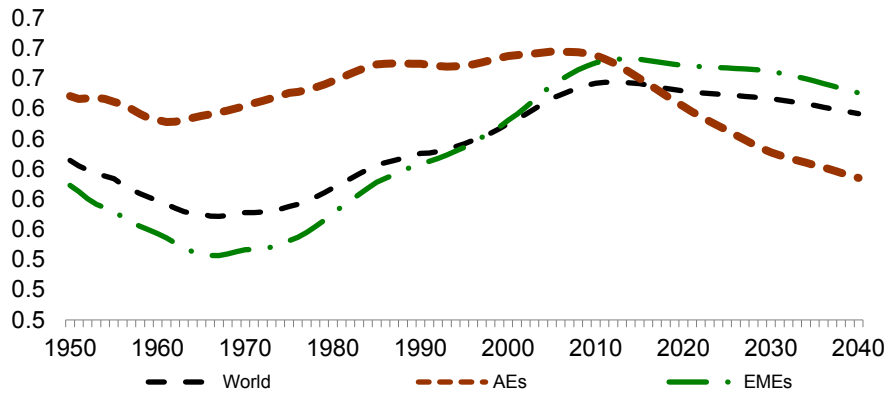


Source: OECD.

Size of the working age population is already falling

Working age population / total population

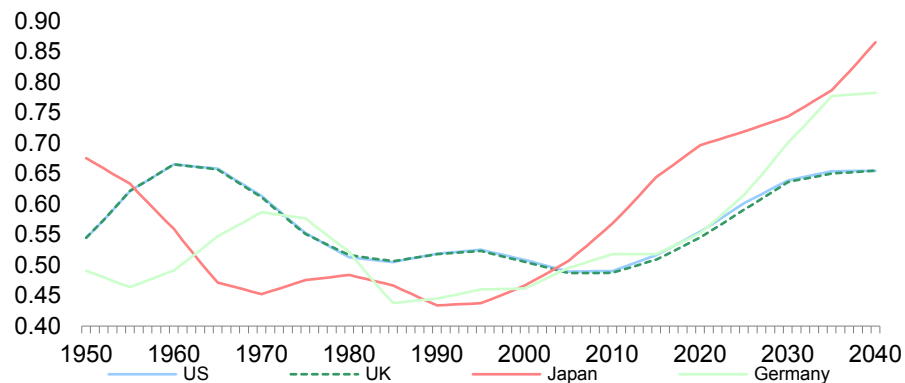
Graph 9



Source: UN World Population Database.

Dependency ratio rising in key AEs

Graph 10

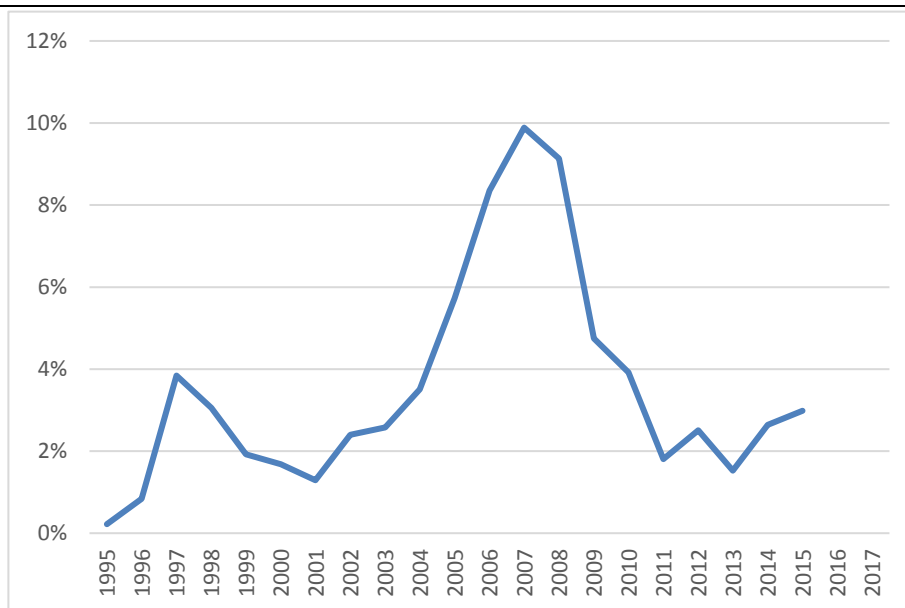


Source: UN World Population Database.

China's current account balance has already started declining

As a percentage of GDP

Graph 11



Source: International Monetary Fund.

2.2.2 Why investment will fall by less

A smaller population naturally requires less investment, but we argue that the reluctance of the old to relocate and corporate behaviour will help explain why investment will remain supported.

Housing and the reluctance of the old to relocate: supporting housing investment

A large proportion of overall capital, and of personal wealth, is tied up in housing and housing-related infrastructure. Many expect that as population growth slows down,

the demand for housing will decline sharply. However, that does not take into account the elderly's preferences. As nations become richer, the old stay in their existing homes rather than relocate to their adult children's homes. Moving is stressful, and those among the old who are homeowners have little incentive to relocate (Graphs 12 and 13). As the young come of age and gain financial independence, they will not move into existing housing vacated by the elderly, but will move into new homes that have to be built². In our view, a shift in the balance of the population of a given size towards more old and fewer workers will raise, not lower, the desired stock of housing. That will support residential and housing-related investment.

Could social behaviour change? Could the elderly sell their homes and live together with their extended family? This could of course happen. But we think it is more likely to happen in EMEs than in AEs. In the latter, breaking long-standing social mores would require that pressures from demographics become substantially worse before any such changes become widespread.

How will the corporate sector respond? The capital/labour ratio will rise, not fall

One aspect of the demographic impact that doesn't suggest a ready answer is the behaviour of the corporate sector. There are two polar arguments. The popular argument is that the corporate sector will respond to demographic headwinds by slowing down the rate at which it accumulates capital so that the capital/labour ratio falls.

Our view is that the corporate sector is likely to respond by raising the capital/labour ratio, ie by adding capital to compensate for labour, which is the factor of production that is getting scarcer and more expensive.

There will be a rising cost of labour and a falling cost of capital. We cannot think of any other time in history when the prices of the two main factors of production were moving as clearly in opposite directions. Even before demographics start pushing wage growth up, the price of capital goods has already collapsed. As wages begin to rise, compensating for more expensive labour will be easier thanks to a lower cost of capital goods. The resulting increase in productivity will somewhat temper the increase in wages and inflation. The savings and investment lens gives us another way to view this response. Given significantly cheaper capital goods, the cost of accumulating a given stock of capital uses up a smaller amount of the economy's stock of savings. To some extent, this can counter the savings deficit created by ageing demographics and somewhat temper the rise in both the interest rate and wages.

Historical experience after the oil shock, which provides evidence of such substitution. Manufacturing in many economies that faced favourable/unfavourable shocks to the price of an input of production has undergone a change in the capital/labour ratio in a significant way. Data from 1972–88 from manufacturing plants in the United States (Davis, Haltiwanger and Schuh (1996)) show that the 1970s oil price shock led to the demise of energy-intensive manufacturing. Plants, employment and wages all shrank as the US economy reacted strongly to protect itself against the then-current and future fluctuations in the price of oil. The opposite effect can be seen in economies that were net producers of energy. The hollowing

² A population with a larger proportion of elderly will seek to have a higher proportion of household heads, and therefore want more houses than in the case of a younger population.

out of Russia's knowledge-intensive manufacturing sector within an oil-dependent economy showcases this transformation all too well.

When it comes to technology, we take an agnostic view

We fully expect technology to have a significant impact on productivity and the real interest rate. But we prefer to take an agnostic view because we have no particular expertise in predicting the pace of innovations. Indeed, it is difficult to tell whether much of the debate around technology is about the pace of innovations or whether it is properly recorded in the statistics. Gordon (2012), for example, argues that productivity in the United States has fallen since 1973 and is unlikely to pick up from here. But Mokyr et al (2014) argue that statistics do not adequately capture technology and hence are misleading. Given that this issue is unlikely to be resolved any time soon, we prefer to remain agnostic on this topic in our note.

Why hasn't capital expenditure already responded to the demographic challenge? For structural and cyclical reasons

Structurally, it is still early days and perhaps until recently the relocation of production abroad remained an alternative and attractive option. The demographic headwind and the associated increase in wages has not yet affected large parts of AEs. Even in Japan, China and Korea, where these demographic pressures are already starting to show, they are still in relatively early stages, with some wage pressure beginning to be evident in Japan's labour market and the labour force in all three economies shrinking already.

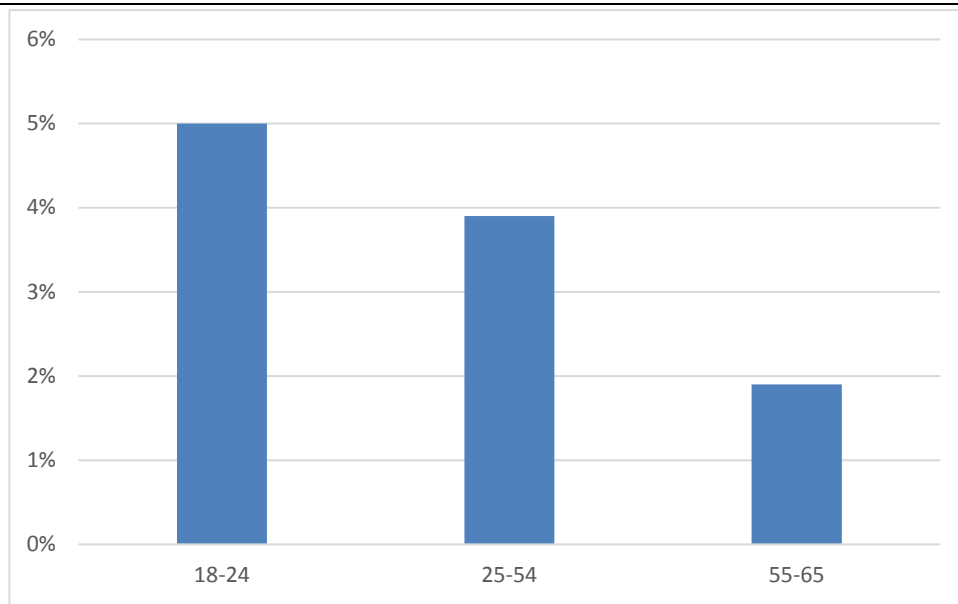
Even at this early stage, signs of a new capital expenditure cycle are already being seen in Japan. The economies of China and Korea, with excess capacity still a problem, are naturally not showing the same response. Most of the advanced world resembles Japan in two ways: (i) labour will shortly become more costly and will become even more costly in an absolute and relative sense; and (ii) the manufacturing sectors have seen neither the large capital expenditure growth nor an increase in private sector debt of their EME counterparts. AEs, therefore, are more likely to show a response to demographics that resembles Japan's more recent experience rather than China's or Korea's (and Japan's previous experience too).

Cyclically, it is a puzzle why corporates are saving rather than investing (particularly in the advanced economies and China). It is quite possible that global excess capacity that was closing only slowing and demand that was rising equally slowly kept corporates from investing in physical capital. There are some early signs of change in EMEs where capital goods imports (a decent leading indicator for investment) have picked up for the first time in half a decade. But the key remains the unlocking of the US investment cycle. The corporate sector of the United States has thus far preferred to increase ROE by leveraged buy-backs of shares and to increase output by employing more. If wage growth eats into corporate profits, then the increase in investment seen in the first quarter of 2017 could be the first signs of a greater willingness to invest in order to raise labour productivity and protect corporate profitability.

Older people less likely to move in the United States

Percentage of total sample that moved

Graph 12

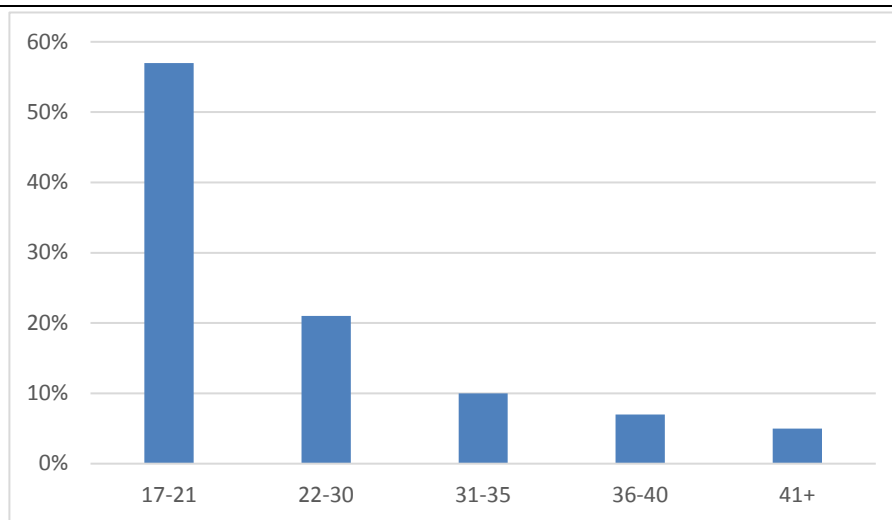


Source: Hernandez-Murillo et al (2011).

And in the United Kingdom, too

Percentage of households that moved

Graph 13

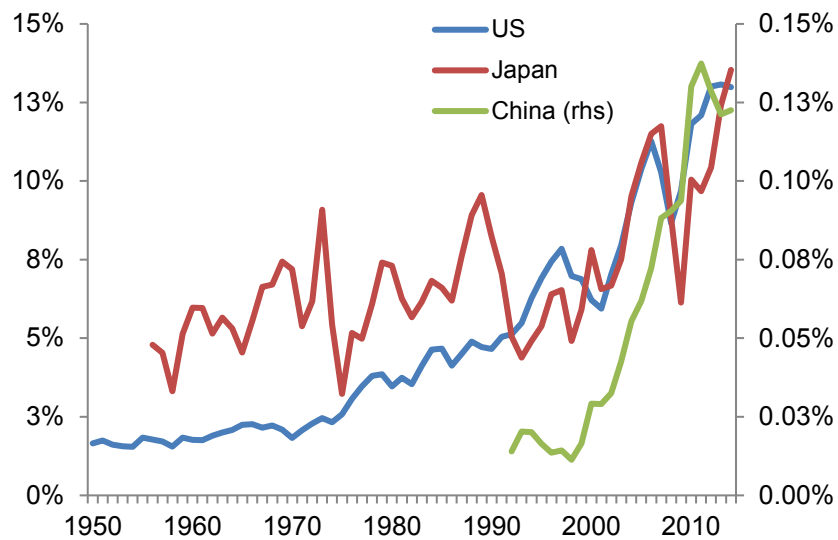


Source: Meen et al (2005).

Corporate profits at very high levels

As a percentage of GDP

Graph 14



Source: National sources.

3. Implications for inflation, inequality and politics

How do we pull together the overall macroeconomic conclusions? It would have been quite a task. Fortunately, a group of Birkbeck economists (Aksoy et al (2015)) have undertaken an econometric and theoretical study of the consequences of such demographic changes. Since we largely accept both the direction of travel, and rough magnitudes, of most of their results, we have simply reproduced their main table (Table 1).

Economic effects of demographic change

Table 1

	β_1	β_2	β_3
	(young 0–21)	(working 21–60)	(old 60+)
Growth rate	0.02	0.12	–0.14
Investment ratio	0.03	0.17	–0.2
Personal savings ratio	0.28	0.31	–0.59
Hours worked	–0.64	1.53	–0.89
Inflation	0.68	–0.85	0.17

Source: Aksoy et al (2015)

Their main conclusions, with which we agree, are:

- overall growth and total hours worked will slow down as ageing advances (which we can see because β_3 – which represents the coefficient on the aged profile of the population – is negative for growth and even more so for total hours worked);

- both the proportion of young and old are inflationary for the economy – this can be seen clearly by the (by the coefficients for inflation of β_1 and β_3); and
- both the investment ratio and the personal savings ratios fall thanks to demographics – as seen by a negative value for β_3 for both investment and the personal savings ratios.

These conclusions fit with our own thinking about the effects of demographics, in that:

- growth is the first and most obvious casualty, with a decline in overall growth, and total hours worked will inevitably fall. However, human happiness is linked to per capita gross domestic product (GDP) and that measure is likely to look a lot more benign;
- both higher proportions of young and old are inflationary, and it is only the working cohort that can be deflationary for the economy. Both of the former are net consumers and it is only the latter cohort that can offset the demand for goods and services by producing those goods and services; and
- both the investment and personal savings ratio will decline, though we add (as we previously have) that we believe savings will fall faster than investment.

Below, we elaborate further on why we believe inflation will rise, and offer two other implications of ageing – falling inequality and a worsening political confrontation that will be linked to protecting the social safety net.

3.1 Implication #1: ageing will raise, not lower, inflation

Inflation will be the inevitable consequence of the tax wedge that plugs the gap between inadequate savings and rising spending. If we are right in our political economy assumption that the social safety net will remain in place, then the age profile of consumption will continue to flat or even upward sloping. The ineluctable conclusion is that tax rates on workers will have to rise markedly in order to generate transfers from workers to the elderly. Workers, however, would not be helpless bystanders. Labour scarcity will put them in a stronger bargaining position. They will use that position to bargain for higher wages. This is a recipe for recrudescence of inflationary pressures. Today's inflation is a cyclical rebound that has shocked the bond market, but the world is still not ready to think about inflation that is likely to remain with us structurally. Central banks will, soon enough, have to revert to their normal behaviour. The zero lower bound (ZLB) was largely the consequence of a combination of a China effect, an unprecedented demographic backdrop and a deep cyclical shock. None of these will be ingredients in the future.

Ageing is inflationary empirically, too. Juselius and Takats (2016) uncover an empirical relationship – “a puzzling link between low-frequency inflation and population-age structure: the young and old (dependents) are inflationary whereas the working age population is disinflationary”. They use data from 22 countries between 1955 and 2014 and their analysis shows that 6.5% of the disinflation in the United States from 1975 to today can be accounted for by age structure. The age structure, they argue, “is forecastable and will increase inflationary pressures over the coming decades”. The intuition behind this result is simple. An increase in

consumption by itself creates an inflationary impulse for a given basket of goods and services. The act of production has the ability to expand the stock of goods and services for a given level of consumption and is therefore disinflationary. Dependents (the young and the old) are purely consumers and hence generate an inflationary impulse, whereas workers can offset this inflationary impulse through production. If the workers in the society outweigh dependents in the economy (as was the case during the demographic sweet spot) the world will go through a period of disinflation as it has for the last few decades. Over the next few decades, when the growth of dependents outstrips that of workers. In levels terms, the level of workers will be greater than that of dependents for decades. It is the rate of growth that is changing throughout.

3.2 Implication #2: Piketty is history

As Piketty (2014) and Atkinson (2015) have reminded us, inequality within most countries has risen in recent decades. Inequality between countries, however, has fallen as north Asia has caught up with Europe. The huge positive supply shock to world labour means that this was to be expected. Why? There are at least three reasons to consider:

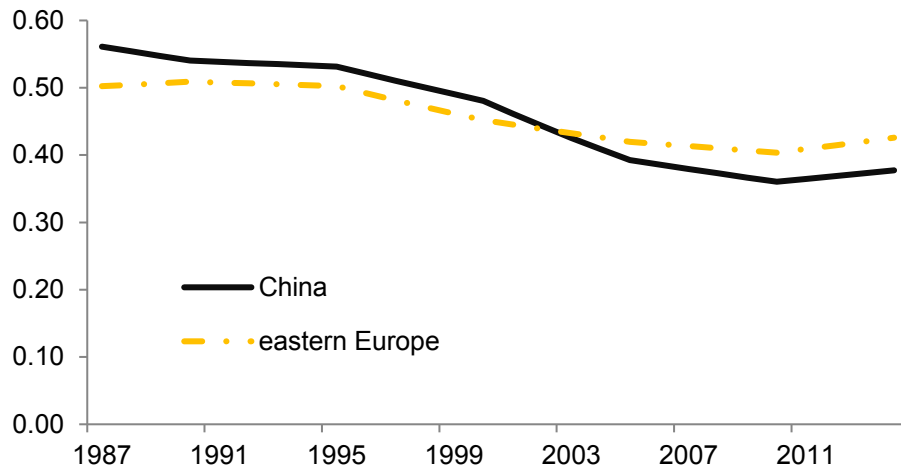
- a. *A positive labour supply shock lowered AE wages and productivity.* Thanks to the positive labour supply shock, the return to labour fell relative to the return to capital. This created greater inequality within an economy but greater equality between countries, with the marginal productivity (real wage) in China and eastern Europe rising relative to the West (and Japan).
- b. *The relocation of production led to higher inequality.* Employers in AEs could and did relocate production to China or eastern Europe. Along with the downward pressure on the price of manufactured goods, this led to deflationary pressures, both on AE domestic demand and AE inflation. As a direct result, monetary policy became more expansionary, and nominal and real interest rates trended downwards. The process started around 1980–82, just after the turn of the demographic cycle. Lower yields raised asset prices, and exacerbated the increasing inequality of wealth within each country.³
- c. *Such relocation helped raise the savings rate in China and raised the returns to capital.* Providing the capital (and the management) to make these additional workers productive was easier than might have been expected. The dependency ratio in China (and eastern Europe) was falling fast between 1975 and 2010 (Graph 15). With fewer children to support them later in their old age, and an inadequate social safety net, the growing population of China (and eastern Europe) saved more voraciously than needed to match the high investment ratios, leading to massive export surpluses, and the well known imbalances and savings glut. Moreover, governance issues encouraged (excessive) corporate saving in several countries, eg China and Japan, and insufficient investment in others, eg the United States and United Kingdom (Smithers (2013)).

³ Central banks argue, with considerable justification, that they have not worsened the inequality of income, but they find it harder to deny that the inequality of wealth has worsened

Total dependency ratio in China and eastern Europe was falling sharply, and is now turning up

Dependency ratios

Graph 15



Source: UN World Population Database.

Thus, we believe that demographic trends were one of the main causes of rising inequality (within country) in recent decades, and had nothing to do with an innate tendency for returns to capital to exceed growth ($r > g$) (Piketty 2014).

The demographic implications for future inequality

The coming reversal of these demographic trends will mean that future inequality is also likely to reverse. Rising wages will mean a larger share of national output for labour and falling inequality within economies. We argue that the capital/labour ratio will rise, and this could mean that inequality declines at a slightly slower pace because capital expenditure is more likely to replace lower-skilled jobs and hence affect lower-income workers adversely. But we do not expect capital expenditure growth to be excessively strong and believe education levels will rise over time, both of which dampen a potential reinforcement of inequality via the capital expenditure channel.

A clear dividing line is likely to be drawn between economies that will face slower growth (those with adverse demographics in AEs and north Asia) and those whose growth can continue to rise (India, Indonesia and Africa). Beyond this demographic dividing line, EMEs have the ability to play catch-up with AEs given their lower starting point, but this will depend on the usual set of factors starting from (and sometimes ending with) administrative abilities and policy.

Inequality has been cited as one of the more important drivers of excess saving. At higher income levels, much more of the income feeds through into savings rather than spending. If inequality is going to fall, this trend should reverse, and more spending for any given increase in income should be expected.

Piketty is history, not the ineluctable future. If these global demographic trends, as we argue below, drove inequality higher, then their reversal could lower inequality too. Labour had lost much of its power to command higher wages between 1980 and 2010. Now labour will become increasingly scarce. The labour share of income, having trended down in most AEs since 1970, is now likely to rebound.

3.3 Implication #3: the political economy of demographics – a clash of ages

The prime working age population and the aged are likely to find themselves in a political battle. The elderly will become a powerful political force as their cohort swells due to ageing. It is this political power that we think will keep administrations from reneging too much on their pension obligations. The prime working age population will be a dwindling cohort but they will possess an important commodity whose price is likely to stay on an upward trend – labour. What the young give up by way of political power to the elderly, they will try and counter-balance by seeking higher wages. Their bargaining position, however, may not be impregnable given they can hardly withhold their own supply of labour, ie they will not be able to abstain from working for long periods of time.

The UK “Brexit” vote (the approval of the United Kingdom’s departure from the European Union) and the US presidential election of Donald Trump show a demographic divide, with the older sections of both populations voting for the result and the younger segments of the population against. The debate, we believe, is primarily about immigration and frustration over low income growth. The political divide of the future will be over the elderly protecting their social safety net and the working age population their real post-tax incomes.

4. Opposing views and the contrary experience of Japan

4.1 Opposing views

If we believe the shift to a rapidly ageing population will lead to higher real interest rates, then why have other experts who have studied this issue come to an opposite conclusion?

In the case of Krueger and Ludwig (2006), our difference is primarily one of political assumption. We assume that political and social pressures will continue to maintain age-related consumption on a slightly upward trend, financed by increased tax transfers from the younger workers, with pension benefits continuing to rise in line with average incomes. In contrast, Krueger and Ludwig generally assume that taxes on workers are held constant, so that the per capita replacement rate (the transfers) to the old decline as the population ages. Naturally, in this case the workers have to save much more, thus imparting a large downward bias on the system. Thus, Krueger and Ludwig write that “keeping pension benefits constant and adjusting taxes, on the other hand, has dramatic consequences for the evolution of interest rates and wages, relative to the benchmark scenario of fixing tax rates for social security. With fixed benefits the incentives to save for retirement are drastically reduced, relative to the benchmark. In addition, the substantial increase in tax rates... and the corresponding reduction in after tax wages make it harder to save. Therefore, despite the decline in the fraction of households in working age (and diminished incentives to work because of higher payroll taxes) now the capital-labor ratio remains roughly unchanged, because of the large reduction of household savings. Consequently the increase in wages and decline in returns is much less pronounced in this scenario”.

Lu and Teulings (2016) provide an interesting angle to their argument that low fertility rates will mean the equilibrium real interest rate will remain low for a long period of time. Their analysis looks at global matters but they pay less attention to China than we would. In the economies of their choice, the benefits of the social safety net vary widely, and we would expect the savings behaviour of elderly citizens of these economies to differ in line with those provisions.

A recent study from the Federal Reserve by Gagnon et al (2016) has been widely publicised in both the press and in Federal Open Market Committee (FOMC) member speeches. Its key prediction is that demographics will keep real interest rates low in the United States for a very long time. Our now-familiar critique applies here, too. Their data are rich but only domestic in their scope. To account for open economy effects, they point to Krueger and Ludwig to argue that open economy models wouldn't change their estimates by that much. When it comes to the behaviour of real interest rates, they argue, "real interest rates are in proportion to TFP [total factor productivity] growth in a broad class of models, meaning interest rates should fall if productivity growth falls". We argued earlier against this line of reasoning and once again remind readers of the results of Hamilton et al (2016), which provide empirical evidence that stands at odds with such assumptions.

4.2 Does the experience of Japan and north Asia tell us what demographics will do to growth, inflation and interest rates? In our view, not necessarily

Just as we have reservations about the approach taken in the literature to analyse the effects of demographics, we argue that the experience of Japan and north Asia tells us less about the future impact of global demographic changes than historical developments in that part of the world would suggest.

Japan's demographics turned in the early 1970s when global demographic pressures were still benign. While Japan's labour was becoming scarce, labour was abundantly available in the rest of the world. Japan's corporates could, if they wanted to, offshore production and keep wages from rising. In fact, that's exactly what they did. Production was offshored and employment moved from manufacturing to services, where a sectoral excess supply of labour kept wage growth controlled.

North Asia's demographics are now turning, but the starting point is one of severe over-investment and over-indebtedness. During the period when excessive investment is being retrenched, growth will be weak, the capital/labour ratio could easily fall even though the labour supply is shrinking, and deflationary pressures could remain persistent because of excess capacity. These effects may be attributed to, but are not necessarily related to, demographics.

The demographic turn that is coming will happen when nearly every country capable of advanced production systems ages at the same time.

Of course, India and Africa continue to have a fast-growing population, but large scale emigration from these countries into AEs is out of the question for the foreseeable future, and for reasons set out later, we doubt whether an influx of capital and management into these continents can transform them, at least not rapidly, into future workshops of the world.

5. Three main risks to our thesis

We see three obstacles that stand in the way of the effects of ageing playing out as we have described above.

5.1 Risk #1: the social safety net is withdrawn

The first risk is that we may be wrong in assuming that the social safety net in AEs will remain in place, keeping individuals from saving enough for retirement and encouraging rapid dissaving upon retirement. This political economy assumption is more a matter of judgment but the difficult experience of Greece and southern Europe in raising the retirement age shows just how difficult it is to take away public entitlements. The experience of the last decade, and the political weight of the growing cohorts of the old, would seem to support our (politico-economic) assumption that medical services and pension benefits for the old will continue to be upgraded, in line with standards in the rest of the economy, rather than that taxes on workers will be held constant with the implication that standards of living and medical provisions for the aged would decline, possibly quite sharply. Any administration that moots reneging on the bulk of pension obligations, we feel, would be booted out of power. While we concede freely that a change in pension obligations would challenge our thesis severely, we are comfortable that this change will not be easy to implement.

5.2 Risk #2: mitigants – higher participation rates and the rise of India and Africa – could offset demographic pressures

The second risk is a set of mitigating factors that could be stronger than we expect them to be. Participation rates among the over-65s could rise faster than expected, India could become the powerhouse that China was, and robotics/technology could make labour redundant.

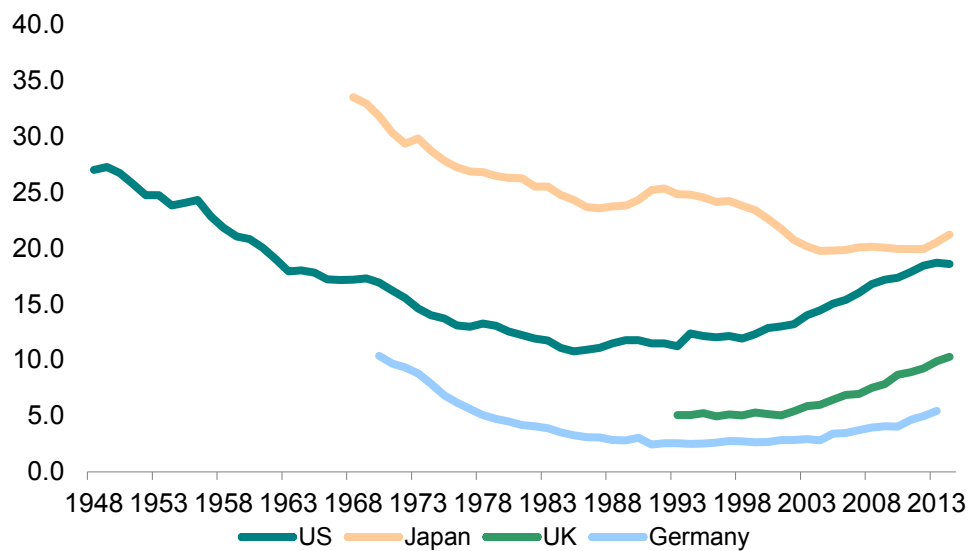
Can the participation rate rise? It already has

A pickup in the participation rate in AEs began some 20 years ago. Graph 16 shows the bottoming out of participation rates, but it also shows big differences in the level of participation among AEs. Part of this could be due to idiosyncratic factors, although Graph 17 suggests at least another explanation for these differences – the generosity of the pension system. The more generous pensions systems show a correspondingly lower participation rate. Germany's generous pension system, for one, results in the lowest participation rate while the far more parsimonious US system elicits a much higher participation rate.

Labour force participation of old-age (65+) workers has been rising for 20 years

In per cent

Graph 16

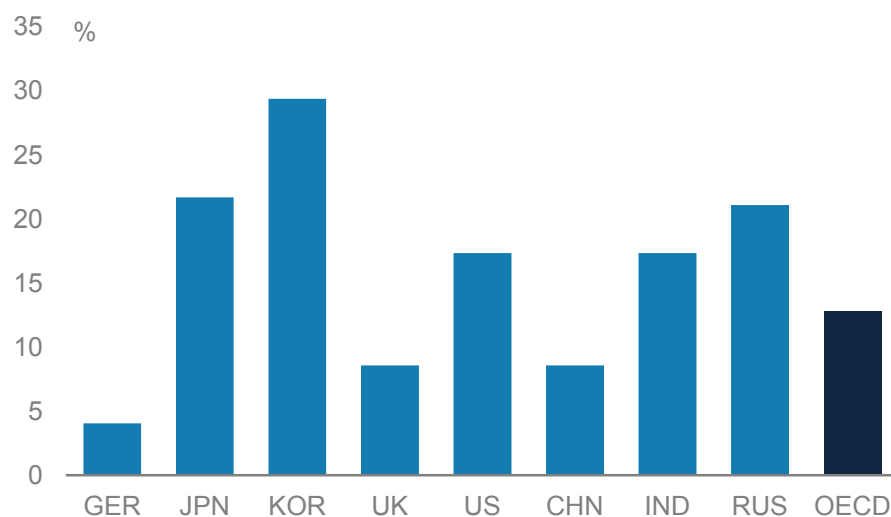


Source: OECD.

Labour force participation of older (65+) workers is higher in economies with less generous pensions

2010, in per cent

Graph 17



CHN = China; GER = Germany; IND = India; JPN = Japan; KOR = Korea; RUS = Russia; UK = United Kingdom; US = United States.

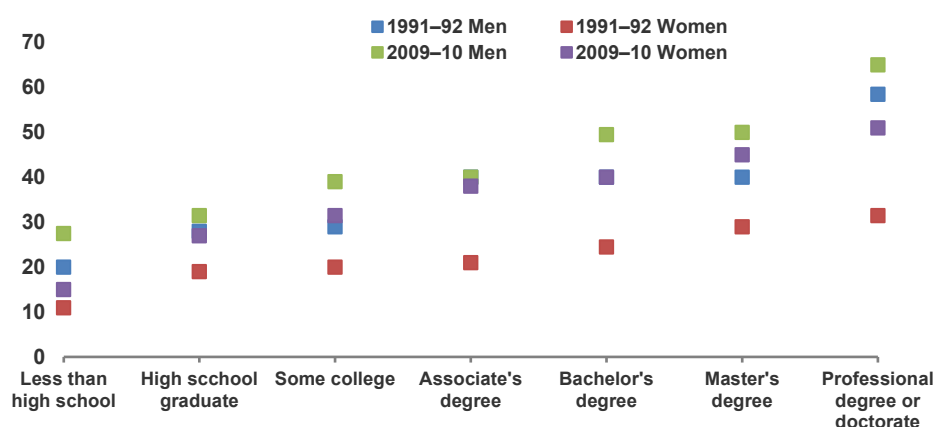
Source: OECD.

There is also a question about the willingness and ability to participate – and the factor that connects the two is education. Graph 18 shows that the level of education shows a clear relationship among the over-65s. Just about one quarter of the men and less than one sixth of the women in this group participate in the labour force when they have less than a high school education. This participation rate increases linearly with education. Two thirds of men and just over one half of women among the over-65s remain in the labour force if they have obtained a professional degree or a doctorate. Gordo and Skirbekk (2013) argue that the over-65s in Germany that have stayed in the labour force have tended to move into jobs that require more cognitive skills. Identifying an age-productivity curve, Skirbekk (2003) argues that productivity tends to decline in the older cohorts of the labour force much faster in jobs that require problem solving, learning and physical skills. Productivity doesn't decline much when the job requires experience and verbal skills. This should imply greater participation from the more educated ranks of the over-65s, leading to an increase in the demand for jobs that can use cognitive skills and experience.

Labour force participation amongst those aged 62-74 is higher for the educated and for men

In per cent

Graph 18



Sources: Gary Burtless, Brookings Institution; *The Economist*.

Can India and Africa offset demographic headwinds to the rest of the world? Numerically, yes. Economically, the offset is much harder

Since Brexit, Europe's frictions over migrants, and the election of Mr Trump, the optimism around immigration being an effective offset for ageing has died a quick death. But if labour cannot be imported into ageing economies, why not export capital instead to economies with growing populations, and produce and import finished goods from there? Some of this will naturally happen, but exporting capital to economies where the labour force is not necessarily easy.

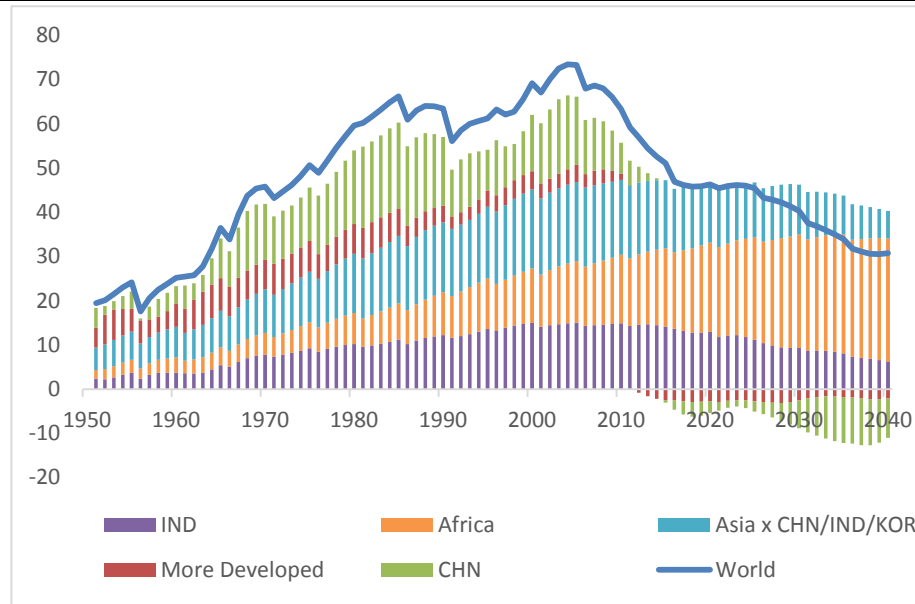
There won't be another "China" for a long time, if ever. The starting point for India and African economies could also allow for rapid growth (Graph 19), but the ability of these economies to transform themselves into the next China is questionable. Perhaps the economy best suited to marry its generous demographics

to an extensive inflow of capital is India. However, such a change is unlikely to occur over the next few years, and could only happen over the next decade with the help of significant tailwinds to the domestic and global economy, in our view.

Growth in the working age population will come mostly from India and Africa

Yearly increase in working age population, in millions

Graph 19



CHN = China; IND = India; KOR = Korea.

Source: UN World Population Database.

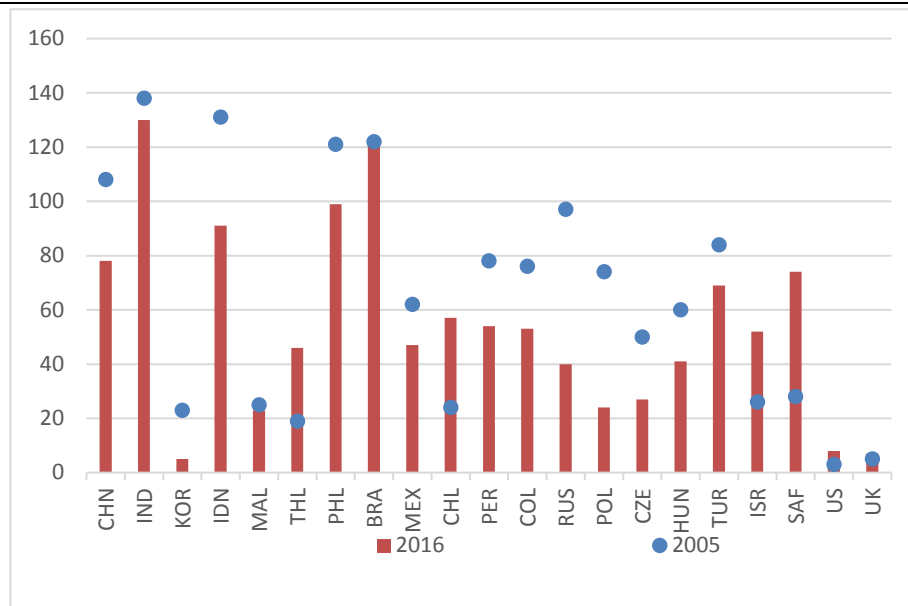
A major factor in keeping India and Africa from becoming economic powerhouses is the lack of an administrative infrastructure. Such infrastructure is critical to help deploy domestic or imported capital to take advantage of the growing supply of labour. The World Bank's Ease of Doing Business index (Graph 20) shows how much more progress both India and EMEs in general have to make in creating better business conditions. India's administration has recently embarked on a series of administrative improvements that are likely to help the economy accumulate capital faster. However, in our view, this could raise growth above its historical average of around 6% or so, but its economic size is still far too small for such a growth rate to have a global impact. Some African economies do score better, and a few even better than China. However, these economies do suffer from weaker human capital compared to India.

Are robotics not the next solution? As we have argued earlier, we do think that capital expenditure will rise in a way that raises the capital/labour ratio, and we have little doubt that robotics will be an important part of that story. In our view, however, most technological promises become realities very slowly. The science of robots has made tremendous progress in terms of cost and efficiency over the last decade, and we may turn out to be wrong about how quickly they take over the workspace, but thus far we see the potential being exploited more in the manufacturing sector where repetitive tasks have always been at risk.

Ease of doing business: better than a decade ago, but still a long way to go

Ease of Doing Business index (1 = most business-friendly)

Graph 20



BRA = Brazil; CHN = China; CHL = Chile; COL = Colombia; CZE = Czech Republic; HUN = Honduras; IDN = Indonesia; ISR = Israel; IND = India; KOR = Korea; MEX = Mexico; MAL = Malaysia; PER = Peru; PHL = Philippines; POL = Poland; RUS = Russia; THL = Thailand; TUR = Turkey; UK = United Kingdom; US = United States; SAF = South Africa.

Source: World Bank.

5.3 Risk three: debt could delay the inevitable

The risks we discuss above could provide slow-moving offsets to our main thesis, but one issue that will keep real interest rates and inflation from rising quickly over the next few years is debt. The world is still awash with debt, and the increase in leverage has been encouraged by interest rates being pushed to historic lows in the advanced economies and in north Asia. If US real interest rates rise or threaten to rise quickly, debt servicing will become more difficult, in turn putting downward pressure on spending and real interest rates more generally.

The genesis of leverage

The trend of increasing leverage, we argue, has been endogenous to the decline in inflation and real interest. The consequent increase in asset prices, particularly in fixed income assets, led to the expansion of the financial sector globally. Collectively, these conditions fostered a higher willingness and ability to issue and pay back debt. Tax laws helped, too. Tax regimes in most economies favour debt rather than equity, which further encouraged the build-up of debt.

The paths to deleveraging – and our preferred method of issuing more equity-like instruments

There are three main paths to deleveraging: inflating away debt, forgiving it, and making it permanent. Historically, the former two have played an important role, and while both will feature in this episode, we doubt they will play the lead role. A

significantly high level of inflation will be needed to make a dent in the real burden of debt – this may be hard to generate quickly. Even if it was possible to raise inflation, we doubt that inflation targeting central banks would allow inflation to rise rapidly initially.

Moreover, even though we owe the debt to ourselves, the distribution of assets in the economies will mean that savers and financial institutions will suffer the most if forgiveness is adopted as the prime strategy for deleveraging.

Insofar as making the debt permanent, converting bonds into consolidated annuities (consols) will mean that the debt never leaves the system. However, because the principal never needs to be repaid, the collateral that guarantees payments looks adequate and coupon payments become easier to make. Renegotiations like this will also be tricky, and even if default is avoided in a strict sense, managing expectations about how far such renegotiations will go and the complications of marking to market will become very important.

Our preferred method is to issue more equity-like instruments. The problem with debt instruments is their lack of state contingency, ie that the fixed servicing cost of debt stands at odds with fluctuations in revenues and asset returns. There are solutions that can be considered for households, corporates, banks and governments to design optimal equity-like instruments that can reduce leverage and allow the servicing of the new liability to fluctuate in line with the state of the world at a point in time. The debt-equity swaps that have been under way in China's banking sector for quite a while now are a step in the right direction. The proposals put forward by US Congressional House of Representatives Speaker Paul Ryan and the Chairman of the US Committee on Ways and Means Kevin Brady to change incentives in the US corporate towards favouring equity rather than debt were a step in the right direction, and we hope the Trump administration will incorporate them into any corporate tax reform plan it introduces.

Debt will delay the inevitable, rising dollar interest rates will force the world to deal with debt

The demographic sweet spot is already behind us, and both the equilibrium real interest rate and inflation have probably already stopped falling. That removes an important support for the bond market after a 35-year stretch. Cyclically, the improvement in US growth now has some company. Growth in the euro area and EMEs has been resilient over the last year, creating the kind of synchronized growth that has the ability to sustainably push up global yields. At some point, that increase in yields will prove to be exogenous from the point of view of those with excessive leverage. We therefore feel that leverage will have to be dealt with over the next three to five years thanks to this mix of structural and cyclical forces.

Beyond that, demographic forces will have a much freer rein to assert themselves. We don't know what the future will look like precisely. It will not, however, be anything like the past, of that we are sure.

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Comments by Masaaki Shirakawa^{*}

1. The state of the debate: a personal note based on my experience in Japan

It is somewhat puzzling to me that it has taken so long for modern economists and policymakers to recognise the effects of demographic changes on the macroeconomy. Demographics as a study has been discussed by well known economists for centuries. However, it is only a recent phenomenon that it is being discussed as a serious topic of concern. And even at the current state of the debate, I believe its importance continues to be grossly undervalued.

The delayed recognition of this topic is something I experienced while serving as Governor of the Bank of Japan from 2008–13. Despite my own emphasis on the importance of demographics during my tenure, I admittedly was not as prescient as I should have been about this issue. During the height of Japan's bubble economy in the late 1980s, a few experts had begun expressing cautionary views about the impact of prospective rapid ageing. At the time, I was rather dismissive of such views, as were many economists. Instead, I was optimistic about a market mechanism induced by demographic change: technological innovation and the substitution of labour for capital. In the 1990s, when Japan was muddling through its burst of bubble and the associated financial crisis, I was still of the view that once deleveraging was complete, the economy would return to a path of reasonably high growth rates, albeit somewhat lower than before. In retrospect, such an optimistic view was quite naïve. I was unaware of the significant effects of certain demographic changes, ie rapid ageing and a lower fertility rate.

Japan's economy has been intensively studied by economists and policymakers over the past 20 years. During this period – which is often dubbed the “lost decades” – too much attention was paid to deflation, which at the time was identified as one of the key causes of Japan's malaise.

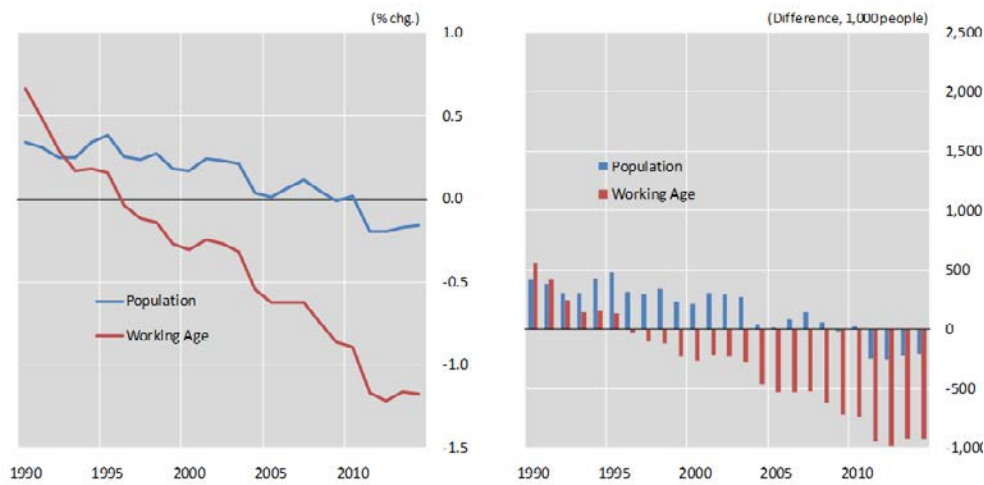
Today's activism in global monetary policy has arisen, in part, from the lessons allegedly learned during so-called “Japan's lost decades”. The country is a forerunner of the demographic changes AEs and EMEs are now experiencing. At present, Japan's working age population is declining by as much as one million every year (1% annually), which is a forceful headwind for its economy (Graph 21).

Looking back at Japan's “lost decades”, I believe different lessons may have been drawn had the impact of its demographic changes been properly recognised. Japan's growth in terms of GDP per working-age population since the start of the 2000s has been the highest among G7 countries (Graph 22). In my view, the current debate on the global economy and monetary policy have been influenced, in part, by two demographic-related factors.

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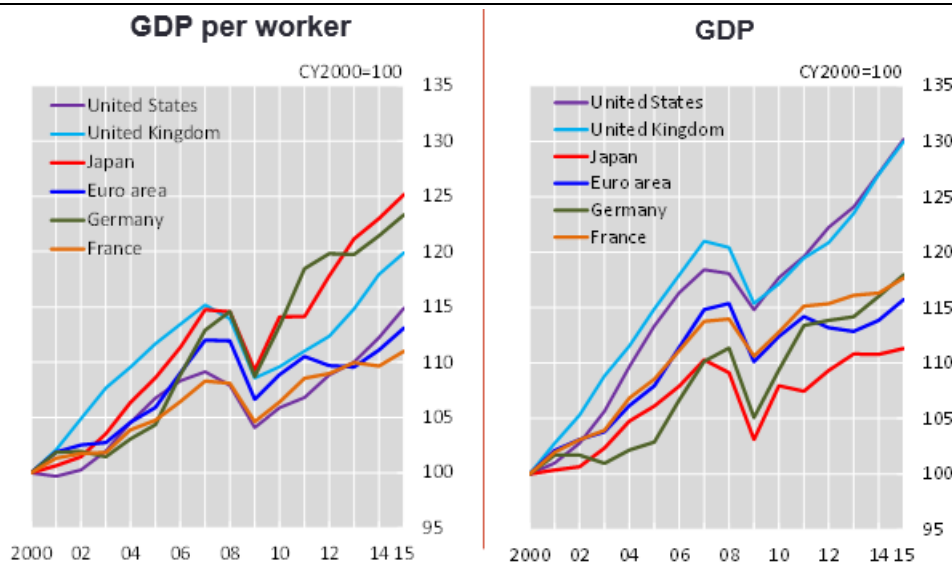
The working age population in Japan is now decreasing by one million every year (1% annually)

Graph 21



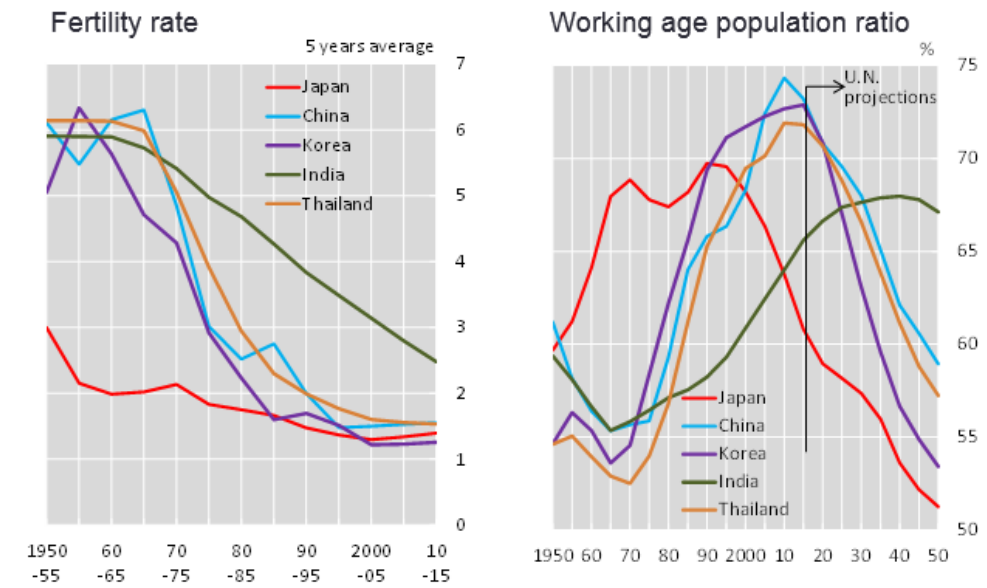
The impact of the decline in the working age population

Graph 22

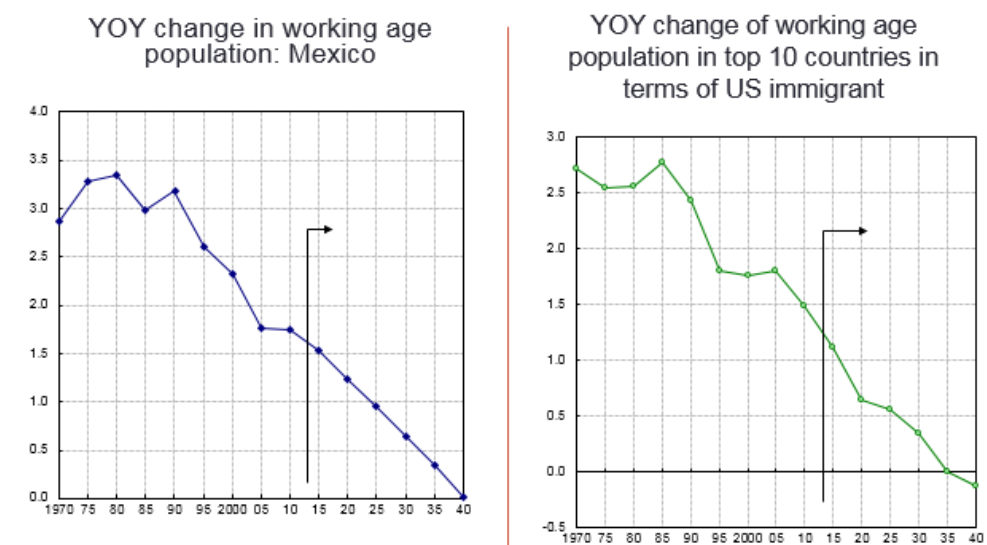


Sources: OECD; Eurostat.

The first is the underestimation of the demographic impact itself. While demographics is not the sole explanation for low growth of the global economy, it is among the crucial factors. For instance, rapid ageing going forward in China and Korea is projected to be much faster than what Japan experienced in the past (Graph 23). The United States, as well, with its relatively favourable demographics, is no exception (Graph 24).



Source: United Nations.



Source: Ryutaro Kono, Chief Economist at BNP Paribas.

The second factor may be referred to as an intellectual channel. The previously mentioned activism in global monetary policy based on lessons allegedly learned during "Japan's lost decades" is affecting the global economy and financial markets. There is a growing discussion on monetary policy responses under declining or negative natural rates of interest. In the case that the shock hitting the economy is temporal, lowering real market interest rates below the natural rate of interest is an effective strategy, one which brings forward future demand to the present. However, should the potential growth rate and natural interest rate decline permanently due to a drop in the working age population, just lowering the real market interest rate will

no longer be effective, as future income, which supports demand itself, is declining. In such a case, a different policy altogether is needed.

2. “Demographics will reverse three multi-decade global trends”: an overall assessment

Goodhart and Pradhan highlight very important issues related to the reversal trends of demographics. They offer a truly global, analytical perspective, and I shared the spirit of their analysis. My assessment on their work centres around four main points.

The global economy’s present stage of reversal due to demographic trends, as described by Goodhart and Pradhan, demands a higher degree of explicitness

The authors’ classification of this stage of demographic change is based on a global landscape and, as a larger-scale picture, is a useful guide. According to them, the global economy is now entering a stage of reversal in terms of dependency ratio. But the term “reversal” is too broad. For instance, in Japan, the working age population peaked in the mid-1990s. The dependency ratio bottomed out between 1989 and 1993. Even over the past 20-year period of reversal in terms of dependency ratio, its impact is markedly changing. We have to be more explicit about the sub-stages of this reversal trend in order to draw meaningful policy implications. I am concerned that failing to distinguish between the possible stages of reversal can lead to confusion in the current debate on demographics.

Thus, when it comes to the impact of ageing on growth and inflation rates, it is useful to divide the reversal trend into the following three sub-stages:

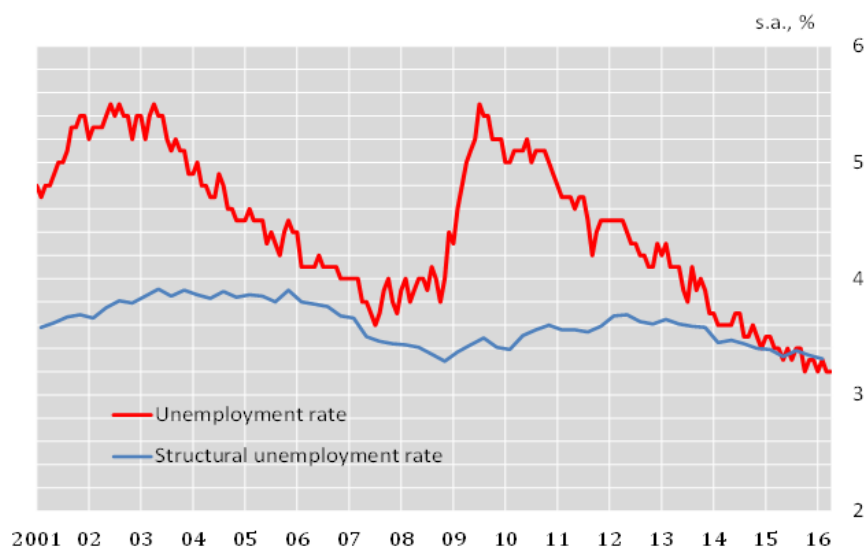
- An anticipation of ageing in the future. An expected decline in future demand depresses current expenditures relative to the current productive capacity. In this sub-stage, the GDP growth rate tends to decline. If the central bank is able to anticipate the change in the natural rate of ageing and adjust monetary policy accordingly, demographics could, in theory, be neutral. But the assumption that the central bank has a long time horizon and perfect knowledge does not fit well with our actual experience of the slow recognition of demographic change. Thus, an expected decline in future demand due to ageing precedes the actual decline in productive capacity, which produces deflationary pressure.
- A transition toward a new steady state with a shrunken population. In this sub-stage, the actual decline in productive capacity due to a decrease in the working age population begins. Subsequently, the effective working age population further declines, because very aged people need an increasing number of home care and nursing specialists. The GDP growth rate tends to decline further. An actual decline in productive capacity due to a decrease in the workforce thus creates inflationary pressure.
- a new steady state with a shrunken population. In this third sub-stage, the impact of demographics on the inflation rate could remain neutral as long as fiscal sustainability is maintained. However, if this condition is not met, either high inflation or instability of the financial system is unavoidable. I will discuss this stage in detail later.

The specificity of these sub-stages within the reversal of demographics change is vital in understanding the development of growth rates and inflation rates. Japan

is now entering the second sub-stage of ageing. At present, its labour market is tightening mainly due to the rapid decline in the working age population (Graph 25).

Japan is now entering the second sub-stage of ageing

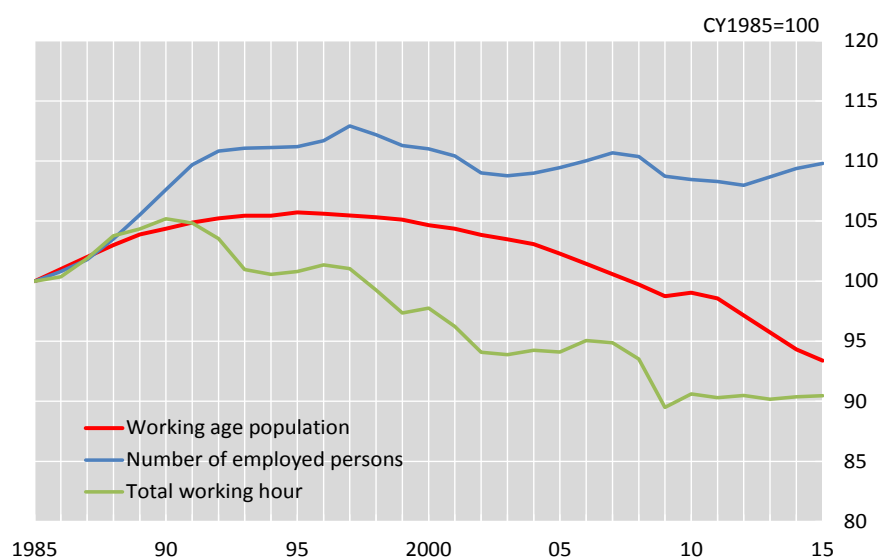
Graph 25



The resultant higher wage entices two groups to remain in the labour market: (i), the elderly, who naturally prefer part-time jobs because of their age; and (ii) female workers with young children, many of whom also prefer part-time jobs to balance the demands of raising children. In short, the new workforce equation equals more participation of aged people and females, but with fewer hours of work. Thus, employment has been almost flat over the past 15 years, while total working hours have been decreasing (Graph 26).

Participation rate has increased but total working hours are on a decreasing trend

Graph 26



Sources: Ministry of Internal Affairs and Communications; Cabinet Office; Ministry of Health, Labour and Welfare.

Against this background, the inflation rate will eventually increase due to ageing-induced tightening in the labour market. But we should note that raising the inflation rate, eg to 2%, does not solve the problem of low growth rate which deflation allegedly caused.

Higher interest rates?

Goodhart and Pradhan predict higher interest rates in the reversal period. Based on Japan's experience, the impact of ageing on investment/the savings gap is not as clear, at least compared to its impact on the growth rate. True, saving rates decrease. But, investment rates also decrease, as a return on investment decreases due to less labour intensity. Thus, I am not convinced that interest rates, at least real interest rates, will be higher in the reversal period.

The impact of demographic reversal on debt is complicated

Predicting a decline in the potential growth rate due to demographic reversal in real time is not easy. Low growth and low inflation coupled with purported lessons from Japan's experience in the first sub-stage of ageing might prolong monetary easing and thus create too much debt – both private and public. As for the second sub-stage, higher inflation rates due to an increase in wages do not reduce the public debt burden. While higher inflation could somewhat reduce the existing debt burden, it does not change the underlying problem of primary fiscal deficits related to ageing. In this regard, fiscal reform is crucially important. However, political momentum on the issue tends to be quite weak as the proportion of the elderly in population and hence its political influence increasing.

The third sub-stage: what is a new steady state with a shrunken population?

Countries with a fertility rate falling far below the replacement level will continue to witness a shrinking population. Are such countries sustainable in the long run? How can a country reach a new steady state? In growth theory, a state of steady growth is expressed as a sum of population growth N and technological progress T . But is any combination of N and T conceivable? Specifically, is it possible to offset a rapid shrinkage in N by making T significantly higher?

Theoretically, yes. But the problem lies with actually achieving this in the real world. Take for example a regional economy. In the area where the local population is declining rapidly, it becomes costly to maintain civil services and public infrastructure such as hospitals and schools. Eventually, economic resources will shift from areas with declining population to areas with increasing population. But such an adjustment tends to be delayed in a democratic society, leading eventually to a decline in productivity. Another example is a social security programme run by a pay-as-you-go principle. The adjustment of the level of benefits that the elderly receive tends to be delayed, which again leads to a decline in productivity via an increased burden on the younger generation. On the other hand, in this advanced age of technology one might imagine a situation in which information technology and robotics can solve the problem. There are, in short, many uncertainties and unknowns about how to effectively increase technology in this new steady state.

Other solutions have been proposed, one of which includes reversing the fertility rate. While this is the most obvious solution, societies experiencing this phenomenon have not yet figured out how to do this. Another proposed solution is to take in more foreign workers. While this could mitigate the decline in the working age population,

a massive inflow of immigrants could have political and social ramifications. A third solution still has been to dramatically increase productivity due to structural reform. This is desirable but it is difficult to implement since it is often beyond society's capacity to manage.

In any event, a one-size-fits-all solution for demographic change does not appear to exist, as labour market practices, the role of the family, the integration of foreign workers into society and the demographics of neighbouring countries are all different in every country. What is needed at a minimum is a clear appreciation of demographic change and an undertaking of serious studies.

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Comments by Alan Auerbach*

As this interesting and provocative paper illustrates, demographic change has become a central component of macroeconomic analysis. The usefulness of models based on smooth population growth was always in question, but the strong and ongoing changes in population structure around the world have made it essentially impossible to understand and predict macroeconomic trends without taking demographics into account.

Before getting into the trends that Goodhart and Pradhan consider, let me review the predictions that one would get from a simple dynamic macroeconomic model, such as in Auerbach and Kotlikoff (1987), when considering the effects of population aging, brought about by a combination of lower rates of fertility and mortality.

1. *An increase in the capital-labour ratio.* Standard life cycle models predict that individuals save for retirement, and that as a result there should be an increasing wealth-income ratio as the share of older individuals in the population increases and the share of the population in the labour force declines.
2. *An increase in the return to labour relative to the return to capital.* The relative returns to the two factors, in a simple two-factor production function, should tilt toward labour as the capital/labour ratio rises, with the return to capital falling.
3. *An ambiguous impact on income shares.* In the same two-factor model of production, the impact on income shares of capital and labour depends on whether the elasticity of substitution in production exceeds 1 (in which case labour's share should fall) or is less than 1 (in which case labour's share should rise). This is a key parameter in the analysis of Piketty (2014), who argued that capital deepening would coincide with an increasing capital share of income.
4. *A decline in the rate of economic growth as the transition to an older population occurs.* As the share of the population in the labour force declines, income per capita will grow less quickly.

It is helpful to keep these general conclusions in mind as one considers the predictions of Goodhart and Pradhan. The three trends of recent decades that they predict will end as a consequence of population aging are:

- declining real interest rates;
- declining returns to labour; and
- increasing inequality within countries.

While the basic analysis above is perfectly consistent with the second of these predictions, the first and third require more discussion.

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Will real interest rates rise and inequality decline?

One of the elements missing from the simple analysis above, of which the paper reminds us, is that fiscal systems in developed countries have large, age-based social insurance programmes, notably for health and public pensions. These systems are largely unfunded, so that an increase in the old-age dependency ratio puts added pressure on government budgets, given that a smaller working population must support a larger retired population. This is an important issue around the world, one which I have discussed in the past (Auerbach (2011)).

How countries deal with such increased budget pressure will influence overall national savings. At one extreme, countries may maintain social insurance tax rates and cut benefits. At another extreme, they may maintain benefits and increase taxes. As the authors note, the literature predicts that the latter approach will weaken national savings relative to the first, possibly leading to a situation in which population ageing is not associated with an increase in the capital-labour ratio. The simple reasoning is that in the second case, resources are being taken from generations with a longer horizon and a lower marginal propensity to consume these resources (the young, rather than the old). Indeed, a policy having an even stronger negative effect on national savings would be one that neither cuts benefits nor raises taxes, but uses additional public borrowing to finance existing benefits, as these resources will come ultimately from those future generations that currently engage in no consumption at all. A simple shorthand is to ask what happens to government liabilities, explicit and implicit, in each case, with higher government liabilities being associated with lower national savings. If benefits are cut and the budget balance is maintained, then implicit liabilities (to pay future benefits) fall and explicit liabilities are unchanged. If taxes are raised and the budget balance is maintained, then there is no change in implicit or explicit liabilities. If both taxes and benefits are maintained through borrowing, then implicit liabilities are unchanged and explicit liabilities rise.

Depending on how government budgets respond to population aging, it is possible that these responses may more than fully crowd out the capital accumulation that population aging would otherwise generate. This is the logic that I understand to underlie the authors' prediction that real interest rates will rise.

While the logic of this analysis is sound, it leaves to be addressed the question of how such a rise in real interest rates could be accompanied by an increase in real wages, which is also predicted in the paper. In the basic model of production, these two outcomes are mutually inconsistent, so some further thought is needed regarding how this apparent contradiction might be resolved.

One possible explanation is that there are several real interest rates, with an important distinction between the safe interest rate and the market return to risky private capital investment. One explanation for the very low real interest rates in recent years has been a flight to safety combined with a shortage of safe assets (Caballero et al 2017). To the extent that the relative demand for safe assets will fall in the future, it would be possible for safe rates to rise even as capital deepening occurs. However, this result seems rather unlikely, and nothing in the paper suggests otherwise. More plausible, it seems, is that a significant increase in government borrowing causes government interest rates to rise even if there is capital deepening.

Another possibility, which also relates to the question of inequality, can be understood by considering a three-factor production function, based on capital, high-skilled labour and low-skilled labour. Much of the literature on inequality points to changes in technology that have helped high-skilled labour at the expense of

low-skilled labour. Part of the technology story is that capital (eg robots) can substitute for low-skilled labour. To the extent that capital is more of a substitute for low-skilled labour than for high-skilled labour, as is generally believed, one could see a decline in the overall capital/labour ratio, an increase in real rates of return, an increase in returns to low-skilled labour, a fall in returns to high-skilled labour, and a decrease in inequality, as measured by the relative returns to low-skilled and high-skilled labour. Perhaps this scenario is consistent with what that the authors have in mind.

As these comments suggest, simple predictions of the economic effects of demographic change leave out factors that are likely to be important, including the heterogeneity of assets and labour and the highly important presence of age-based, unfunded government spending programmes. Taking these and other complications into account is important as one considers the economic path ahead.

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