The Australian Population Research Institute, Research Report, March 2020

Demographic ageing: time-bomb or breakthrough?

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Executive summary

Some commentators see demographic ageing as a problem, even a threat. For example Josh Frydenberg writes that 'With the sixth highest life expectancy in the world', ageing in Australia 'will place new demands on our health, aged care and pension systems'. He focuses on the relative decline of people of conventional working age compared to those aged 65 and over, warning that 'over the next four decades [the ratio will] fall to just 2.7 to 1'. For him this is 'an economic time-bomb'.

He is not alone. For example, Bernard Salt calls the prospective maturity a 'demography induced fiscal calamity' and says that voters need to be scared. Those 'who pretend there is no intergenerational fiscal sustainability risk are demographic deniers'.

But is increasing demographic maturity a threat or is it a sign of progress? And are the changes that come with it manageable, even beneficial?

The Malthusian trap

For millennia Malthusian pressures kept population growth in check. Many children were born but scarcity and disease meant few lived to grow old. High birth rates and high death rates kept populations young and (from our perspective) miserable. This was the Malthusian trap, the old demographic equilibrium. But in the last 200 years most human populations have escaped from it.

Scientific advances led to better sanitation, cleaner water, improved transport, more food, more health care and better education. These changes brought with them lower infant mortality and longer lives which, in turn, boosted productivity.

The longevity dividend

In the wake of these changes adults no longer had to spend most of their short lives bearing children and trying to raise them. They now had more years and more time to do other things, including learning new skills and taking on paid work. Longevity delivered a social and economic dividend.

As more of their children lived to grow up, many parents moderated their family size. They would not have been able to see a statistical overview of the effects of their decisions. But if they had they may well have thought that fewer, but healthier, children were worth the cost of more surviving grandparents, if indeed this was a cost.

Australia's escape into the virtuous circle of longevity and productivity

Like all economically advanced societies, Australia has long ago escaped the Malthusian trap of early death and stagnant living standards.

The average (median) age of Australia's population has been rising since at least 1901. Longer lives can increase workers' productivity as the education and experience of mature people is drawn on for longer periods than before. Material progress leads to an older population and this in turn may promote more material progress.

Though there are sceptics, the potential is there for a virtuous circle.

The inevitability of demographic maturity

Barring a catastrophe that pitches us back into the Middle Ages, demographic maturity is inevitable.

The only way for a society to achieve a stable population with a permanently youthful age structure is for many children to be born and for many people to die young. Unless

we want to return to this old equilibrium some increase in the relative size of older age groups must occur.

But this new equilibrium does mean social change. We are moving into new territory and it is understandable that there should be debate about its consequences.

This debate is the focus of this paper. Are the changes manageable? Will Australia with an older population be worse off or better off, and in what respects?

Findings

As well as ageing Australia's population has been growing rapidly. The estimated resident population grew by an annual average of 1.7 percent from June 2007 to June 2019, adding 4.5 million extra people. This took us to a total population of 25.4 million in 2019. The average contribution of net overseas migration (NOM) to this increase was 59 percent. In the last three years (June 2017 to June 2019) it was 63 percent.

In 2020, Australia's share of people aged 65 plus reached 16 per cent. This is well below the level in most other wealthy societies, including Sweden where it is 20.1 percent, Germany 21.7 percent and Japan 27.5 percent. All three are coping well, including Japan. Will Australia be able to do so too?

The proportion elderly need not increase indefinitely. For example, with support for the two-child family and nil net migration our proportion aged 65 plus would stabilise at around 28 percent in 2066 and remain at that level.

Health

Certainly a higher proportion of older people means that the numbers of frail elderly will increase. But Section 2 shows that rates of healthy life expectancy are increasing. In the 12 years between 2003 and 2015 males gained 3.9 years of healthy life expectancy and lost 1.2 years of living with disability. In the same short period females gained three years of healthy life expectancy and lost 1.3 years of disability.

Rates of severe and profound disability among older Australians are falling. This means that while there will be more older people in 2066, they will be fitter than they have been even in the recent past.

This trend towards higher levels of fitness can be seen in the positive contribution older Australians make to others through volunteering and caring for grandchildren. At the 2016 census 73,562 children lived with their grandparents who acted as primary carers. And from June 1999 to June 2017 between 22% and 30% of children aged 0-4 were cared for by grandparents as were 13% to 16% of children aged 5-11.

Older people's higher level of fitness is also reflected in the labour-force.

The labour force

Section 3 shows that older people's participation in the labour force is growing, especially among older women. For example, in 1978 13.1% of women aged 60-64 were in the labour force. By 2018 the figure had nearly quadrupled to 50.9%.

Costs—health care

Section 4 shows that health-care costs are rising. But it also shows that this is mostly due to more medical services being provided per person in all age-groups, and to overall population growth. Demographic ageing plays but a minor role.

Comparisons with other OECD countries show that the way in which health care is provided has a more dramatic effect on health-care costs than does the proportion

elderly. Japan, with the world's oldest population, has moderate health care costs. In contrast, the United States, with a median age only slightly higher than Australia's, has the highest health expenditure per capita by a wide margin.

Costs—social welfare: aged care and age pensions

Section 4 also shows that in June 2018 only 6% of Australians aged 65 plus were in permanent residential aged care. Even for the group aged 90 plus only 44.6% were in care.

Assistance to the aged (residential aged care and age pensions combined) accounted for 38.9% of the welfare budget in 2019-20, a proportion that is estimated to rise to 40.1% in 2022-23.

The Parliamentary Budget Office (PBO) assumes that over the decade from 2018-19 to 2028-29 costs will rise by $36 billion because spending on age care and pensions will rise (by $16 billion) and a smaller proportion of the population will be in paid work (depleting tax revenue by $20 billion). But it also assumes that population growth and income growth will increase tax revenue by around $187 billion resulting in a net increase by 2028-29 of around $166 billion.

The PBO assumes that the population growth will be fuelled by a net migration rate of 225,000 a year. But if this number should be trimmed the loss in tax revenue would be more than offset by lower annual spending on infrastructure. In any event assistance to the aged will not bankrupt us.

Sources of revenue

Section 5 shows that, over the nine years from 2008-09 to 2017-18, total tax revenue for all three levels of government increased by an annual rate of 5.11% (while the annual rate of inflation was 2.2%). It also shows that, in 2017-18, only 36.7% of revenue came from personal income tax. While this includes taxes on salaries and wages it also includes taxes on allowances, dividends, interest, capital gains, business income, pensions, rents, royalties, partnership income, and distributions from trusts, all of which are independent of age.

Data from the Australian Taxation Office for 2013-14 indicate that 75.3% of personal income tax comes from salaries and wages. If this holds for 2017-18 only some 28% of total tax revenue would derive from taxes on paid work.

Pessimists often assume that government's only source of revenue is personal income tax levied on paid work. This is far from being the case.

Productivity

Section 6 reports on research findings that population ageing does not detract from workers' productivity. Older people in paid work are often no less productive than younger workers and, in some instances, more productive. A number of researchers find a positive effect of demographic ageing on labour productivity and now talk of the longevity dividend in productivity per worker.

However, it is true that over time as the population ages, the ratio of people in their retirement years to those of prime working age will increase. Other things being equal population ageing will eventually slow the rate of economic output per capita.

The effects of population growth are different. Here there is a negative association with productivity in Australia and in 36 OECD countries right now. High rates of population

growth are currently linked with lower levels of growth in GDP per capita and with lower levels of growth in GDP per hour worked.

In Australia's case population growth appears to be a drag on growth in productivity. Of course we have lost of much of our manufacturing industry, where productivity gains are most easily achieved. But apart from this, sluggish productivity derives from congestion and from the fact that much of our capital is being invested in city building and home building. This means capital widening rather than capital deepening.

Labour productivity grew by 1.5 per cent per year in Australia from 1974-75 to 2018-19. But this is a long-term average. It actually fell to minus 0.2 per cent in 2018-19.

At some time in the future growth in productivity may well be lower than it might have been with a constant proportion of conventional working wage. But productivity is falling now when the effects of ageing are negligible but the effects of numerical growth considerable.

Infrastructure costs

Rapid population growth of the kind seen since 2007 leads to productivity-sapping congestion. It also promotes investment in housing and additional infrastructure. This duplicates existing capital rather then enhancing it. Both congestion and capital widening lead to diseconomies of scale.

In 2013 the Productivity Commission wrote that, with the then current rate of population growth, public and private investment would have to grow by five times the amount over the next 50 years as it had in the previous 50 years. There has been substantial investment in infrastructure recently but not at this level, and not at a level high enough to keep up with population growth.

Jane O'Sullivan estimates the infrastructure costs of settling one new immigrant at $100,000. In 2018-19 net overseas migration was 244,000, implying an infrastructure bill of $24.4 billion for that year alone, and this is without including the 143,000 infants added to the population by natural increase.

The PBO estimates ageing will deplete tax revenue by $36 billion over the next decade, but expects the extra immigration numbers per year it assumes are needed to avert this 'loss' will offset much of expected tax loss. Given that it is assuming net migration of 225,000 per year, during this ten-year period the infrastructure costs of this alone could total $244 billion. These costs are not made clear in the PBO's calculations.

Ageing and the immigration fix

Many policy makers and interest groups argue not only that demographic ageing is a social ill but that it can be ameliorated (if not cured) by high numbers of younger immigrants. Some voters share these concerns about ageing and thus are liable to believe in the proposed treatment.

Section 7 focuses on an analysis of the population projections published by the Australian Bureau of Statistics (ABS) in November 2018. This allows a test of immigration's efficacy as a promoter of youthfulness.

The projections show that very high migration, net overseas migration (NOM) of 275,000 per year (combined with high life expectancy and a total fertility rate of 1.95), leads to a population of 49.2 million in 2066.

This projection would result in a median age by 2066 of 29.5 years, 6.3 years younger than a projection with similar assumptions about life expectancy and fertility but with nil

net migration. (This second projection leads to a population of 27.4 million in 2066 with a median age of 45.8 years.)

The ABS assumption of a NOM of 275,000 per year is not unrealistically high. It is almost exactly the level Treasury is planning for.

Simple subtraction shows that these extra years of youthfulness come at the cost of adding an extra 21.8 million people. This means nearly 3.5 million extra people for every extra year of youthfulness (more than two and a half times the current population of Adelaide).

Section 7 also confirms findings made by Peter McDonald and Rebecca Kippen in 1999. Some immigration reduces the median age a bit, more immigration reduces it relatively less, more immigration less again. The law of diminishing returns sets in.

Moreover, this gain in youthfulness would only be temporary. No matter how young they are on arrival migrants grow old too. As no population can grow for ever, at some time in the future the older age structure would be waiting for us. But with very many more people, including many more older people.

The projections show that if policy makers were serious about modifying Australia's age structure the most cost effective way to do this would be to support the two-child family. One way to do this would be to prune the immigration intake and, by reducing competition, improve housing affordability. This in itself would promote a modest increase in fertility from its current level of 1.74.

Whatever the level of immigration, Tables 9 and A1 show that a fertility rate of 1.95 produces a lower median age than does one of 1.8 or 1.65, the other two assumptions used in the ABS projections.

Conclusion

Demographic ageing is the outcome of social progress, indeed of revolutionary social change. It proves that we have escaped from the Malthusian trap. And thanks to the longevity dividend, it can provide us with the resources to manage this change.

It is not a threat. The only danger lies in futile attempts to resist it with rapid population growth.

Demographic ageing: time-bomb or breakthrough?

Grow old along with me.
The best is yet to be,
The last of life for which the first was made…
Robert Browning 1864

1 Introduction

Like all developed societies, Australia's population is growing older. Many commentators take a pessimistic view. They see this a lamentable change, one to be avoided at any and all costs. But the only way for a society to achieve a stable population with a permanently youthful age structure is for many children to be born and for many people to die young. Perhaps the pessimists do not realise this.

1.1 The Malthusian trap

Prior to the Industrial Revolution constant child-bearing and early death was the pattern for all societies. This was the equilibrium described in Thomas Malthus' famous treatise on population. Just as with all other animal species, improved living standards increase fertility and child survival and decrease death rates. This leads to population growth which leads to pressure on resources, which leads to increased death rates and a return to the situation as before.[1]

The Black Death in 1347 in Europe was a tragedy. But the death of 30 to 50% of their compatriots was a boon to the survivors. Wages increased and food was plentiful. The years from 1350 to 1600 saw better living standards for many, before population pressures reestablished their former grim constraints.[2]

The Malthusian equilibrium was a trap that held all societies in its grip until around 1800.[3] The history of developed nations after this date is marked by technological and organisational changes. These increased yields from the fixed resource of land and led to engineering works that brought sanitation and clean water to many. They also ushered in a transport revolution — canals, railways, steamships — serving broader markets as trade in food, textiles and other comforts of life increased. In the wake of these changes health care and basic education expanded too.

Gradually, and then more swiftly, many of these benefits spread to less developed nations too.

1.2 The longevity dividend and the reproductive revolution

The slow triumph over early death and, for many populations, a growing desire and ability to limit family size began from that time. As early death and incessant childbearing retreated the process of reproduction became less wasteful, and less miserable. In short, we saw a reproductive revolution.[4]

People in societies that have moved through the reproductive revolution have longer lives, less dominated by the care of young children. As well as enjoying improvements in health, diet and housing, adults now have more time and energy to learn more skills and to engage in useful work for others outside the family. They also have more time for leisure.

Human resources have been immeasurably increased. This is the dividend that we all gain from increased longevity.

1.3 Responses to Australia's escape

We can follow the course of Australia's escape from the Malthusian equilibrium from the early years after federation. The data show that our population has been ageing since at least 1901. For some demographers, such as W.D. Borrie, this is the inevitable and welcome consequence of increased life expectancy and moderate family size.[5]

For others who write about demography the change is to be feared and, if possible, avoided. The Treasurer, Josh Frydenberg, writes that 'With the sixth highest life expectancy in the world', ageing in Australia 'will place new demands on our health, aged care and pension systems'. He focuses on the relative decline of people of conventional working age compared to those aged 65 and over, warning that 'over the next four decades [the ratio will] fall to just 2.7 to 1'.[6] For him this is 'an economic time-bomb'.[7]

Bernard Salt calls the new maturity a 'demography induced fiscal calamity' and says that voters need to be scared. Those 'who pretend there is no intergenerational fiscal sustainability risk are demographic deniers'.[8] He also tells his readers: 'The science is settled; there's not enough workers to fund the likely number of retirees'.[9]

James Button and Abul Rizvi write: 'As populations age, the costs of funding health care, aged care and pensions rise steeply. If, at the same time, the share of the population who are working and paying taxes falls, then governments have to borrow more'.[10] And Carla Wilshire, CEO of the Migration Council of Australia, claims that only immigration can save us. Without it 'by 2050 roughly half of us would be over the age of 65 and we'd essentially be one gigantic floating nursing home somewhere in the Pacific'.[11]

1.4 The objectives of this paper

From the perspective of the pessimists an older population with low growth means senescence and stagnation rather than maturity and stability. But does maturity indeed create a crisis for government budgets and the economy? Are the pessimists right?

Answers depend on an observer's feelings, interests, and understanding. Feelings and interests are personal but the aim of this paper is to help the reader's understanding.

There are two underlying themes: demographic changes in age-related physical dependency, and demographic changes in age-related economic dependency. It is the latter which dominates the ageing debate — too few tax payers struggling to support too many old-age pensioners.[12] The suggestion of high levels of immigration as a remedy follows easily from this conclusion.

Here we will explore the question of whether these demographic changes present problems or whether they are manageable and welcome.

These questions should be answered with an eye to the past as well as the future. Living to be old was rare when Browning wrote his lines, but in his time it was less rare in Britain than in most other countries.

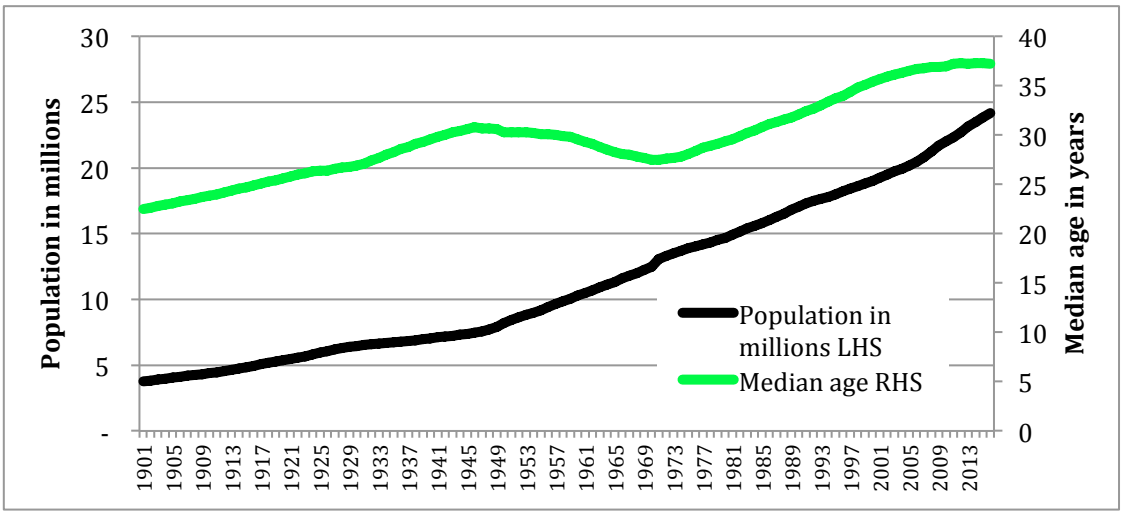
1.5 Changes in life expectancy and the average age of a population

In 1864 Britain had one of the highest levels of life expectancy at birth in the world, exceeded only by Norway. On average a child born in Britain in 1864 could expect to live to turn 40, and in Norway 49.[13] (Australia, at 48, was closer to Norway.)[14] Today girls born in Australia can expect to live to 84.6 and boys to 80.5,[15] a life span more than twice that of Browning's England.

How did this change come about and what are its implications?

From Federation in 1901 to 2016 the average (median) age of the Australian population increased from 22.5 to 37.2 years. (Over the same period the population grew from 3.8 million to 24.2 million.) See Figure 1.

Figure 1: Changes in the average(median) age and population in millions, 1901 to 2016

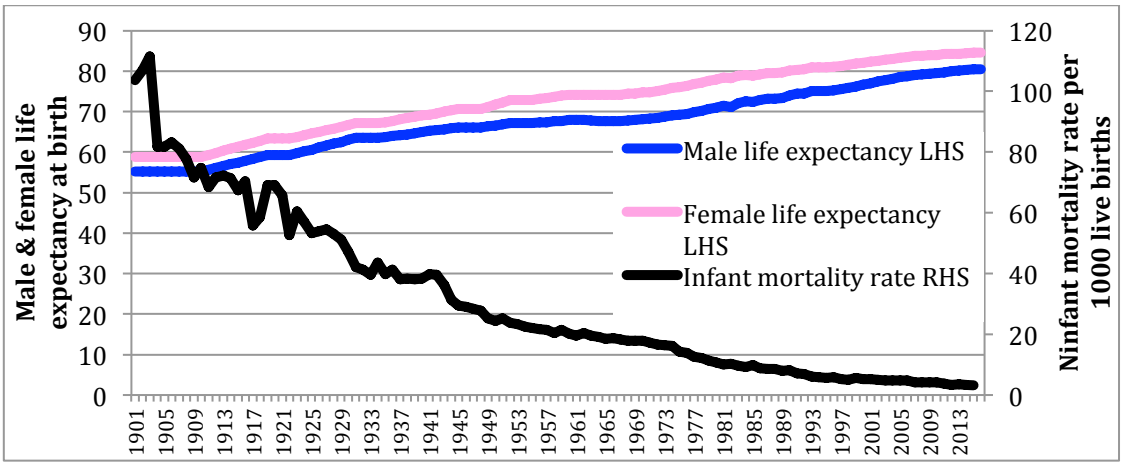


Source: Australian Bureau of Statistics (ABS) 3105.0.65.001 Australian Historical Population Statistics, 2019

One explanation for the increase in life expectancy is that infant mortality fell dramatically. For every 1000 live births in Australia in 1901 over 100 babies (10 per cent) died in their first year.[16] (In Melbourne in 1850 the figure had been 200 per thousand—20 per cent.)[17] In today's Australia fewer than four infants per thousand suffer this fate.

But longer life expectancy was not, and is not, simply a matter of lower infant mortality. Early death has also retreated for those who live to adulthood. In the period 1881 to 1890 an Australian man aged 20 could expect another 40.6 years of life; by 2015 to 2017 he could expect another 61 years. Comparable figures for women aged 20 were an extra 43.4 years in 1881 to1890 and an extra 64.1 years in 2015 to 2017.[18] Figure 2 illustrates changes in life expectancy at birth and changes in infant mortality.

Figure 2: Life expectancy at birth for males and female, and infant mortality rates, 1901 to 2016



Source: ABS 3105.0.65.001 Australian Historical Population Statistics, 2019 (deaths, and life expectancy)

1.6 Infant mortality and the total fertility rate

Increased life expectancy is one of the two causes of demographic ageing and lower fertility is the other. Life expectancy has increased at all ages but especially in the first year of life. And as infant mortality fell in Australia, so did the number of births per woman.

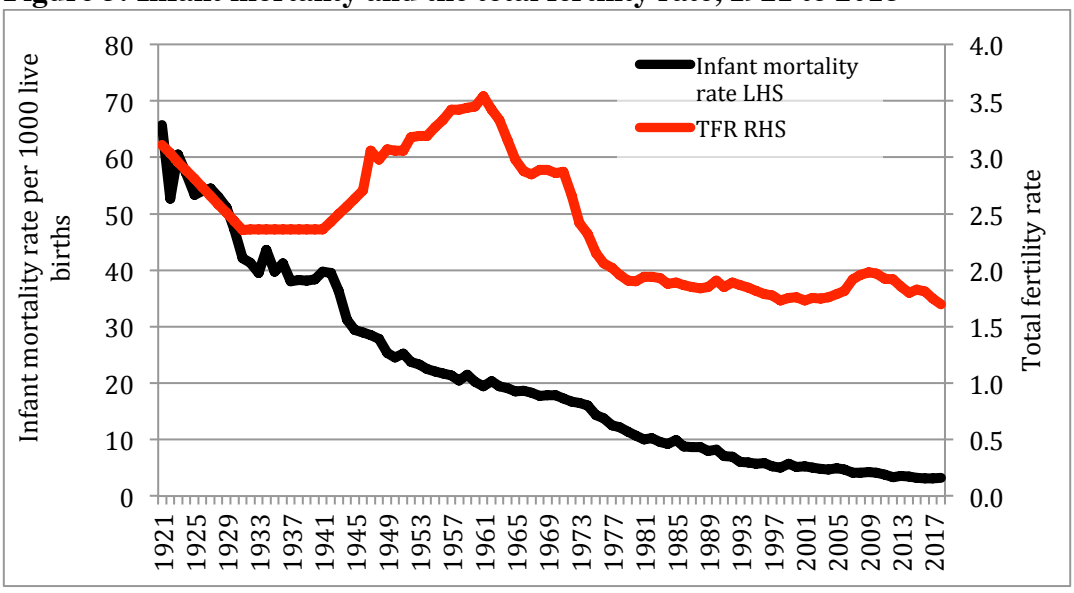
Births are often summarised by the total fertility rate (TFR). For convenience this can be thought of as the average number of children per woman at a particular time.[19]

Figure 3 begins with the year 1921 as data on the TFR are not available for earlier years. It shows that, in the 1920s and 1930s, the fall in the TFR appears to track the fall in infant mortality. This lends credence to the theory that parents have fewer children when they can be more confident that their existing children will survive.

But in some circumstances causation may go in the opposite direction. Some infants can be unwanted and, through neglect (poor nutrition, failure to seek medical attention, lack of care and affection), they may die,[20] as may those put out to underpaid wet nurses, a practice known as 'baby farming'.[21] High infant mortality can also include infanticide, not just in far away countries but in Australian cities, such as Melbourne.[22]

Where neglect or deliberate action play a part it is probable that, even though infant mortality is high, many couples would welcome effective contraception. Historians show that, well before the pill, many Australians were practicing some form of birth control,[23] though most methods were unreliable. High infant mortality may drive high fertility or in some cases it can be it is an indicator of post-birth attempts to limit family size.

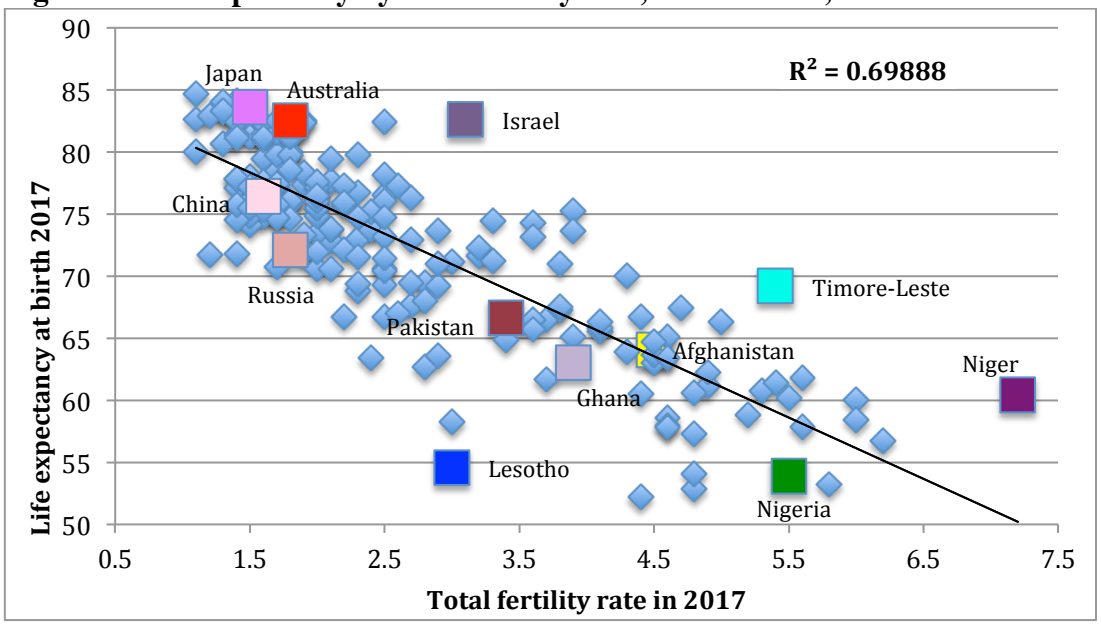
Figure 3: Infant mortality and the total fertility rate, 1921 to 2018



Sources: ABS: 3105.0.65.001 Australian Historical Population Statistics, 3301.0 Births, Australia, and 3101.0 Demographic Statistics

Increased life expectancy, lower fertility and demographic ageing are linked in Australia and in all other developed and developing countries. Figure 4 shows that, in 2017, the link between lower fertility and higher life expectancy holds for almost all countries as of 2017, and that the link is strong.

Figure 4: Life expectancy by total fertility rate, all countries, 2017

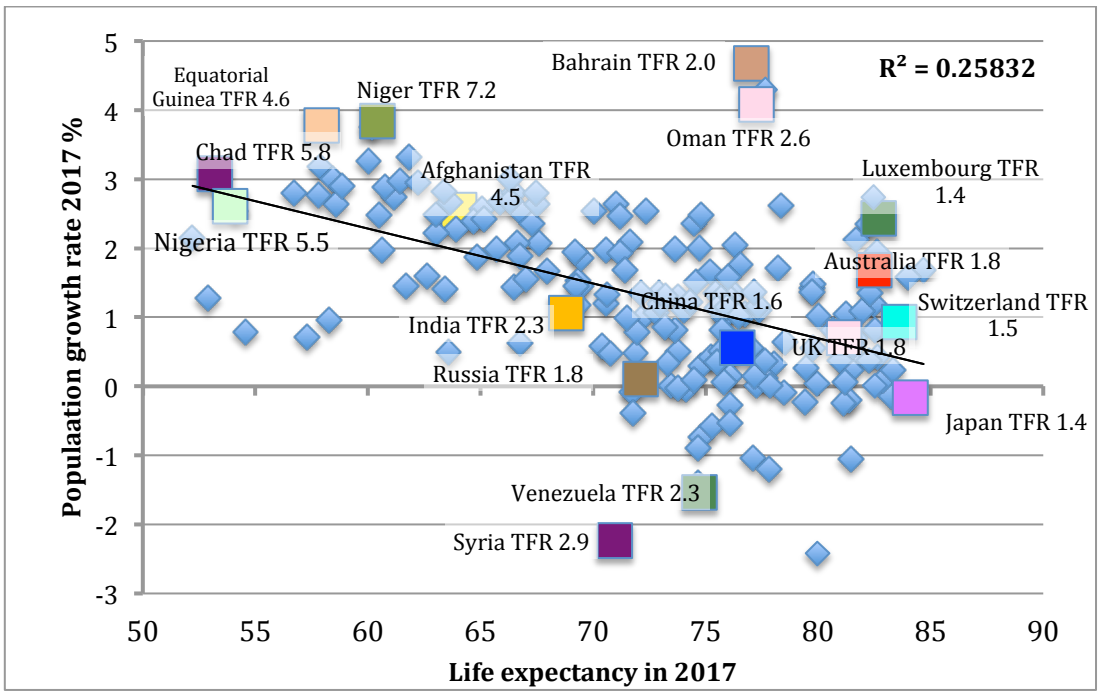


Source: World Bank data bank
Note: The graph includes 198 countries, omitting only a few small nations with missing data. (Afghanistan, coloured yellow — life expectancy 64 and TFR 4.5 —is almost obscured by five other countries with similar data.)

1.7 Demographic youthfulness and population growth

Countries where fertility is high and life expectancy low have youthful age structures and, in the past, low rates of population growth. If their life expectancy increases, as it now has in all countries, but their fertility remains high, they remain youthful but grow rapidly.

Figure 5: Population growth rate by life expectancy, with total fertility rate shown for selected countries, 2017



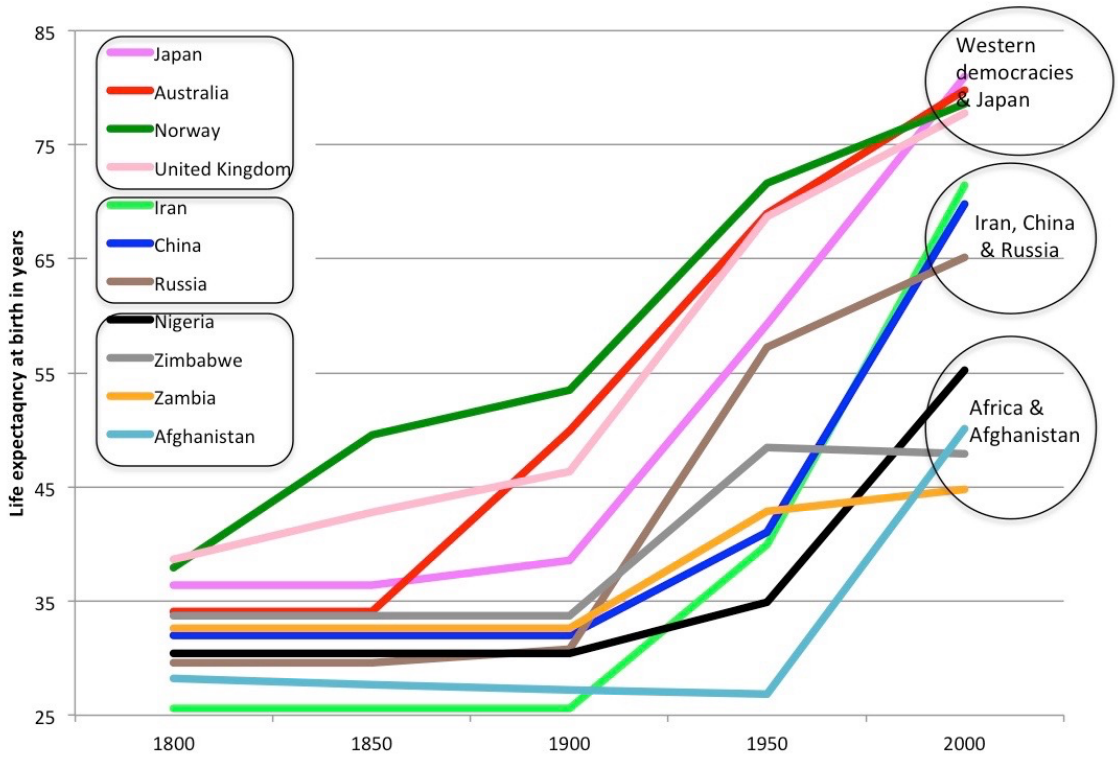
Source: Table A1 (from World Bank data), 194 countries
Note: Figure 5 omits countries where data were unavailable for growth rate, life expectancy or TFR.

This is illustrated in Figure 5. It shows that countries such as Nigeria, Niger, Chad and Equatorial Guinea had moderate life expectancy in 2017 (higher than that of Britain in 1864 but lower than that of most other countries), and that their TFR ranged from 7.2 to 4.6.

Other countries such as Bahrain, Oman, Luxembourg and Australia had high life expectancy and moderate TFR, but high population growth. In these cases their growth is largely due to immigration.

No country today has a life expectancy as low as that of England in 1864,[24] when the total fertility rate, in the form of babies per woman, is estimated to have been around five.[25] But many poor countries still have both high fertility and a life expectancy lower than that of developed countries. See for example Nigeria, Zimbabwe, Zambia and Afghanistan in Figure 6. These countries (included in the legend as 'Africa and Afghanistan') have a youthful age structure and, in 2000, had life expectancies at birth of between 45 and 55, They are all still growing briskly from natural increase.[26] (Contemporary research suggests that as many as 270 million women of reproductive age, particularly in Africa, have an unmet need for modern methods of family planning.)[27]

Figure 6: life expectancy at birth, selected countries, 1800 to 2000



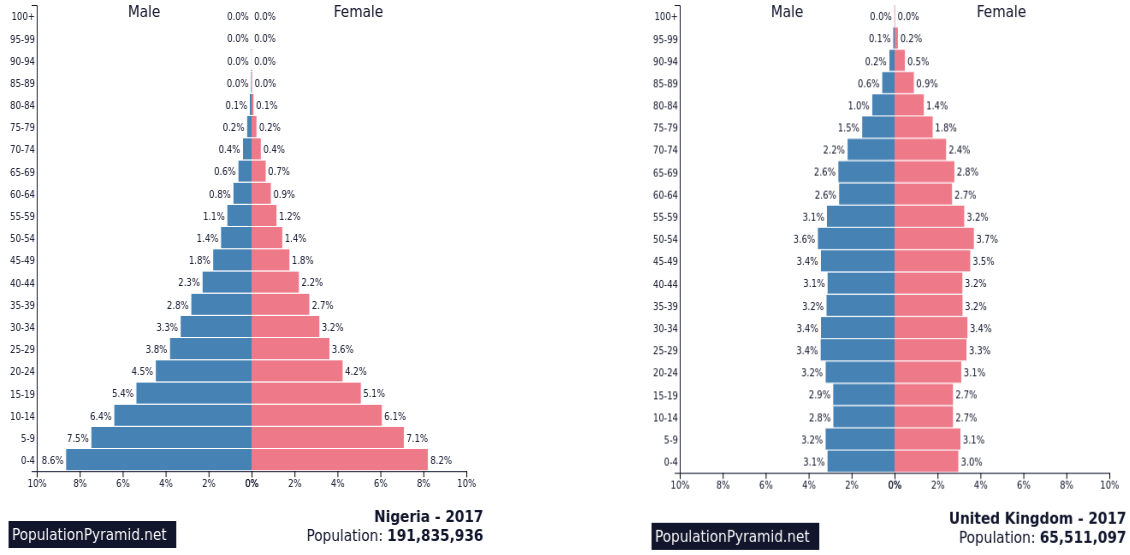
Source: Gapminder <https://www.gapminder.org/data/>

High fertility and life expectancy higher than it used to be, though still not very high, mean rapid population growth. For example, Nigeria's population was 196 million in 2018 and is growing at the rate of 2.6% per annum.[28] If it were to continue to grow at this rate it would double every 27 years, leading to 384 million in 2044 and over 1.5 billion by 2100.

Figure 7 also shows Nigeria's youthfulness, with 43.9% of the Nigerians under the age of 15. In contrast, the UK had 17.9% under the age of 15 and (if not for immigration) could look forward to a future of demographic maturity and stability with all its promises and challenges.

Figure 7 also tells us that even if Nigeria's population does not double every 27 years it will inevitably grow substantially from natural increase. This is because there are so many children under the age to 15 who are yet to start having families of their own. A universal two-child family norm for this younger generation would, as it were, put straighter sides on the population pyramid but in so doing add many millions more. This is the phenomenon demographers call 'population momentum'.

Figure 7: The populations of Nigeria and the UK in 2017



Sources: www.populationpyramid.net

Nigeria's demography is rather like that of Afghanistan, though Afghanistan has a higher life expectancy (64 in 2017 as opposed to 53.9 for Nigeria). In 2017 42.6% of the population of Afghanistan was under the age of 15.[29] In 1950 it had had a population of 7.6 million, in 2000 20.1 million and in 2019 37.2 million, with a median age of 17.6.[30] Life expectancy in both Nigeria and Afghanistan is low compared to Australia but much higher than that of mid-nineteenth century Europe. This, combined with high fertility, gives them a youthful age structure and high population growth.

1.8 Australia's demographic ageing in context

Table 1 puts demographic ageing in Australia into context. When just over 200 countries in the world are ranked by the percentage of their population aged 65 or more in 2018, Australia comes in at number 37 with 15.7% aged 65 plus. This is lower than the OECD average (17.1%), and lower than countries such as Germany, Sweden, Switzerland and Denmark, generally held to be prosperous nations with good social welfare systems. Japan heads the list with 27.5% aged 65 plus but it, too, is far from being the economic basket case that some of its detractors assume.[31]

Table 1: The top 37 countries ranked by per cent aged 65 plus in 2018

Rank	*Country*	% 65 +
1	Japan	27.5
2	Italy	23.3
3	Portugal	21.9
4	Germany	21.7
5	Finland	21.6
6	Bulgaria	21.1
7	Greece	20.6
8	Croatia	20.1
9	Sweden	20.1
10	France	20.1
11	Latvia	20.0
12	Malta	19.9
13	Denmark	19.8
14	Estonia	19.7
15	Spain	19.7
16	Slovenia	19.7
17	Czech Republic	19.5
18	Austria	19.4
19	Netherlands	19.2
	OECD average	17.1

Rank	*Country*	% 65 +
20	Lithuania	19.2
21	Hungary	19.2
22	Virgin Islands (US)	19.1
23	Belgium	18.8
24	United Kingdom	18.7
25	Switzerland	18.6
26	Channel Islands	18.4
27	Romania	18.3
28	Serbia	17.9
29	Canada	17.4
30	Poland	17.3
31	Norway	17.0
32	Curacao	16.8
33	Hong Kong & China	16.9
34	Curacao	16.8
35	Ukraine	16.8
36	United States	15.8
37	**Australia**	**15.7**
	World average	8.9

Source: World Bank, data bank
Note: Other developed countries have a lower percentage aged 65% than does Australia: for example New Zealand 15.6%, Luxembourg 14.5%, Ireland 14.3%, Singapore 13.6% and Israel 12%.

Table 1 suggests that an older population need not mean strained welfare and health-care systems. Many countries with populations older than Australia's manage well.

But in what ways are health, welfare and prosperity linked with demographic maturity? The following five sections explore this question.

Section 7 analyses the November 2018 ABS population projections and allow us to test the likelihood of the prediction, that without immigration 'by 2050 roughly half of us would be over the age of 65 and we'd essentially be one gigantic floating nursing home somewhere in the Pacific'.[32] (Table 8 in section 7 sets out the 24 projections for Australia in 2066. It shows that the highest projected population aged 65 plus is less than 32%. If fertility should be raised to 1.95 the proportion 65 plus would range between 29% and 19.1%, depending on life expectancy and immigration assumptions.)

2 Health and demographic maturity

But first, what about the health of an older population?

2.1 The compression of morbidity thesis

The medical literature has for some time debated a theory developed by James Fries, called the compression of morbidity thesis.[33] In 1980 Fries argued that longer life expectancy in developed nations has resulted in a lower proportion of people's lives being spent in poor health. This is achieved because the onset of age-related disabilities has also been deferred, while the period of life spent with disabilities prior to death remains more or less the same or even shrinks, hence the phrase 'compression of morbidity'. While

some research supports it, other results are equivocal.[34] At least, some types of disability have been deferred, perhaps some more successfully than others.

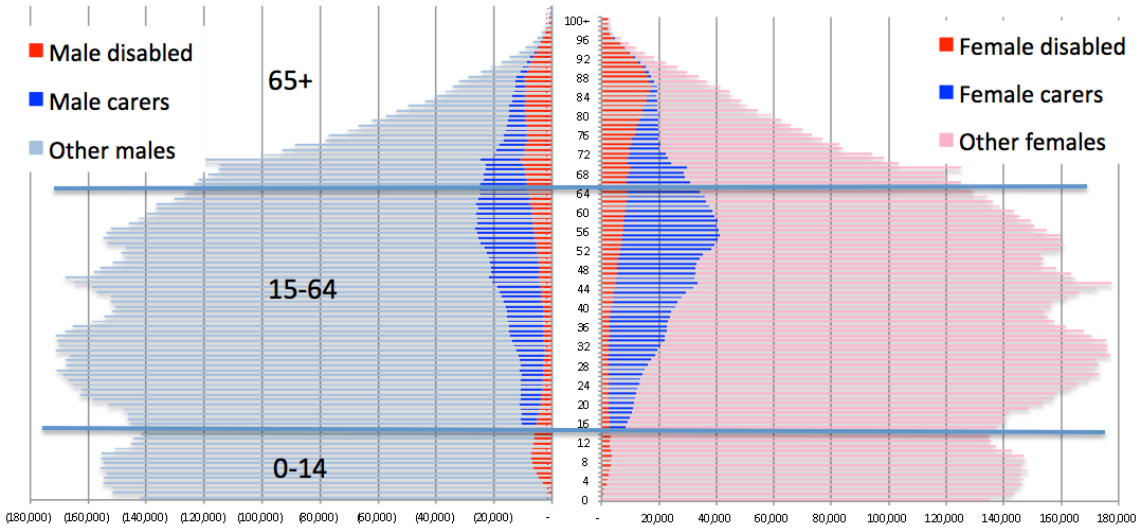
What is the situation in Australia? Are many older Australians ill and disabled to the extent that they are dependent on others to manage daily living? It is useful to distinguish between physical dependency on others for help with core activities (such as self care, mobility and communication) and financial dependency. The latter may occur if able-bodied people are not receiving a sufficient income from work or savings. In the first case social dependency is unavoidable. In the second case family support, incentives for labour-force participation, anti-discrimination practices,[35] superannuation, and welfare payments are involved.

Financial dependency can be modified with different policies and different practices. Physical dependency is less easily changed, but better management of chronic conditions and better in-home support can reduce demands on aged-care services.

2.2 Disability and age in Australia

Figure 8 shows the numbers of Australians by age and sex who, at the 2016 census, were recorded as being severely or profoundly disabled. This means that they always or sometimes needed help with one or more core activity[36] and thus, without other support, might need institutional care. (The disability is severe if the person needs help sometimes, and profound if they need it always.) Figure 8 also shows the number of Australians aged 15 and above acting as unpaid carers.[37]

Figure 8: Australians with a profound or severe disability, and carers, by sex and age, 2016 census



Source: ABS TableBuilder

Overall, in 2016, 5.1% of the population were severely or profoundly disabled. This amounted to 1.2 million people out of an enumerated population of 23.7 million.[38] Of this group 9.3% were aged 0-14, 37.5% 15-64, and 53.2% 65 plus. Yes, older people were more likely to suffer from serious disabilities than younger people, but nearly half (46.8%) of those who were profoundly or severely disabled were under the age of 65.

Most carers (80.1%) were aged 15 to 64, but 19.1% were aged 65 plus. (Indeed there were 56 carers aged 100 or more.)

Figure 8 is snapshot of one moment in time. It does not show whether the incidence of physical dependency is rising or falling.

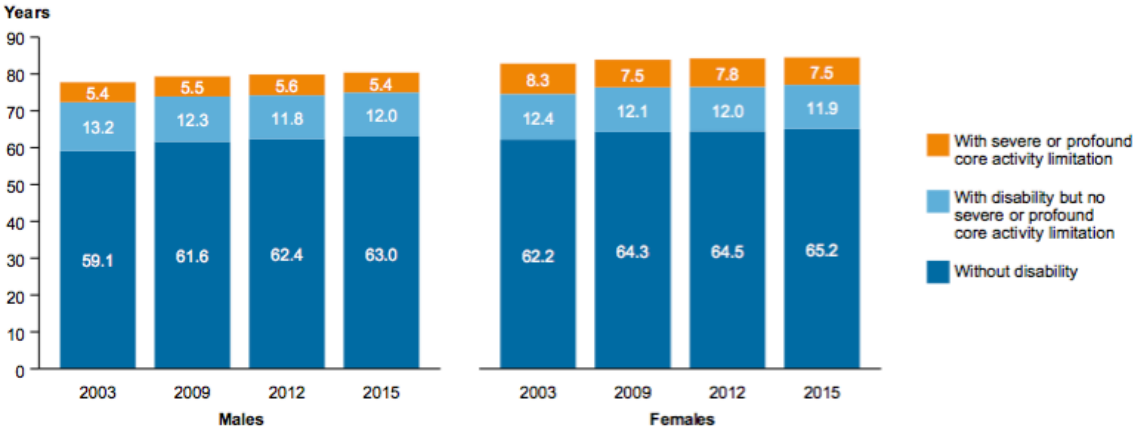
Here data from the Australian Institute of Health and Welfare (AIHW) can help. They analyse the changing incidence of physical dependency over time using the concept of 'health expectancies at birth'.

This is the number of years of a person's life expectancy that are likely to lived free of disability, or with some disability, or with a severe or profound disability, with age-specific rates of disability at their observed level at that time.

The AIHW find that over the 12 years from 2003 and 2015 healthy life expectancy has increased, and that life expectancy with some, or severe, disability has decreased. (This patterns also holds true when their analysis is restricted to health expectancies of people aged 65.)[39]

Figure 9 shows health expectancies at birth from 2003 to 2015, demonstrating that, for Australia at least, Fries' compression of morbidity thesis holds good.

Figure 9: Health expectancies at birth, 2003 to 2015



Source: Australian Institute of Health and Welfare, *Life expectancy and disability in Australia: expected years living with and without disability*, Australian Government, 2017, p. 1

This finding is reinforced by data from regular ABS surveys on disability and age (in combination with the 2016 census data).

Table 2 sets out rates of severe or profound disability by age group between 2003 and 2016. It shows that, over the 13-year period covered, rates have declined in all age group categories, with the exception of people aged 15-24 where rates have remained the same.

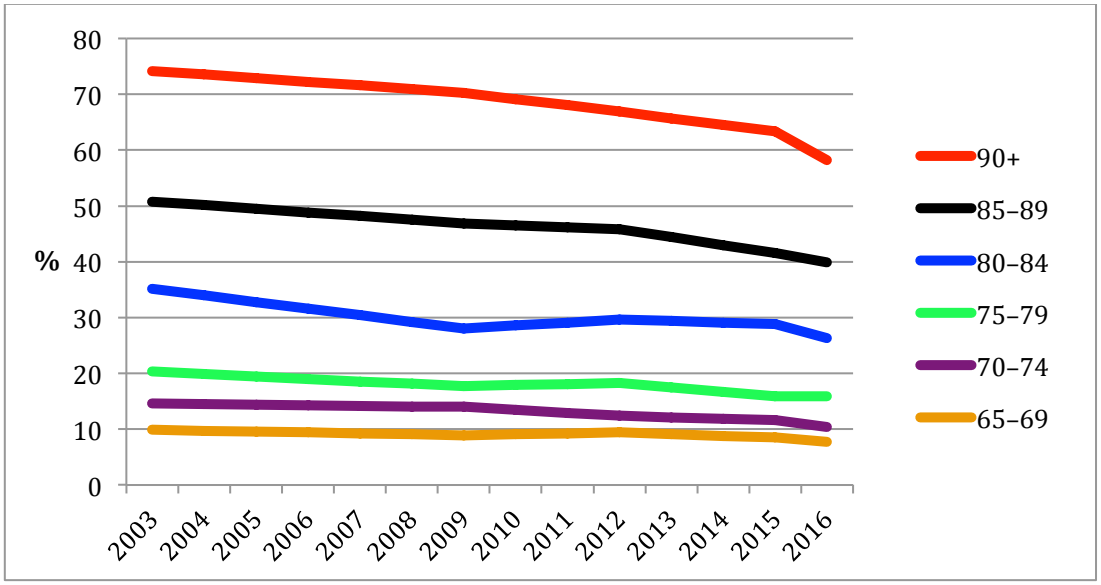
Table 2: Persons with profound or severe core activity limitation, 2003, 2009, 2012, 2015 (ABS Survey data), 2016 (Census data), all ages %

Age group	2003	2009	2012	2015	2016
0–4	2.9	2.2	2.5	2.0	1.1
5–14	4.9	4.8	4.8	5.0	3.3
15–24	2.2	1.8	2.2	2.6	2.2
25–34	2.3	2.0	2.0	2.0	1.5
35–44	3.3	2.8	2.9	3.0	2.1
45–54	4.9	4.2	4.5	3.5	3.5
55–59	7.3	6.8	6.1	6.0	4.9
60–64	8.7	8.5	8.7	7.8	6.3
65–69	9.9	8.9	9.4	8.5	7.7
70–74	14.6	14.0	12.4	11.6	10.4
75–79	20.3	17.7	18.3	15.9	15.9
80–84	35.2	28.0	29.7	28.8	26.3
85–89	50.8	46.9	45.8	41.6	39.9
90 and over	74.2	70.3	66.9	63.4	58.2
All persons	6.3	5.8	6.1	5.8	5.1

Source: ABS 44300DO020_2015 Disability, Ageing and Carers, Australia: Summary of Findings, 2015. The 2016 data are from the census and have been extracted using TableBuilder.
A disability is *profound* if a person always needs help with a core activity, or *severe* if they sometimes need help with a core activity. A core activity comprises communication, mobility or self care. (See https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4430.0main+features202015)

Figure 10 provides a visual presentation of these changes for Australians aged 65 and over.

Figure 10: Persons with profound or severe core activity limitation, 2003, 2009, 2012, 2015 (ABS Survey data), 2016 (Census data), people aged 65 and over %



Sources: See Table 2.
Note: Data for the years between the four ABS surveys (2003, 2009, 2012, and 2015) have been extrapolated. The steeper dip in the lines for the 90+ group and the 80-84 group from 2015 to 2016 may be partly an artifact of the different methods used to collect the data: interview-based survey data from the 2013 to 2015 ABS surveys as opposed to self-reported census data in 2016.

We can't explore all of the reasons for these declines here, but lower rates of smoking[40] seem a strong contributing factor, as is a fall in the incidence of cardiovascular disease.[41] Lower rates of alcohol consumption[42] may also play a part. Among the elderly, the increased availability of joint replacement surgery for those who would otherwise be crippled by osteoarthritis is certainly important.[43] It is also true that rates of dementia are falling.[44]

These improvements lengthen lives, and so help to increase the proportion of older people in our population. But they show that disability, and its associated costs, are not rising proportionally. Rather, the additional years are years of good health.

Figure 2 above (p. 3) shows impressive improvements in life expectancy at birth from 1901 to 2016: from 55.2 years for males to 80.5 and from 58.5 for females to 84.6.[45] Based on recent relatively modest declines in mortality, Lopez and Adair suggest that future life expectancies at birth will not rise as sharply as had been projected previously. This is partly because of a higher prevalence of obesity and less scope for further reductions in smoking.[46] Nevertheless neither they nor the ABS assume that life expectancy will fall. Rather they suggest that future increases will be more modest than those projected in the recent past.

2.3 Total physical dependency including the young

If we just consider physical dependency, all children aged 0 to 4, whether healthy or not, need help sometimes or always with communication, mobility or self care. Honest accounts of physical dependency on others should include them. If we take this step the total physical dependency burden in 2016 shown in Figure 8 becomes 2.8 million rather than 1.2 million, of whom 60.4% are aged 0-14, 16.4% 15-64, and 23.7% 65 plus.

It can cost as much or more in labour and/or money to care for an infant as to care for a frail elderly person. The only difference is that most of the costs of caring for children are private costs, born by parents, while some or most of the costs of caring for the frail aged are subsidised by government.

In terms of human labour, whether unpaid or paid, the cost of young children is high. In youthful populations a large proportion of adult work and time is spent on child care. In mature populations the longevity dividend means that there are more human resources for other activities.

The carers shown in Figure 8 (p. 9) are restricted to those providing care in the two weeks before the census 'to family members or others [who need care] because of a disability, long term illness or problems related to old age'.[47] Consequently they do not include parents, grandparents and others providing care to healthy babies and infants who are nonetheless dependent on others for help with communication, mobility and self care.

2.4 Contributions of older Australians: grandchild care and volunteering

In many cases the person providing the child care is a grandparent, and in a large number of cases they are the sole carers. On census night in 2016, 73,562 children were living with their grandparents who were acting as their primary carers.[48]

The more usual pattern is for grandparents to provide day care for children living with one or both parents. From June 1999 to June 2017 between 22% and 30% of children aged 0-4 were cared for during the day by grandparents, as were 13% to 16% of children aged 5-11.[49]

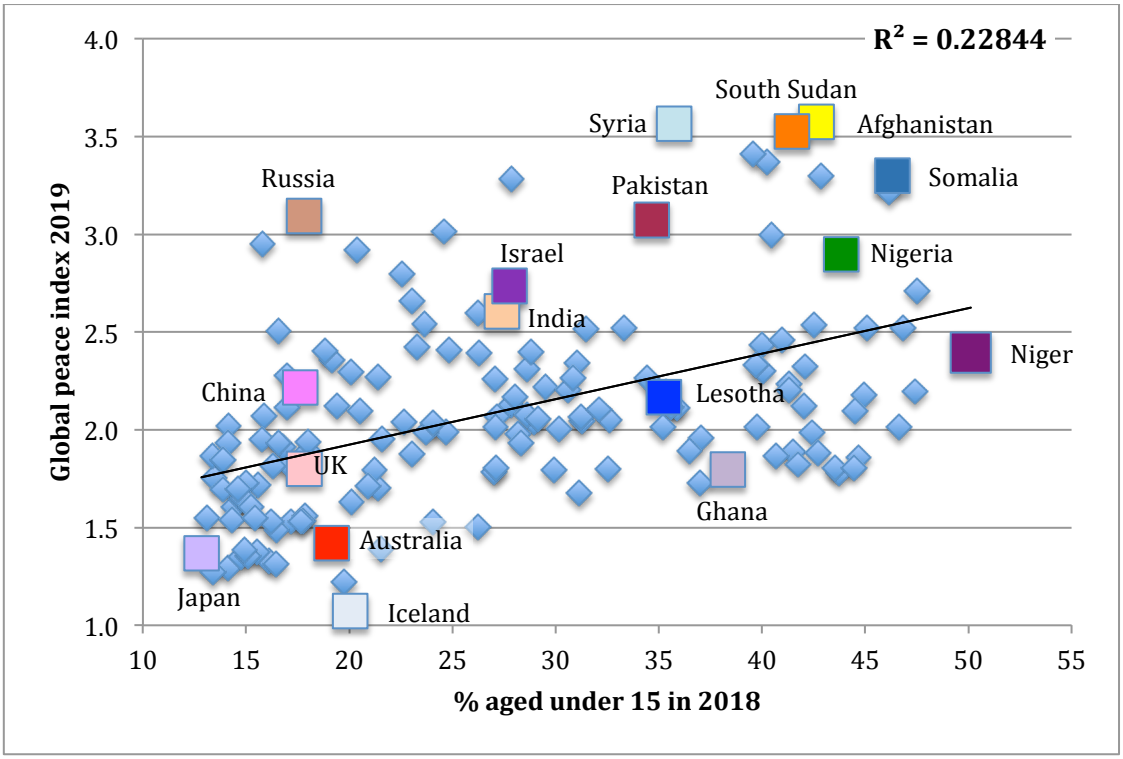
As well as this, many older people work as volunteers: 34.6% of those aged 65-74, 25.5% of those aged 75-84, and 18.9% of those aged 85 plus.[50] And as disability rates decline, older people are contributing unpaid work for longer.

2.5 Links between poverty, violence and youth

As children reach adolescence some of the social costs of youthful populations become more evident. This is because the costs are felt outside the home in the wider society. Across the world, youthful populations are associated with increased levels of crime and communal violence. See Figure 11.

Of course it is not youthfulness *per se* that is the prime cause but the poverty, predatory governance, gang warfare and anarchy that too often accompany it. Youth can bring energy and ambition to a population but miserable circumstances may not always allow young people to find peaceful outlets for this energy.

Figure 11: Levels of violence and fear of violence, 2019, by proportion of the population aged under 15, 2018



Sources: The global peace index (GPI), 2019 <countryeconomy.com/demography/global-peace-index>, and World Bank, world development indicators.
Note: Low scores on the GPI indicate a relative absence of violence or fear of violence. The index is based on 22 indicators. See information at the GPI web site.

3 Labour-force participation

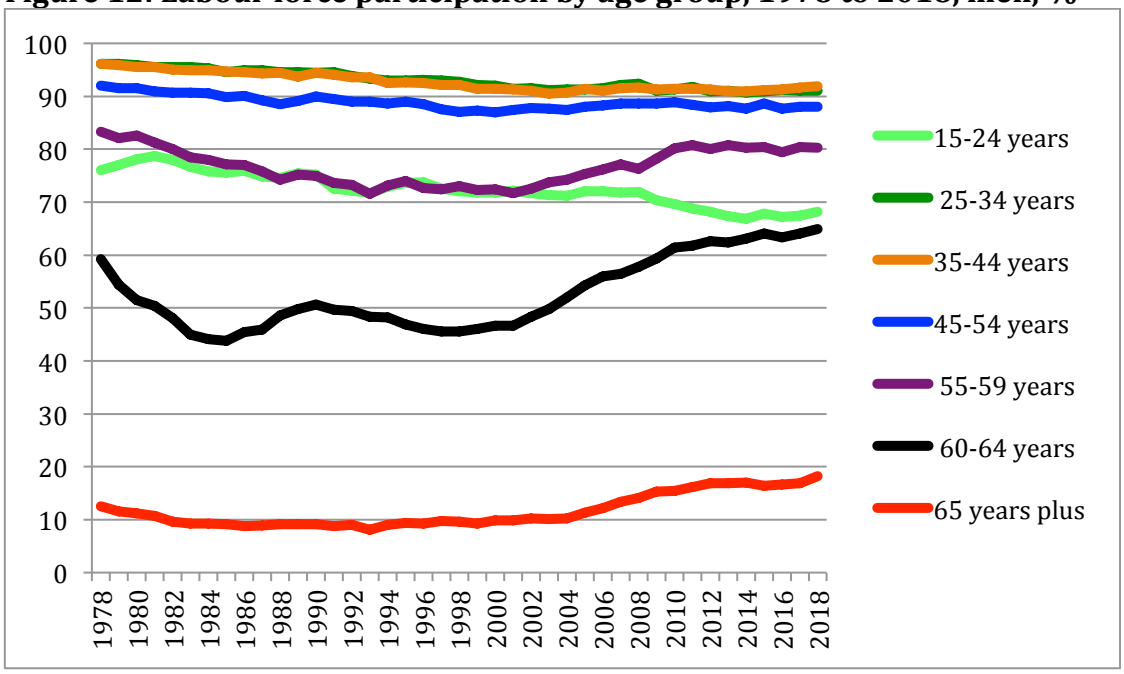
Many older people, as we have seen, do unpaid work caring for grandchildren and volunteering beyond the family. Besides this, growing proportions are now in the paid labour force. (Being in the labour force means having paid work, full-time or part-time, or being unemployed and actively looking for paid work.)

3.1 Men 1978 to 2018

Figure 12 shows increasing rates of labour-force participation for men aged 65 plus. In 2018 18.3% were in the labour force, more than twice the proportion recorded in 1993 (8.1%).

It also shows a remarkable turn-around in participation for men aged 60-64. From 1981 on they had shown a tendency to drop out of the labour force but, by 2018, 64.1% were participating, a higher proportion than at the start of the series in 1978.

Figure 12: Labour force participation by age group, 1978 to 2018, men, %



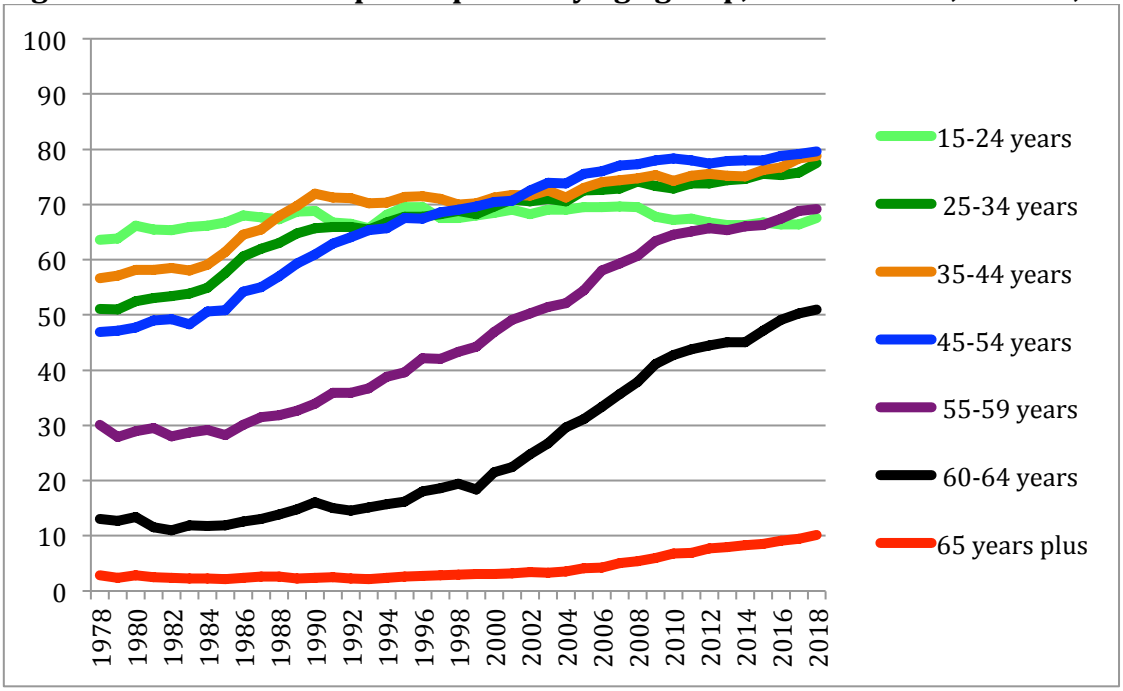
Source: ABS 6291.0.55.001 Labour Force, Australia, Detailed - Electronic Delivery, Table 01. Labour force status by Age, Social marital status, and Sex.
Note: students, including full-time students, who are working for pay for at least one hour in the reference week or who are actively looking for paid work are included in the labour-force participation figures.

3.2 Women, 1978 to 2018

As Figure 13 shows, participation rates for women have increased more than men's, though from a lower base. Women's employment has increased at all ages, but most strikingly for women aged 45 and over. This reflects an increased tendency to return to work after childbearing, a trend helped since 1976 by smaller families.

But more strongly, it shows a tendency to defer retirement.

Figure 13: Labour force participation by age group, 1978 to 2018, women, %



Source: ABS 6291.0.55.001 Labour Force, Australia, Detailed - Electronic Delivery, Table 01. Labour force status by Age, Social marital status, and Sex

As with the men, participation of women aged 60-64 has increased, in this case dramatically. In 1978 13.1% of women aged 60-64 were in the labour force. By 2018 this figure had reached 50.9%, almost quadruple the early percentage. Participation of women aged 65 plus has also risen from 2.8% to 10.2%.

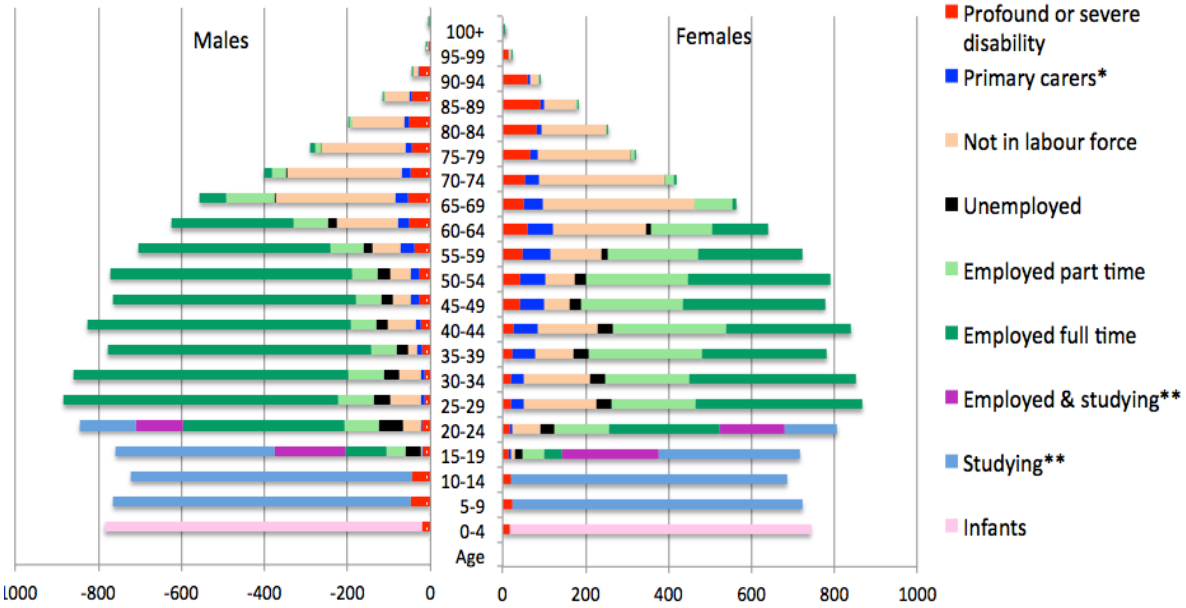
3.3 'Working age' and people actually in paid work by age

Conventionally writers who comment on demographic ageing take the years 15 to 64 as being 'working age' and the years from 65 on as being 'retirement age'. The data above show than an increasing share of people aged 65 plus are not retired from paid work. Likewise they show that not everyone aged 15 to 64 is in the labour force. Far from it.

This is clear in the detailed analysis of population data for July 2014 set out in Figure 14. Most young people aged 15 to 19 are studying full-time, though some (coloured mauve) are in full-time paid work as well (if students were working part-time this is not shown). Added to this about 35% of people aged 20-24 were also studying full-time.

Beyond these age groups around 20% of women aged 25 to 64 were either not in the labour force or were unemployed, as were 12% of men. Added together this means 16% of people aged 15 to 64 were either unemployed or not in paid work. (These figures do not include the many people aged 25-64 who were working as unpaid carers; some of them may also have been in paid work.)

Figure 14: Population, June 2014 by age, sex and other characteristics, '000s [51]



Notes: The total population in July 2014 was 23.5 million.
* Some primary carers may also have been in paid work.
**Studying in Figure 14 means attending full-time education. Those under the age of 25 who are shown as employed and studying are studying full-time and employed full-time. (People aged 25 plus who may have been studying full-time as well as, or instead of, working full-time are not shown.)
Unemployment among people aged 15 to 24 is under-estimated as they have not been shown as unemployed if they are also in full-time education.

Some economists, are aware of these trends and count potential working age as 20 to 69 (and potential retirement age as 70 plus).[52] Even so, Figure 14 shows that the assumption that all adults, even all adults aged 20 to 69, are employed income earners and thus potentially payers of tax based on wages and salaries is rough and ready.

Before we spend too much time worrying about older people who are not in paid work we should also think about younger and middle-aged people who are also absent, especially those among them who are unemployed or under-employed and would dearly like paid employment.

A shortage of jobs offering livable wages is a key barrier to finding work. But this can combine with disincentives in the social security system meaning high effective rates of marginal taxation.[53] There is also the problem of the high transaction costs in time and effort involved in reclaiming social benefits after brief periods of work in a casualised labour force.[54]

Nevertheless increasing levels of labour-force participation among older Australians show that an older population does not have to mean a dramatic fall in the ratio of paid workers to people not in paid employment.

4 Costs: health and welfare

Much of the debate about demographic maturity in Australia focuses on costs. For example the Parliamentary Budget Office (PBO) estimates that over the next decade to 2028-29 demographic ageing will subtract 0.4 percentage points from real annual growth in tax revenue and add 0.3 percentage points to real annual growth in spending. In all, this will cost the budget 'around $36 billion by 2028-29'.[55]

The PBO explains that, by the cost of ageing, they mean the additional cost of an increasing proportion of the population aged 65 plus, not the total cost of older Australians to the budget.[56]

4.1 Parliamentary Budget Office (PBO) estimates

The PBO writes that the figure of $36 billion is derived from a loss to revenue of $20 billion from slower growth in the labour force, and thus a slower growth in revenue from income tax, in addition to an increase in spending of $16 billion. The latter expenses stem from the costs of the age pension, aged care and health.[57]

The loss in tax revenue is not an actual loss. It does not mean less revenue than, say, that of 2017-18, but rather a drop in the expected growth in revenue that might have been received if the age structure had stayed in its 2017-18 form. This is a hypothetical calculation that ignores the inevitability and positives of people staying alive and relatively healthy for longer and, provided they are not discriminated against, also contributing to the paid work force.

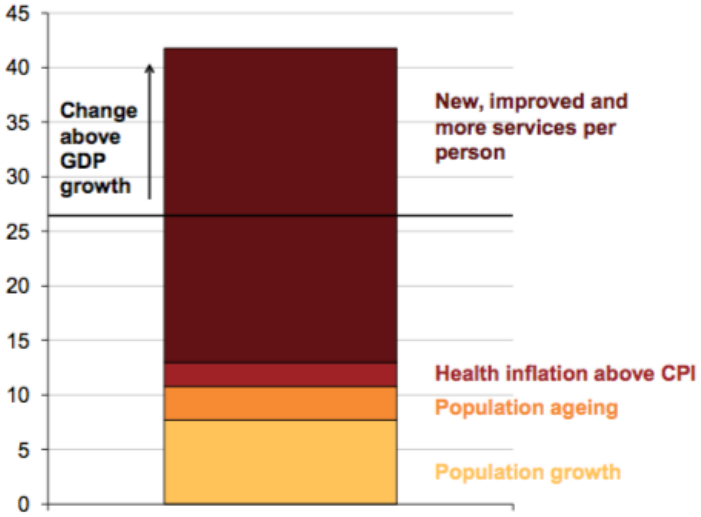
Age-based discrimination is still common. Cameron Murray, professor of organisational behaviour at QUT's Business School, says: 'Culturally it's acceptable to discriminate fundamentally against people who are older'. Other research confirms this.[58] Of course many older workers are staying on in their long-held positions rather than applying for new jobs but, as Murray points out, they may still be under pressure to retire on the grounds of age.

4.2 Health-care costs

Health expenditure in Australia has risen, and continues to rise. This leads some to question whether we can afford the health-care costs of ageing. But as the graph prepared by John Daley of the Grattan Institute shows, over the 10 years from 2002-03 to 2012-13 demographic ageing played a small part in the increase in health care expenditure. During this period ageing accounted for approximately 7% of the increase (see Figure 15). Population growth played a larger part (approximately 18%). Population growth is modeled by Daley as 'the effect of the increase in population size with no change in the age structure or average per capita health expenditure'.[59]

Population growth inflates health-care costs to a much greater extent than ageing but Figure 15 shows that by far the largest component of the increase (around 70%) is due to 'new, improved and more services per person'.

Figure 15: Changes in Australian governments' health expenditure ($ billions), 2002-03 to 2012-13



Source: John Daley, *Budget pressures on Australian Governments*, Grattan Institute, Melbourne, 2013, Figure 9, p. 16

Taking a broader span of years we can see that medical services per capita have increased sharply over the 32 years between 1984-85 and 2016-17, growing by 121%. (See Table 3.) The increases were steeper among the older age-group categories but were not exclusive to them. For example the number of services per capita for people aged 35 to 44 more than doubled.

Table 3: All annual Medicare services per capita by age 1984-85 to 2016-17

Age group	1984-85	1989-90	1994-95	1999-00	2004-05	2009-10	2013-14	2004-15	2015-16	2016-17	% increase 1984-85 to 2016-17
0-4	7.1	8.1	9.5	8.3	8.2	9.0	8.9	8.8	9.0	9.3	31
5-9	4.3	4.7	5.3	4.5	4.4	5.0	5.6	5.8	5.8	6.0	40
10-14	3.7	4.1	4.6	4.2	4.1	4.9	5.4	5.6	5.8	6.0	62
15-19	4.9	5.7	6.7	6.4	6.2	7.2	8.0	8.2	8.3	8.6	76
20-24	6.8	7.0	8.8	8.1	7.7	8.2	9.5	9.9	9.7	9.9	46
25-34	7.4	7.9	9.8	9.5	9.6	10.5	11.8	11.9	12.1	12.4	68
35-44	6.9	7.7	9.6	9.8	10.2	12.0	13.2	13.3	13.7	14.3	107
45-54	8.5	9.2	11.6	12.1	12.6	14.6	15.6	15.6	16.1	16.7	96
55-64	10.2	12.0	15.5	16.3	17.5	20.2	21.2	20.9	21.6	22.2	118
65-74	12.5	13.6	19.3	22.7	25.9	29.2	31.0	30.2	31.7	32.5	160
75-84	16.1	17.9	22	22.4	29.5	38.5	42.4	41.8	43.9	44.6	177
85+	16.8	19.6	24.1	24.9	26.5	31	39.5	39.7	42.6	44.3	164
Total	7.6	8.5	10.8	11.1	12.1	14.3	15.7	15.8	16.3	16.8	121

Source: Annual Medicare Statistics (compiled by Mike Moynihan). These include GPs, specialists, pathology, imaging and sundry other services

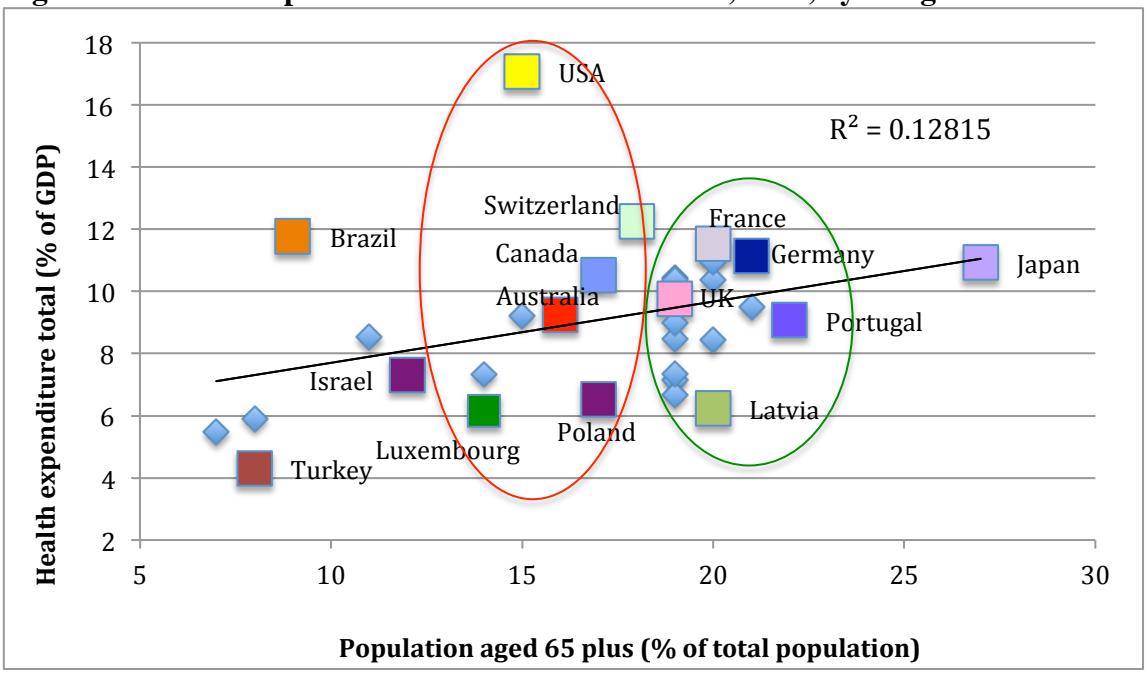
Both Figure 15 and Table 3 make it clear that the main driver of increased health-care costs is not ageing. It is increased services per person, including better services, followed by population growth *per se*. Some over-servicing may be involved. But the data set out in Table 3 combined with the data on declining rates of physical dependency shown in Section 2.2 suggest that, rather than ministering to their decline, higher expenditure on health care is helping to keep older people well.

4.3 International comparisons

Figure 16 shows that while there is an association between demographic ageing and the proportion of GDP spent on health among OCED countries, this association is not strong: ageing only explains about 13% of the variance in health expenditure. It also shows that there is wide variation among countries with similar age distributions.

For example, Japan with the oldest population in the OECD, spends less on health care as a proportion of GDP than do France, Switzerland and Brazil. It also spends a great deal less than the United States, as do all of the other 32 countries analysed.

Figure 16: Health expenditure in 33 OECD countries, 2016, by % aged 65+ in 2017



Sources: Proportions aged 65+ World Bank <https://data.worldbank.org/indicator/SP.POP.65UP.TO.ZS>, Health expenditure as a percentage of GDP <https://data.worldbank.org/indicator/SH.XPD.CHEX.GD.ZS>

Some countries have health care systems which, as a proportion of GDP, cost less than other countries with a similar age structure. Others have systems that cost more. Compare, for example, the countries in the red oval in Figure 16. Their proportions aged 65 plus range between 14.5% (Luxembourg) and 18.6% (Switzerland) but their health expenditure as a share of GDP ranges between 17% (the United States) and 6% (Luxembourg).

The group of countries in the green oval also have a similar age range, from 18.7% aged 65 plus in the United Kingdom to 21.9% for Portugal. The range of their expenditure on health care is less extreme than for countries in the red oval but it nonetheless varies from 6.2% of GDP for Latvia to 11.5% for France.

Some of the countries spending less may be doing so at the expense of providing adequate care but this is unlikely to be true of all. As is clear from the analysis of the Australian data, an older population is only a marginal determinant of health care costs.

4.4 Numbers and percentages of older Australians in aged care, 2018

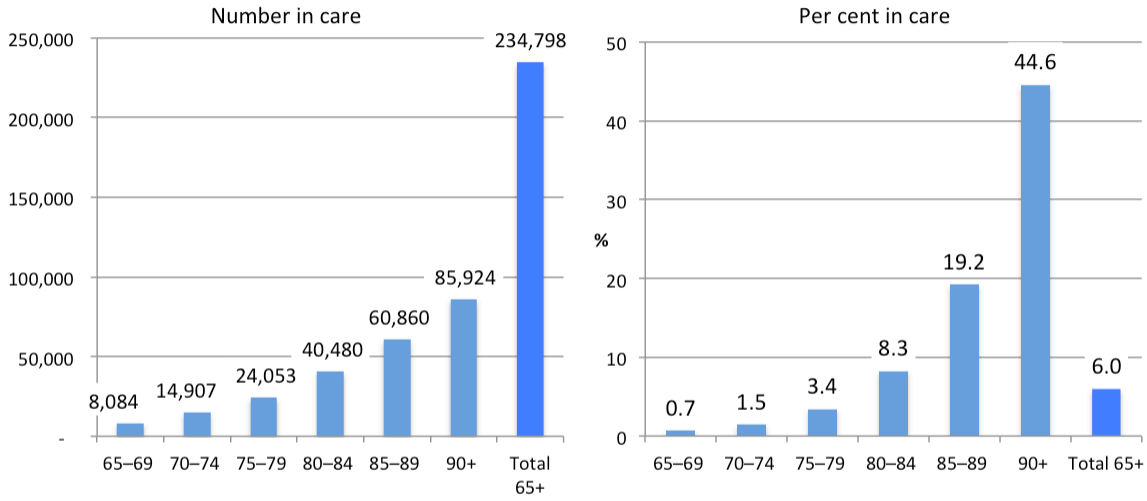
Nevertheless Figure 8 (and Figure 14) do show that older people are more likely to suffer from severe or profound disability than are younger people. Overall they account for only slightly more than half of the severely disabled but their age-specific rates are higher. And this age-related problem is reflected in the proportions in permanent residential age-care.

The problem however is less serious than it might have been if, for example, the rates of age-specific severe and profound disability observed in 2003 were still the norm in 2018 (see Table 2 and Figure 10).

For example Figure 17 shows low proportions in aged-care up until the age of 85, but even among those aged 90 plus, less than half are permanent residents of nursing homes. Currently Australia spends a smaller percentage of GDP (1.2%) on aged care 'than the average of comparable countries (2.5 per cent)'.[60]

Overall in 2018 people aged 65 plus made up 16% of the population but only 0.9% of Australians were permanent residents of nursing homes.[61]

Figure 17: Number and percentage of people aged 65 plus in permanent residential aged care, June 2018



Source: Derived from Australian Institute of Health and Welfare, *Aged care data snapshot, 2018*
Note: The total includes 490 ATSI people not shown in the subtotals by age group.

While rates of disability are falling the numbers potentially at risk are growing. This will mean higher numerical levels of physical dependency, more people physically dependent on others.

If these numbers are combined with those financially dependent on the age pension, how great are the financial costs from demographic ageing that Australia faces?

4.5 Welfare costs

Table 4 shows that age pension recipients are the largest group of welfare recipients in Australia.

Table 4: Welfare recipients, Australia, December 2018, by payment type

	On full rate	Total	% on full rate
Age Pension	1,553,766	2,506,968	62.0
Carer Payment	216,010	277,376	77.9
Disability Support Pension	632,325	750,045	84.3
Newstart Allowance	554,575	722,923	76.7
Parenting Payment Single	175,183	237,249	73.8
Other	264,542	368,462	71.8
Total	3,396,401	4,729,479	71.8

Source: Department of Social Services <dss-payment-demographics-dataset-december 2018>

However it also shows that they are the least likely to be on the full payment rate.

Partly because of this, when the costs of assistance to the aged, that is the age pension and aged care, are placed in the context of the costs of other programs they are less dominant. As Table 5 shows they currently account for 39% of all social security welfare payments, a figure which may rise to 40% in 2022-23.

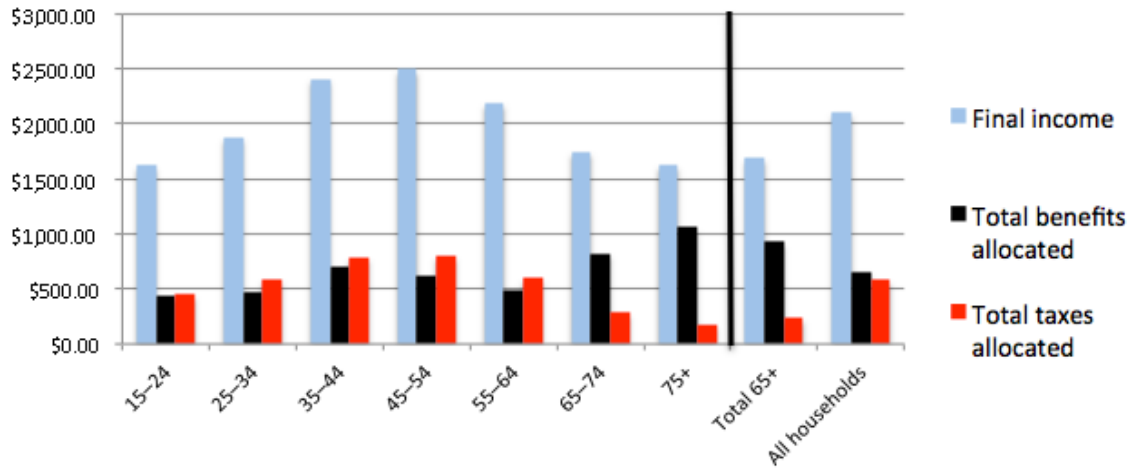
Table 5: Summary of expenses — social security and welfare, 2018-19 to 2022-23, $millions and percentages

	Estimates						*Projections*			
	2018-19 $m	**2018-19 %**	2019-20 $m	**2019-20 %**	2020-21 $m	**2020-21 %**	2021-22 $m	**2021-22 %**	2022-23 $m	**2022-23 %**
Assistance to the aged	67,449	**39.0**	70,151	**38.9**	72,884	**39.0**	76,293	**39.4**	80,215	**40.1**
Assistance to veterans & dependants	6,717	**3.9**	6,707	**3.7**	6,560	**3.5**	6,509	**3.4**	6,309	**3.2**
Assistance to people with disabilities	44,079	**25.5**	47,005	**26.1**	51,209	**27.4**	53,641	**27.7**	55,499	**27.7**
Assistance to families with children	35,754	**20.7**	37,412	**20.8**	37,740	**20.2**	38,659	**20.0**	39,471	**19.7**
Assistance to unemployed & sick	10,476	**6.1**	10,834	**6.0**	10,861	**5.8**	11,337	**5.9**	11,754	**5.9**
Other welfare programs	1,791	**1.0**	1,729	**1.0**	1,743	**0.9**	1,418	**0.7**	1,396	**0.7**
Assistance for Indigenous Australians nec	2,288	**1.3**	2,269	**1.3**	2,231	**1.2**	2,252	**1.2**	2,274	**1.1**
General admin.	4,196	**2.4**	4,016	**2.2**	3,625	**1.9**	3,498	**1.8**	3,300	**1.6**
Total	172,749	**100.0**	180,125	**100.0**	186,852	**100.0**	193,607	**100.0**	200,217	**100.0**

Source: Budget Strategy and Outlook 2019-20, p. 5-22. Percentages calculated from their data.

Figure18 shows that households where the reference person is aged 65 or over have lower incomes than other age groups, except for those where the reference person is aged 15-24. It also shows that older households contribute less to revenue than younger households and that they receive more in benefits.

Figure 18: Weekly value of household income, benefits and taxes, by age of reference person, 2015-16



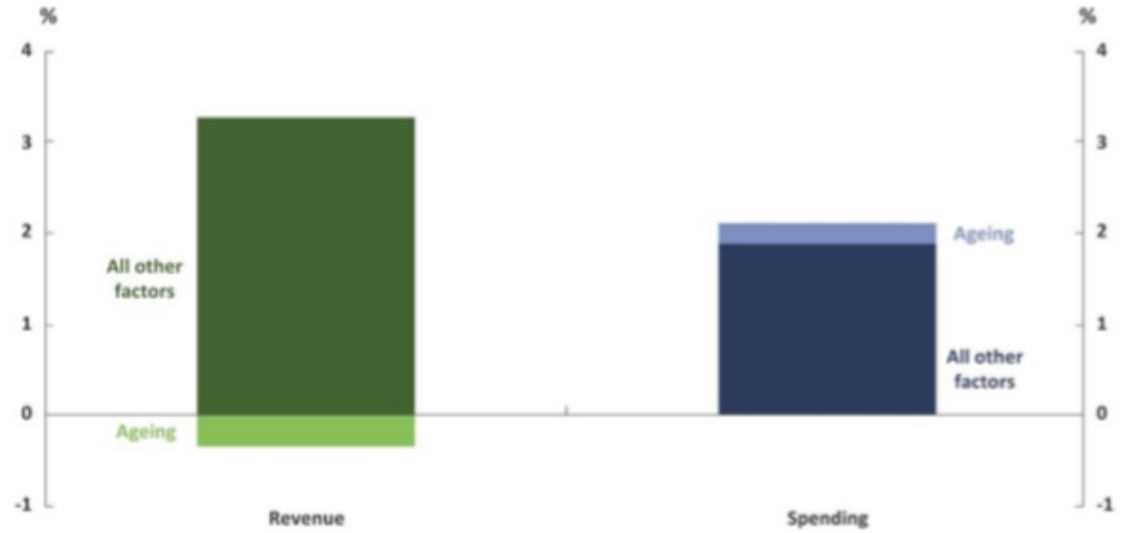
Source: ABS 65370DO010_201516 Government Benefits, Taxes and Household Income, Australia: Summary of Results, 2015–16, 2018
Note: *Final income* includes total benefits and subtracts total taxes.

How serious is this pattern? Does it represent a ruinous drain on the government spending while at the same time sapping government sources of revenue? As Section 4.6 shows, the picture it presents is not calamitous, far from it.

4.6 The PBO's estimates of costs in context

The total extra costs of demographic ageing projected by the PBO over the decade from 2018-19 to 2028-29 is large: $36 billion. But in the context of its estimates for overall growth in both revenue and spending over the same period they are small. See Figure 19.

Figure 19: Average annual real growth in revenue and spending 2018-19 to 2028-29



Source: Parliamentary Budget Office, *Australia's ageing population: Understanding the fiscal impacts over the next decade*, Commonwealth of Australia, 2019, p. 5

A full $20 billion of the projected $36 billion is assumed to come from tax revenue forgone through an hypothesised reduction in income tax revenue (the other $16 billion is from increased costs). The foregone $20 billion is thought to be due to a relative shrinking in the assumed labour force of people aged 15-64. Even if the hypothesised loss to revenue occurs, it would be only a small detriment, given the projected increase in government revenue from all other factors. The PBO puts it like this:

The influence of ageing should be considered in the context of the overall budget position. Ageing is estimated to detract around $20 billion in real terms from revenue in 2028–29, but population and income growth are expected to increase revenue by around $187 billion (resulting in a net increase in 2028–29 in the order of $166 billion).[62]

The PBO assumes that the population growth will be fuelled by a net migration of 225,000 a year. But if this number should be trimmed the loss in income tax revenue would be more than offset by lower spending on infrastructure, a cost presumably included in 'all other factors' in Figure 19. It is not clear how the costs of these 'other actors' were calculated, but they cannot have included a realistic figure for the infrastructure costs of providing for 2,250,000 immigrants over the decade. See section 6.4 below.

As Section 3 on labour-force participation showed, while many older people are in the labour force, many others aged 15 to 64 are not. Moreover, some who are work part-time and would be earning too little to pay much, if any, income tax.

Thus it is fortunate that, as we will see in section 5, the greater part of government revenue is not derived from income taxes based on wages and salaries.

5 Sources of revenue

The PBO's projections of increased revenue in Figure 19 appear to have been well founded. Data from the recent past show that revenue from taxation has indeed been growing and, in recent years, quite sharply. Will this trend continue? Now that the Australian economy is heavily dependent on the export of commodities rather than elaborately transformed manufactures the question is hard to answer.[63] If the value of

commodities on the world market should falter this would affect the revenue base (and with a growing urban population the implications of such a downturn would magnify).

Table 6 shows that, over the decade from 2008-09 to 2017-18, total tax revenue for all levels of government increased by $190 billion, at an average annual rate of 5.11% (compared to an annual average inflation rate of 2.2%).

Table 6: Tax revenue received by Commonwealth, State, and Local government, 2008-09 to 2017-18, $ millions

	Commonwealth	States	Local govt (rates)	Total tax revenue, all levels of government	Annual increase in total tax revenue %	Annual rate of inflation %
2008-09	277,785	50,600	10,951	339,336		*1.4*
2009-10	267,108	54,666	11,669	333,443	*-1.74*	*3.1*
2010-11	288,297	58,213	12,506	359,016	*7.67*	*3.5*
2011-12	316,666	59,807	13,290	389,763	*8.56*	*1.2*
2012-13	337,338	63,426	14,192	414,956	*6.46*	*2.4*
2013-14	350,230	68,152	15,075	433,457	*4.46*	*3.0*
2014-15	355,232	73,391	16,013	444,636	*2.58*	*1.5*
2015-16	369,257	78,216	16,900	464,373	*4.44*	*1.0*
2016-17	388,576	81,294	17,698	487,568	*4.99*	*1.9*
2017-18	427,237	83,703	18,451	529,391	*8.58*	*2.1*
Increase 2008-09 to 2017-18	149,452	33,103	7,500	190,055		
Average % increase 2008-09 to 2017-18					*5.11*	*2.2*

Sources: Tax revenue, ABS 55060DO001_201718 Taxation Revenue, Australia, 2017-18, Inflation data, <https://www.rateinflation.com/inflation-rate/australia-historical-inflation-rate?start-year=2009&end-year=2019> accessed 14/8/19

Note: Commonwealth revenue mainly derives from income taxes on individuals and enterprises. These include: capital gains tax, some payroll tax, GST, and 'taxes on the use of goods and performance of activities'; state governments rely on payroll tax, property taxes, GST, and 'taxes on the use of goods and performance of activities' which in their case mainly means motor vehicles; and local government relies on rates. See Table 7.

Financial benefits from the export of commodities take three forms: State government royalties, Commonwealth company income tax, and effects on the balance of payments and thus the value of the Australia dollar. (As the dollar rises in value imports become cheaper; should it fall the reverse is the case.)

Table 7: Sources of all tax revenue received by all levels of government, 2015-16 to 2017-18 %

	2015-16	2016-17	2017-18
	%	%	%
Commonwealth government			
Income taxes levied on individuals			
Personal income tax*	37.3	36.9	36.5
Government health insurance levy	3.1	3.1	3.0
Fringe benefits tax	1.0	0.8	0.7
Income taxes levied on enterprises			
Company income tax	13.9	14.8	16.4
Income tax paid by superannuation funds	1.5	1.7	2.1
Income taxes levied on non-residents			
Dividend withholding tax	0.1	0.1	0.1
Interest withholding tax	0.3	0.3	0.3
Taxes on employers' payroll and labour force**	0.1	0.1	0.2
Taxes on the provision of goods and services			
General taxes (sales taxes)	0.3	0.3	0.3
Goods and services tax (GST)	12.7	12.6	12.1
Excises and levies			
Crude oil and LPG	3.9	3.8	3.6
Other excises	0.8	0.7	0.7
Agricultural production taxes	0.1	0.1	0.1
Levies on statutory corporations	0.1	0.0	0.0
Taxes on international trade	3.0	2.9	3.0
Taxes on financial and capital transactions	0.0	0.0	0.3
Taxes on the use of goods and performance of activities	1.4	1.4	1.4
Total Taxation, Commonwealth Government	***79.5***	***79.7***	***80.7***
State governments			
Taxes on employers' payroll and labour force	4.9	4.7	4.6
Total taxes on property	2.1	2.3	2.2
Total taxes on the provision of goods and services	7.4	7.3	6.6
Total taxes on use of goods and performance of activities (includes taxes on motor vehicles)	2.5	2.4	2.4
Total taxation, all states	16.8	16.7	15.8
Local government			
Municipal rates	3.6	3.6	3.5
Total taxation, local government	**3.6**	**3.6**	**3.5**
Total %	100.0	100.0	100.0
Total $ million	$464,373	$487,568	$529,391

Source: ABS 55060DO001_201718 Taxation Revenue, Australia, 2017-18,

Notes:

*Personal income tax includes salary and wage income. But it also includes: allowances; dividends; interest; capital gains; business income; pensions; rents; royalties; partnership income; and distributions from trusts. See 'Australia's Future Tax System, Architecture of Australia's tax and transfer system',
<www.taxreview.treasury.gov.au/content/Paper.aspx?doc=html/publications/papers/report/section_2-04.htm>

** Payroll tax is levied by the states, but this item in the Commonwealth government list includes superannuation guarantee charges (information provided by the ABS).

Table 7 sets out all of the sources of government tax revenue from 2015-16 to 2017-18. Tax benefits for the Commonwealth from the export of commodities are captured here under company tax. Mining royalties paid to State governments are not. This is because they are treated as a form of property income rather than as income from taxation.[64] Benefits from a higher dollar are only captured indirectly.

Table 7 shows, for example, that in 2017-18, 36.5% of all tax revenue came from personal income tax (under income taxes levied on individuals). This revenue includes taxes on wages and salaries earned from participation in paid work. But the income stream involved also includes an array of other sources of personal income: capital gains, dividends, interest, business income, allowances, pensions, rents, non-mining royalties, partnership income, and distributions from trusts.

All of these additional sources are independent of labour-force participation and can accrue to people who are not engaged in any paid work.

Data from the Australian Taxation Office for 2013-14 indicate that 75.3% of individuals' income comes from salaries and wages.[65] Assuming that this holds for 2017-18 only some 28% of total government revenue derives from taxes on paid work.

This means that fluctuations in the proportion of revenue derived from paid work could, in principle, be offset by relatively small changes in other items in the revenue stream.

Adjustments of this kind could be more readily achieved if the Australian economy became more productive.

6 Productivity

Productivity (largely based on expanding supplies of cheap energy) powered the developed world's escape from the Malthusian trap and it is productivity that will make the new mature equilibrium more comfortable and manageable.[66]

6.1 Older workers and productivity

There is no evidence that older workers are less productive than younger workers.[67] Indeed Gary Burtless finds that workers aged 60 to 74 are more productive than younger people, possibly because it is the more educated who chose to stay on in the labour force.[68]

However, it is the case that in the long run as the population ages, the ratio of people in their retirement years relative to those of prime working age will increase.

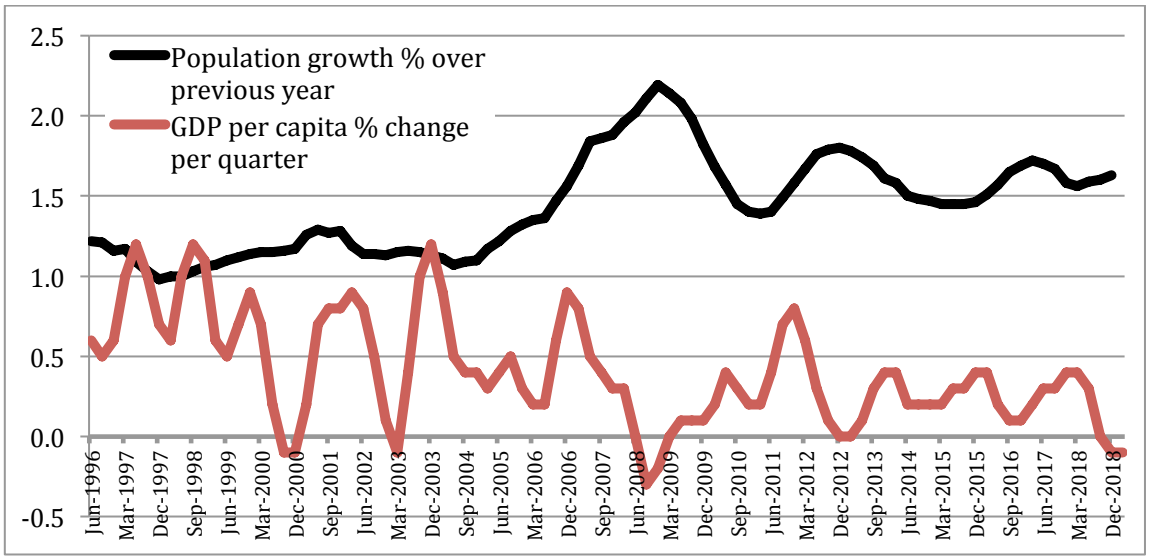
Other things being equal this will slow the rate of output per capita. It is this relationship that fuels much of the pessimists' concern.

But other things are unlikely to be equal. The pessimists are in a position to act on their beliefs and they turn to high immigration in an attempt to forestall inevitable change. This risks negative economic consequences for Australians.

6.2 Population growth and productivity

Economic growth as measured by changes in GDP per capita has not flourished during Australia's decade or more of high population growth. On the contrary, Figure 20 makes it clear that, as the population has grown, the rate of growth in per capita GDP has declined.

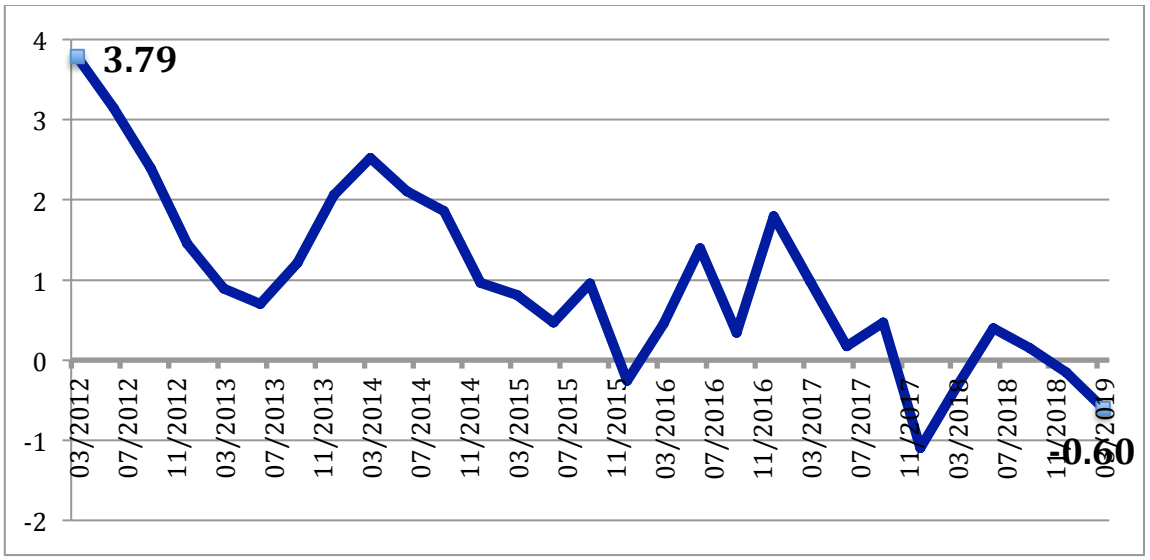
Figure 20: Australia, GDP per capita and population growth, June 1996 to March 2019, percent change



Source: Derived from ABS 5206.0 Australian National Accounts: National Income, Expenditure and Product, Table 1, and ABS 3101.0 Table 1: Population Change, Summary – Australia

Labour productivity is measured by real GDP per hour worked. Figure 21 shows that this fell from a high point in the March quarter of 2012 to minus 0.6 percent March 2019.

Figure 21: Australia, percent change in labour productivity March 2012 to March 2019



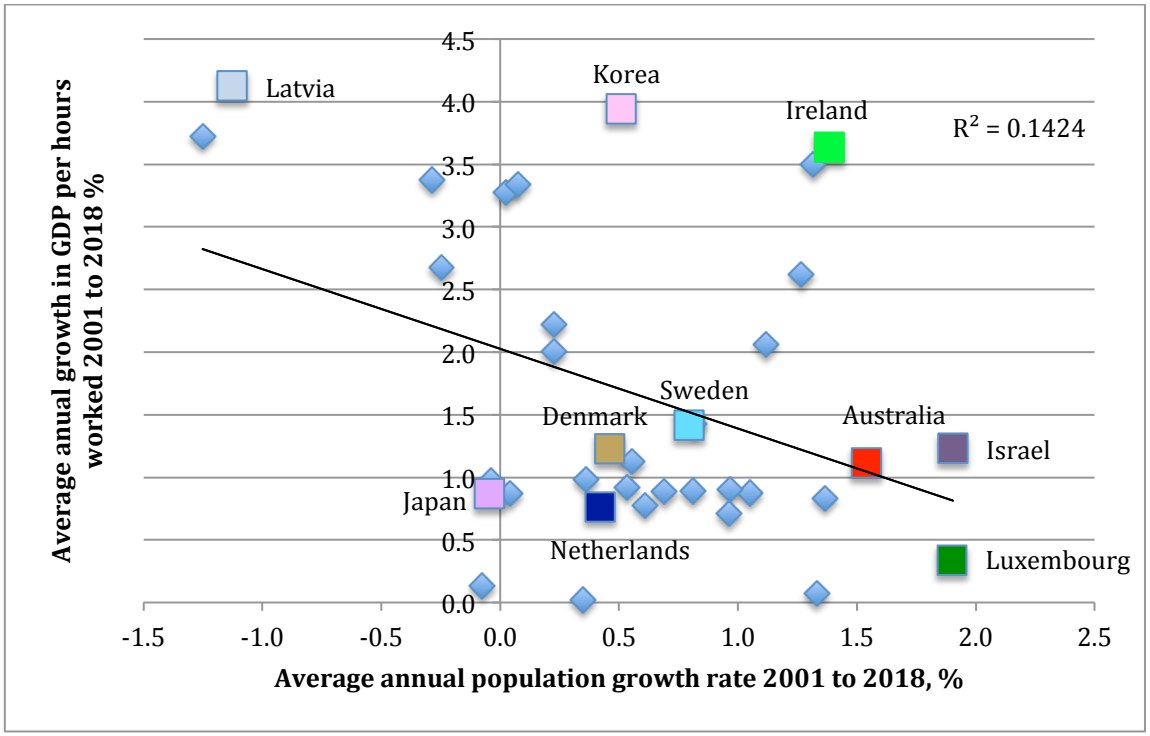
Source: https://insights.ceicdata.com

Taking a longer timespan, the Productivity Commission reports that, while labour productivity grew by 1.5 percent per year over the 44 years from 1974-75 to 2018-19, it fell to minus 0.2 percent in 2018-19.[69]

Data on 36 OECD countries from 2001 to 2018 show a similar negative association between population growth and growth in labour productivity. Of course OECD countries

differ by many more factors than their rate of population growth. Nevertheless the overall picture gives little support to proponents who argue that population growth in some fashion drives growth in productivity.[70] (See Figure 22.)

Figure 22: Thirty-six OECD countries, average increase in GDP per hour worked by average population growth rate, 2001 to 2018, %



Sources: Derived from OECD data at data.oecd.org and stats.oecd.org

The data shown in Figure 22 are consistent with those analysed by Murray and van Onselen for the years 2000 to 2017.[71] They observe that: 'Since population growth rates and population ageing are negatively related, this matches the research showing that ageing increases economic performance'.[72]

6.3 Demographic ageing, productivity and the longevity dividend

Yes, other things being equal, a smaller ratio of people of conventional working age to the population as whole will slow growth in per capita output and thus per capita labour productivity. But what if the people who are in paid work were to become more productive. Some researchers suggest that population ageing can have positive implications for productivity.[73]

We have seen that increased life expectancy and lower fertility produce a longevity dividend. This is because a smaller proportion of a person's life span is devoted to childcare leaving more years free for other kinds of work. In Australia there has also been an increase in the labour force participation of older people. This means that their experience and skills are engaged. Thus it may not be just a question of more years being available for work, but of that work being more productive. This may be especially likely to be true for white-collar and professional work.

Yes, Figure 21 shows a serious drop in the level of labour productivity in recent years. But this cannot be attributed to current rates of demographic ageing. Why? Because the

ratio of post 65s to younger workers only begins to accelerate when the bulk of baby boomers, born between 1946 and 1964 retire. The oldest among them will have reached the age of 65 in 2011 and the youngest will arrive there in 2029.

Between 1999 and 2019 the proportion of Australians aged 65 plus grew from 12.3% to 15.9%.[74] In 2029, assuming nil net migration, is it projected to reach 20.2%.[75]

6.4 Infrastructure

At some time in the past population growth might have boosted productivity by enabling economies of scale and a finer division of labour. But by the second decade of the 21st century this is no longer the case. Now both more developed countries and developing countries have no shortage of people and are more likely to experience diseconomies of scale.

These diseconomies of scale are evident in aged, stressed and over-used physical infrastructure as well as strained health and education services. Infrastructure Australia has recently quantified the costs of road congestion and public transport crowding estimating that by 2031 these will amount to $39.6 billion.[76] (This figure is rather more than the PBO's cost of $36 billion attributed to ageing in 2028-29.)[77]

So, if high immigration is being pursued to counteract ageing, the costs from diseconomies of scale need to be taken into account.

In their supplement on Urban Transport, Infrastructure Australia writes:

However they are measured, congestion and crowding do not only frustrate the daily commuter. They also compromise Australia's productivity by making the movement of freight slower and more unpredictable, choking our exports, damaging the performance of public transport, and turning our cities into less pleasant places to live, where it is simply harder to access daily needs.[78]

Societies need to fund both the turnover of infrastructure and its expansion to accommodate population growth. Jane O'Sullivan argues that if we assume that the average life span of major infrastructure is around 50 years, a society with a stable stationary population would need to replace 2% of its fixed infrastructure every year. If its population is growing at 2% per year the costs of building additional infrastructure must be added to the replacement costs and the total doubles to 4%. Thus for a potential 2% increase in income tax revenue, infrastructure costs rise by 100%. If this work is not done then the productivity of the burgeoning population is constrained by deteriorating and inadequate infrastructure.[79]

The costs of building new infrastructure for the extra numbers Australia now accepts are high. O'Sullivan estimates the infrastructure costs of settling one new immigrant at $100,000.[80] In 2018-19 net overseas migration was 244,000, implying an infrastructure bill of $24.4 billion for that year alone, and this is without including the 143,000 people added to the population by natural increase. Providing adequate infrastructure for an extra 387,000 people implies an annual cost of $38.7 billion.

To cope with these costs the Federal Government plans to spend $75 billion over a ten-year period.[81] This sum could easily be consumed in less than two years.

In 2013 the Productivity Commission wrote:

Australia's population is projected to rise to around 38 million by 2060, or around 15 million more than the population in 2012. [For current projections see section 7.] *Sydney and Melbourne can be expected to grow by around 3 million each over this period. ...*

Total private and public investment requirements over this 50 year period are estimated to be more than 5 times the cumulative investment made over the last half century, which reveals the importance of an efficient investment environment.[82]

Clearly Australia is not now investing at five times the rate that it was investing in the last 50 years.[83] As of March 2020 the population was 25.6 million. If we are to reach 49.2 million in 2066 this means adding 23.6 million people with an infrastructure cost of $2.36 trillion. (As of December 2019 Australia's GDP was $502.6 billion.)[84]

6.5 Declining capital investment

Meanwhile there is already evidence that the rate of growth in capital investment in Australia is declining, such that the Productivity Commission now writes that Australia is experiencing 'capital shallowing'.[85]

Until the last couple of years the rate of capital investment had grown at a greater rate than the growth in labour input (measured in hours of work). This meant that, on average, workers had been benefiting from an increased capital stock (or capital deepening), which was contributing to growth in labour productivity.

In 2017-18 and 2018-19 this pattern reversed. The rate of growth in capital investment fell below the rate of growth in hours of work. Thus the amount of capital per worker fell in these years, resulting in 'capital shallowing'.

The Productivity Commission believes that this capital shallowing is an important contributor to the decline in labour productivity shown in Figure 21. This is because new capital investment often includes new technology and thus enables an increase in output per worker.

Of course other factors are involved. The demise of Australia's manufacturing industry has erased the segment of the economy where technological innovation can most readily lift productivity.[86]

6.6 Masking declining productivity with population growth

Another contributor to Australia's recent slow-down in productivity growth is that successive governments have chosen to obscure it by maintaining very high levels of population growth. Labour inputs have grown and this has kept growth in aggregate GDP growth positive (thus maintaining Australia's 28 years of unbroken economic growth). This statistical triumph was achieved at the expense of growth in GDP per capita. (See Figure 20.)

It has also led to rapid increases in the size of Australia's major cities and fuelled demand for city-building and people-servicing industries.

6.7 The shift to services

It is inevitable that, as an economy becomes more affluent, the demand for services will increase. The huge growth in Australia's metropolises has accentuated this trend. The Productivity Commission has shown that growth in labour productivity in these service industries is relatively low and in some cases is declining.[87] The overall level of growth in labour productivity has fallen because of the growing share of these services in the economy.

The evidence so far shows that population growth comes with many downsides and does not suggest that population ageing threatens social and economic harm. Despite this, many pessimists assume it does. And the remedy they offer is high immigration.

This raises the question: can immigration make us younger?

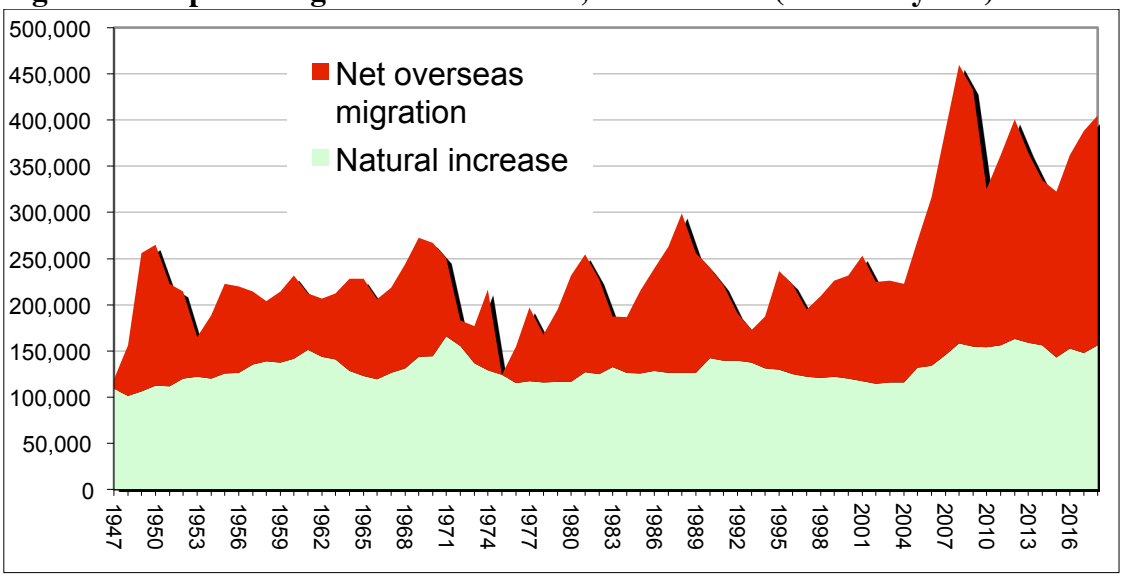
7 Ageing and the immigration fix

Historically most populations have grown from natural increase, an excess of births over deaths, and much of Australia's growth since 1901 shown in Figure 1 (p. 3) has indeed been due to this.

Figure 1 also shows an accelerated rate of population growth after WWII. Since 1947 immigration has played a significant role and one that has increased still further since 2007.

The estimated resident population grew by 4.5 million from June 2007 to June 2019, taking the total from 20.8 million to 25.3 million. This meant an average annual growth rate of 1.7 percent. The average (mean) contribution of net overseas migration (NOM) to this increase was 59 percent but in the last three years (June 2017 to June 2019) it has been 63 percent.[88] Figure 23 provides an overview.

Figure 23: Population growth in Australia, 1947 to 2018 (calendar years)



Sources: 1945 to 1951, *Demography 1954, Bulletin No. 72*, Commonwealth Bureau of Census and Statistics; 1952 to 1977 J. Shu, S. E. Khoo, A. Struik and F. McKenzie, *Australia's Population Trends and Prospects* 1993, (BIR), AGPS, Canberra 1994; 1978 on, *Demographic Statistics,* ABS, Catalogue no 3101.0
Note: At the time or writing calendar year data were not yet available for 2019.

The pessimists claim that high immigration will ameliorate the ill effects of an older population by reducing its average age.[89] Media commentators and politicians frequently make this argument so it is not surprising that many Australian voters share their concern. In 2015 Sustainable Population Australia conducted a survey of voters' attitudes to population growth. This asked if respondents thought Australia needed more people. Among the minority (38%) who thought that it did, offsetting the ageing of the population was their second most frequently cited reason after economic growth.[90]

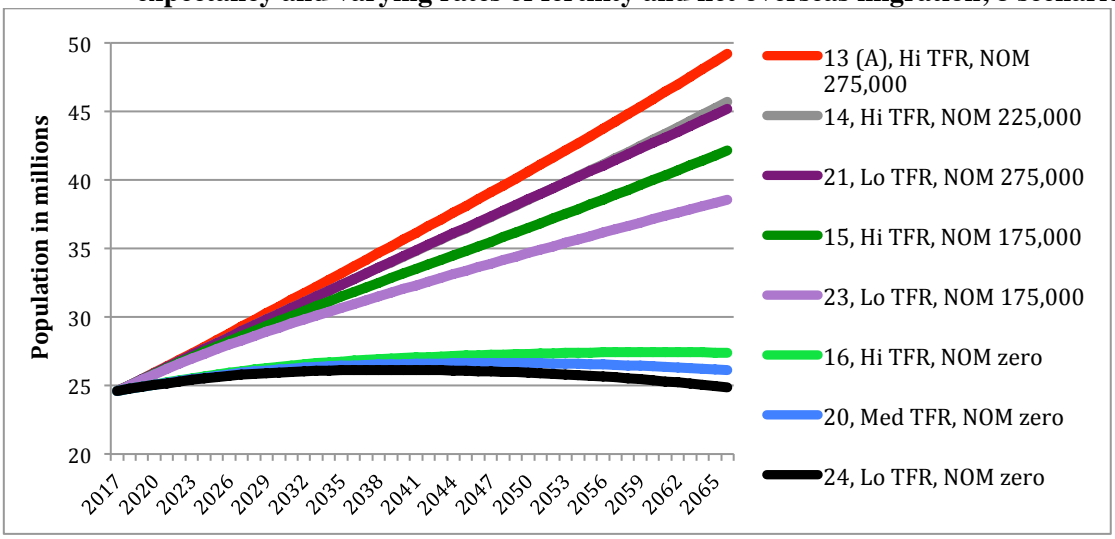
This mirrored results of an earlier survey run in 2009 where again economic growth was the most popular reason given among the minority favouring population growth, followed by a belief that it offset demographic ageing.[91]

7.1 Population size, percent 65 plus and median age in 2066, ABS projections

So what effect do high levels of net migration have on Australia's demographic profile? Figure 24 presents eight different population projections published by the ABS in November 2018.

They all assume high life expectancy, meaning that life expectancy at birth is projected to rise to 87.7 years for males and 89.2 years for females by 2066 from its current levels of 80.4 for males and 84.6 for females.[92]

Figure 24: Projected population of Australia in millions, 2017 to 2066, assuming high life expectancy and varying rates of fertility and net overseas migration, 8 scenarios



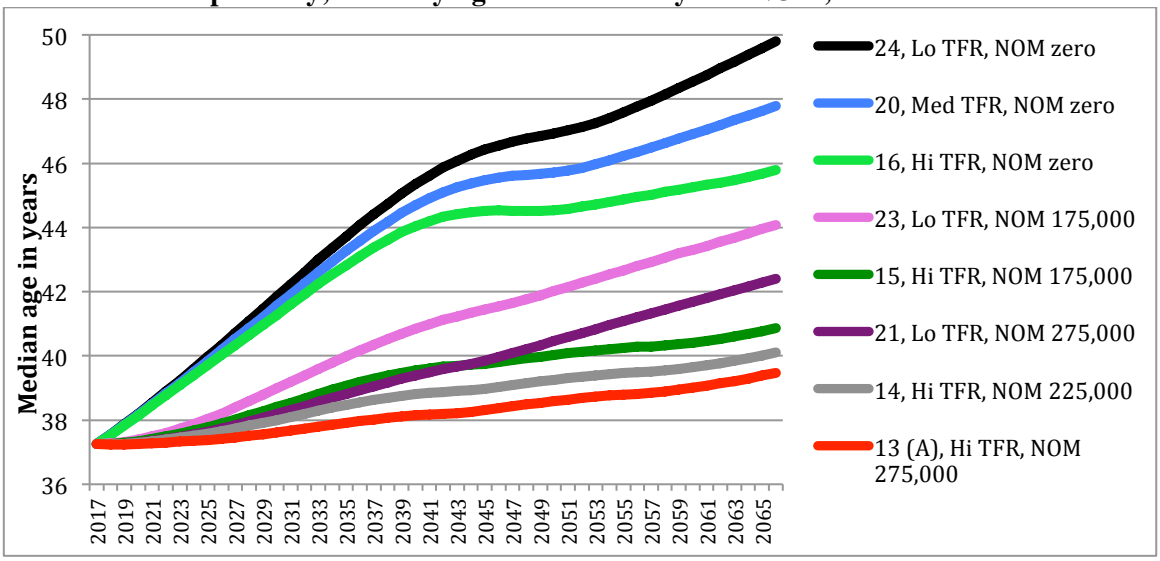
Source: Derived from ABS population projections published online, 3222.0, December 2018
Notes: The series numbers have been adopted for convenience in this paper. Series 13 is described as Series A by the ABS. It is their highest series. (The other two ABS-named series, B and C, assume medium life expectancy and are not shown in Figure 25. See Table A1 for details.)
Hi TFR is 1.95, Med TFR is 1.8, and Lo TFR is 1.65. In all there are 12 projections for the high life expectancy set and 12 for the medium life expectancy set shown in Table A1.

Figure 24 shows that a total fertility rate of 1.95 (labelled *high* by the ABS) and nil net migration (series 16) leads to the population leveling off at around 27 million. A similar result would be achieved at a lower fertility level with net immigration in the order of net 40,000 to 50,000 per year, but the ABS has not provided such a projection. In contrast, all of the levels of immigration they project lead to substantial population growth, with no end in sight.

Series 13 (labelled series A by the ABS) is the standout, reaching 49.2 million in 2066.

Is the NOM projection employed in 13(A) (275,000 p.a.) unrealistically high? Not at all. It is almost exactly what Treasury expects and is planning for.[93]

Figure 25: Projected median age of the population of Australia, 2017 to 2066, assuming high life expectancy, and varying rates of fertility and NOM, 8 scenarios



Source and notes: see Figure 24.

Figure 25 shows the differing effects of the eight scenarios on the median age. Yes, series 16 (which has nil NOM and a TFR of 1.95) adds very few extra people but it is certainly older than the any of the five series involving immigration, reaching a median age of 45.8 years in 2066. By contrast the booming 13(A) series with NOM at 275,000 each year, scores a relatively youthful median of 39.4 in 2066.

In 2017 15.4% of the population was aged 65 plus and the population was 24.6 million. Table 8 sets out the 24 projections that can be drawn from ABS data. It shows that the highest proportion aged 65 plus in 2066 (31.9%) is produced by the series numbered here as series 24, with high life expectancy, a TFR of 1.65 and nil net migration.

It also shows a wide variation in the sizes of the projected populations, largely caused by the varying size of the net migration assumptions as compared to a baseline of nil net migration.

As we have seen, the ABS has chosen to work with high to very high annual migration assumptions (net 175,000, 225,000 and 275,000). This does not allow us to explore the effects of more manageable numbers such as net 50,000 or 70,000.

Table 8 shows the outcomes of the 24 projections in 2066. All of them start from the base level recorded in 2017 (24.6 million people, with 15.4% aged 65 plus).

Twenty-three show an increase in the size of the population while series 12 shows a slight decrease. The size of the population in 2066 varies between 23.9 million (series 12) and 49.2 million (series 13A). And, as illustrated by the eight projections shown in Figure 24, it is immigration that makes the difference. Slight variations in the TFR and in life expectancy affect the median age but play a much smaller part in the overall numbers.

The proportions aged 65 plus also vary widely from 31.9% (series 24, nil net migration, high life expectancy, TFR 1.65) to 19.1% (series 1, net migration 275,000 per year, medium life expectancy and TFR 1.95). At first glance this looks as if immigration could make the population younger. So it does, for a while, but Table 9 explores the cost.

Table 8: Australia, % aged 65 plus and population in millions, 24 projections

Assumptions and series	*High life expectancy* % 65 plus in 2066*	**Total population in 2066 millions**	*Assumptions and series*	*Med. life expectancy* % 65 plus in 2066*	**Total population in 2066 millions**
Panel 1: NOM 0, TFR variable			*Panel 1: NOM 0, TFR variable*		
24, TFR 1.65	31.9	**24.9**	12, TFR 1.65	29.5	**23.9**
20, TFR 1.8	30.4	**26.1**	8, TFR 1.8,	28.0	**25.1**
16, TFR 1.95	29.0	**27.4**	4, TFR 1.95	26.7	**26.4**
Panel 2: TFR 1.65, NOM variable			*Panel 2: TFR 1.65, NOM variable*		
23, NOM 175,000	24.9	**38.6**	11(C), NOM 175,000	23.0	**37.4**
22, NOM 225,000	23.6	**41.9**	10, NOM 225,000	21.8	**40.7**
21, NOM 275,000	22.5	**45.2**	9, NOM 275,000	20.8	**44.0**
Panel 3: TFR 1.8, NOM variable			*Panel 3: TFR 1.8, NOM variable*		
19, NOM 175,000	23.8	**40.3**	7, NOM 175,000	22.0	**39.2**
18, NOM 225,000	22.6	**43.8**	6(B), NOM 225,000	20.9	**42.6**
17, NOM 275,000	21.6	**47.2**	5, NOM 275,000	19.9	**46.0**
Panel 4: TFR 1.95, NOM variable			*Panel 4: TFR 1.95, NOM variable*		
15, NOM 175,000	22.8	**42.1**	3, NOM 175,000	21.0	**41.0**
14, NOM 225,000	21.6	**45.7**	2, NOM 225,000	20.0	**44.5**
13(A), NOM 275,000	20.7	**49.2**	1, NOM 275,000	19.1	**48.0**

* High life expectancy means 87.7 years for males by 2066 and 89.2 years for females, medium life expectancy means 83 years for males by 2066 & 86 years for females.
Life expectancy in 2017, the base year for the projections, was 80.5 years for males and 84.6 years for females.
Source: Data derived from the ABS population projections published online, 3222.0, December 2018
The series numbers have been adopted for convenience in this paper. Series 13 is described as Series A by the ABS. It is their highest series. The other two ABS-named series, B and C, assume medium life expectancy and are labeled here as 6(B) and 11(C).

As the eight projections illustrated in Figure 25 show, the five which include NOM of 175,000 to 275,000 lead to a lower median age in 2066 then do the three that assume nil net migration. But is this an efficient way of making Australians younger?

Table 9 focuses on the median age of all of the 12 high life expectancy projections (those for the medium life expectancy group are analysed in Table A1). Table 9 sets out a cost benefit analysis.

Benefit is taken as years shaved off the projection with highest median age, that of series 24. This series assumes low fertility (a TFR of 1.65) and nil net migration. It reaches a median age of 49.8 years in 2066. *Cost* is the number of extra people required to reduce that age by one year.

Table 9: Australia, median age in 2066, 12 high life expectancy projections, the demographic cost in population growth needed to reduce the median age by one year, relative to series 24

1 Assumptions and series	2 Median age in 2066	3 Fall in median age in years relative to series 24	4 Population in 2066	5 Population growth in 2066 relative to series 24	**6** **Growth needed to reduce the median age by one year, relative to series 24***	7 Diminishing returns – extra population growth needed to lower the median age of series 24 by one year **
Panel 1: NOM 0, TFR variable						
24, TFR 1.65	**49.8**	**—**	**24,859,383**	—		—
20, TFR 1.8	47.8	2.0	26,107,161	1,247,778	**623,889**	—
16, TFR 1.95	45.8	4.0	27,389,537	2,530,154	**632,539**	—
Panel 2: TFR 1.65, NOM variable						
23, NOM 175,000	44.1	5.7	38,557,796	13,698,413	**2,403,230**	—
22, NOM 225,000	43.2	6.6	41,867,069	17,007,686	**2,576,922**	173,692
21, NOM 275,000	42.4	7.4	45,176,326	20,316,943	**2,745,533**	342,303
Panel 3: TFR 1.8, NOM variable						
19, NOM 175,000	42.4	7.4	40,329,424	15,470,041	**2,090,546**	—
18, NOM 225,000	41.6	8.2	43,753,116	18,893,733	**2,304,114**	213,568
17, NOM 275,000	40.9	8.9	47,176,859	22,317,476	**2,507,582**	417,036
Panel 4: TFR 1.95, NOM variable						
15, NOM 175,000	40.9	8.9	42,146,145	17,286,762	**1,942,333**	—
14, NOM 225,000	40.1	9.7	45,686,086	20,826,703	**2,147,083**	204,750
13(A), NOM 275,000	39.5	10.3	49,226,089	24,366,706	**2,365,700**	423,367

Source: Data derived from the ABS population projections published online, 3222.0, December 2018
Notes: All of the 12 series shown in Table 8 assume high life expectancy. High life expectancy means life expectancy at birth rising to 87.7 years for males by 2066 and 89.2 years for females.
The series numbers have been adopted for convenience in this paper. Series 13 is described as Series A by the ABS. It is their highest series. (The other two ABS-named series, B and C, assume medium life expectancy and are not shown here. See Table A1.)
In 2014-2016, life expectancy at birth was 80.4 years for males and 84.6 years for females (ABS 3302.0.55.001).
* Column 6 is the result of dividing column 5 by column 3.
** Column 7 shows the extra numbers for panels 2, 3 and 4, in column 6 needed to lower the median by one year with a NOM of 225,000 p.a. compared to a NOM of 175,000 p.a., and then the extra numbers needed to lower it by one year with a NOM of 275,000 p.a. relative to the one of 175,000 p.a.

While all of the projections in Table 9 assume high life expectancy their fertility and migration assumptions vary. Series 24 with its low fertility and nil net overseas migration

provides a base line. Of all the high life expectancy projections it produces the oldest population in 2066 with a median age of 49.8 years. It also produces the smallest population in 2066: 24.9 million people.

Using it as a benchmark we can see the difference to the median age that other assumptions of fertility and migration produce. All of the other projections lead to younger median ages, and larger populations. Higher fertility and very high annual NOM give series 13A a median age of 39.5, slightly more than 10 years younger than that of series 24. This is its benefit (where older age is taken as negative and youthfulness as positive).

But this supposed benefit comes at a high cost. To achieve this youthfulness we must add an extra 24.4 million people and double the population of 2017 in just 49 years.

Column 6 in Table 9 shows the extra people that need to be added in order to reduce the median age of series 24 by one year. From this it is clear that by far the most cost effective way of doing this is to support the nearly two-child family with nil net migration (series 16) increasing the TFR from 1.65 to 1.95.[94] If we grow a little younger by adding a few more babies we can shave two to four years off the series 24 median age at a cost of a 5–10% increase population from 2018 to 2066. While this leads to modest population growth, Figure 24 shows it stabilising at around 26 to 27 million by 2066.

7.2 The cost/benefit efficiency of slightly higher fertility versus high migration

This result demonstrates that if the policy goal is to make the population younger high immigration is much less efficient than slightly higher fertility. For example, with continued NOM of 175,000 (a high figure but nonetheless lower than 275,000) and TFR at 1.95 by 2066 the median age is 40.9. This compares with median age of 44.1 with NOM of 175,000 and TFR of 1.65. The figure of 40.9 is not much higher than the current median age of around 37 (Figure 25).

In 2018 Australia's TFR was 1.74.[95] This low figure reflects couples putting off starting a family because of high housing costs. In Sydney and Melbourne at least, these costs are partly a product of increased competition for existing family-friendly housing, an increase driven by high immigration in both cities.[96] A reduction in NOM to 175,000 would help diminish this situation (while a return to the average NOM for the 1990s of 80,400 per year would help still further). [97]

7.3 Series 16 versus series 13A

Series 16 assumes nil net migration, a TFR of 1.95 and high life expectancy. It shaves one year off benchmark series 24 at a cost of 632,539 extra people. In contrast all of the immigration series are much less cost effective.

For example series 13A (NOM 275,000, TFR 1.95, high life expectancy) needs to add 2.4 million extra people to achieve the same result. This is nearly four times the cost of series 16. And, as with the other series assuming different levels of high migration, the population is still rising steeply in 2066 (see Figure 24).

7.4 Diminishing returns from high migration

Column 7 of Table 9 also shows that, among the migration scenarios, the law of diminishing returns sets in.

For example, Panel 4 shows three projections (series 15, 14 and 13A). They all assume a TFR of 1.95 but varying levels of NOM. A TFR of 1.95 and NOM of 175,000 p.a. (series 15) lowers the median age by one year at a cost of an extra 1.9 million people per year of

youthfulness. If NOM is lifted to 225,000 p.a., the cost per one year of youth rises by an extra 214,000 people, and if it rises again to 275,000 p.a. the cost climbs by an extra 426,000 people.

Similar diminishing returns are clear for the other fertility and migration assumptions shown in panels 2 and 3.

Table A1 in the appendix sets out data for 12 projections assuming medium life expectancy and finds the same pattern of diminishing returns.

These analyses confirm findings made by Peter McDonald and Rebecca Kippen in 1999:

...at all points in time, the impact of immigration on ageing is subject to diminishing returns. Each additional 50,000 immigrants has a smaller impact on ageing. ...
The addition of 6.7 million people merely to change the aged proportion by less than half a percentage point is a very inefficient approach to modifying Australia's population age structure, evoking images of the sledgehammer and the walnut.[98]

High levels of net migration are an extraordinarily expensive way of trying to make ourselves younger and, of course, they are only a temporary fix. As the Productivity Commission pointed out in 2005:

The numbers reveal that feasible increases [in immigration] have only modest and relatively short-lived impacts....
To delay any increase in the aged dependency ratio by 40 years would require a net migrant inflow to population ratio of 3:1 per cent — more than five times the present ratio. This would result in an Australian population of around 85 million by 2044-45 (compared to the base case projection of 28.3 million).[99]

By 2016 the 'base case projection' would have ballooned but the Commission remained of the same opinion.[100]

Yes high levels of immigration can make Australia a little younger but at the cost of making it very much bigger. And at some time in the future we would have to stop. From then on the older age structure would be waiting for us, but with far more people, including far more older people than would otherwise have been the case.

8 Conclusion

No population can grow for ever without degrading its resource base and, eventually, perishing. Because of this the only way to maintain a stable stationary population that is also youthful is to return to the pre-industrial Malthusian equilibrium.

No member of a society that has escaped from that particular form of misery would wish to return to it. Our challenge is to find a new equilibrium that can enjoy the benefits of the longevity dividend and appreciate the contribution of all members of society, irrespective of age.

Gloomy prognoses of half the population being over the age of 65 by 2050 are simply not plausible. Even with a nil net migration projection, high life expectancy and a TFR of 1.65 only 32% of Australians would be aged 65 plus in 2066. And, applying 2018 rates to that future, 3.4% of the population would be in permanent residential care. The 'gigantic floating nursing home' in the Pacific is going to be short of passengers.

The evidence analysed in this paper, and in the many sources on which it has drawn, paint a different picture. Productivity increases have allowed most of our children to survive

and for their parents to grow old enough to see their grandchildren and to help care for them. We need to focus on a sensible use of our human and natural resources.

The only risk is that vested interests and short-sighted governments will create unnecessary difficulties by deliberately cramming in more and more people. The nation is struggling with creaking infrastructure, jammed roads, crush-loaded public transport, unaffordable housing and a deteriorating natural environment. These ills are not being caused by the ageing of the population.

Demographic maturity is the outcome of social progress. It is not a threat. In the course of a brief couple of centuries it has been a breakthrough. Robert Browning was closer to the mark than he could have known.

The danger lies not in maturity but in futile and dangerous attempts to resist it with rapid population increase.

Appendix

Table A1: Australia, median age in 2066, 12 medium life-expectancy projections, the demographic cost in population growth needed to reduce the median age by one year, relative to series 12

1 Assumptions and series	2 Median age in 2066	3 Fall in median age relative to series 12	4 Population in 2066	5 Difference in size relative to series12	6 Population growth needed to reduce the median age by one year , relative to series 12*	7 Diminishing returns – extra population growth needed to lower the median age of series 12 by one year **
Panel 1: NOM 0, TFR variable						
12, TFR 1.65	**48.3**	—	**23,875,283**			
8, TFR 1.8,	46.3	2.0	25,119,356	1,244,073	626,455	—
4, TFR 1.95	44.4	3.9	26,397,941	2,522,658	640,727	—
Panel 2: TFR 1.65, NOM variable						
11(C), NOM 175,000	43.0	5.3	37,443,819	13,568,536	2,574,654	—
10, NOM 225,000	42.2	6.1	40,727,542	16,852,259	2,757,561	182,908
9, NOM 275,000	41.5	6.8	44,011,213	20,135,930	2,956,873	382,220
Panel 3: TFR 1.8, NOM variable						
7, NOM 175,000	41.4	6.9	39,210,377	15,335,094	2,229,274	—
6(B), NOM 225,000	40.7	7.6	42,608,269	18,732,986	2,451,540	222,265
5, NOM 275,000	40.0	8.3	46,006,141	22,130,858	2,674,532	445,257
Panel 4: TFR 1.95, NOM variable						
3, NOM 175,000	39.9	8.4	41,021,958	17,146,675	2,042,389	—
2, NOM 225,000	39.2	9.1	44,535,813	20,660,530	2,275,319	232,930
1, NOM 275,000	38.7	9.7	48,049,645	24,174,362	2,505,041	462,652

Source: Data derived from the ABS population projections published online, 3222.0, December 2018
Notes: All of the 12 series shown in Table A1 assume medium life expectancy. This means life expectancy at birth rising to 83.0 years for males by 2066 and 86.0 years for females. (In 2014-2016, life expectancy at birth was 80.4 years for males and 84.6 years for females: ABS 3302.0.55.001.)
The series numbers have been adopted for convenience in this paper. Series 11 is described as Series C by the ABS and series 6 as Series B.
* Column 6 is the result of dividing column 5 by column 3.
** Column 7 shows the extra numbers for panels 2, 3 and 4, in column 6 needed to lower the median by one year with a NOM of 225,000 p.a. compared to a NOM of 175,000 p.a., and then the extra numbers needed to lower it by one year with a NOM of 275,000 p.a. relative to the one of 175,000 p.a.

Notes

[1] See Gregory Clark, *A Farewell to Alms: A Brief Economic History of the World*, Princeton University Press, Princeton, 2007, pp. 4-8, 20-24

[2] ibid., pp. 100-101

[3] ibid., p. 111

[4] John MacInnes and Julio Pérez Díaz, 'The reproductive revolution', *The Sociological Review*, 2009, 57, 2, pp. 262-284

[5] See W. D. Borrie, 'Population and our society: some demographic and social interactions', *Journal of the Australian Population Association*, 1984, 1, 1, pp. 3-8
'If our goals remain the two-child family (as appears to be now well established) and a life expectancy of around 75 years or even higher (as certainly is the case) then a the normal age distribution of the stable population gives ratios of approximately:
65% aged 15-64
14% aged 65 and over
21% aged 0-14
'The fact that the ratios are currently 65/10/25 reflects the baby boom and the high immigration of the 1960s. It is the present and not the potential future age distribution that is abnormal, and the sooner sensible forward planning for the aged recognizes this the better'. p. 7

[6] Josh Frydenberg, 'Australia needs to prepare for an ageing population', *The Australian Financial Review*, 19 November 2019, p. 39

[7] Frydenberg quoted in Phillip Coorey, 'Treasurer warns of ageing bill', T*he Australian Financial Review*, November 2019, p. 1

[8] Bernard Salt, 'Grim reality of when the boom goes bust', *The Australian*, 12 March 2015, pp. 26, 28

[9] See ibid. The full quote is: 'The science is settled; there's not enough workers to fund the likely number of retirees. Or at least not to the level that today's retirees believe they are entitled'.

[10] James Button and Abul Rizvi, 'The great transformation: hooked on migration', *The Griffith Review*, 2018, 61, p. 25

[11] Carla Wilshire, 'Mongrel Nation, episode 4', Radio National (transcript), 4 August 2013, <www.abc.net.au/radionational/programs/mongrelnation/a-big-australia/4779942#transcript accessed>

[12] See Peter Costello quoted in 'Massive thumbs down for Big Australia', news.com.au, 23 January 2013; Bernard Salt, 'Soaring age pension bill on the way', *The Australian*, 6 August 2019, p. 22; Kevin Rudd, 'A growing challenge', *The Australian*, 19 January 2010, p. 12; Stephen Lunn, 'Profound stress on the nation's workers predicted', *The Australian*, 2 February 2010, p. 6.

[13] Data are from Gapminder <https://www.gapminder.org>.

[14] The Australian data are based on the years 1870-1881 and are from W. D. Borrie, *First Report of the National Population Inquiry*, The Government Printer of Australia, Canberra, 1975, p. 40. (Forty-eight is an average; the life expectancies for 1870-1881 published by Borrie are 46.5 for males and 49.6 for females.)

[15] Australian Bureau of Statistics (ABS), 'Media release: life expectancy gender gap narrows', 30 October 2018 <https://www.abs.gov.au/ausstats/abs@.nsf/latestProducts/3302.0.55.001Media%20Release12015-2017>

[16] ABS 3105.0.65.001 Australian Historical Population Statistics, 2019, Table 5.4 Infant mortality rates(a), states and territories, 1901 onwards

[17] R. J. Pryor, *Morbidity and minerals: health and mortality in Victoria in the 1850s, Working Papers in Demography No 7,* Department of Demography, Research School of Social Sciences, Australian National University, Canberra, 1977, p. 13

[18] ABS, 3105.0.65.001 Australian Historical Population Statistics, 2019, Tables 6.2 and 6.6

[19] This way of thinking of the TFR is an over simplification. The TFR is based on the average number of children that would be born to a population of women if they were to pass through their childbearing years conforming to the age-specific birth rates of a given year. See A. Haupt and T. T. Kane, *Population Handbook: International Edition*, Population Reference Bureau, Inc., Washington, 1980, p. 13.
It is a better measure than the crude birth rate (births per 1000 people in the population) because it is less likely to be affected by changes in the age or sex structure of the population. But it's not perfect. This is because it can be affected by changes in the timing of births. For example, during the baby boom years (1946 to 1964) women tended to have their children at a younger age than did their mothers (or indeed their own daughters). Consequently there was a heaping of births as older mothers continued to have their children and younger women joined them. The TFR reached a high point of 3.548 in 1961 but average family size was never as large as this. See ABS 3105.0.65.001 Australian Historical Population Statistics (1921 to 2002). A better measure of fertility is cohort fertility. This counts up the number of children born to a group of women who were themselves born in a particular year and who have passed through their

child-bearing years (conventionally thought of as 15 to 49). This provides an accurate figure but it doesn't tell us what is happening now. Its main use is for looking at past trends.

[20] See S. C. M. Scrimshaw, 'Infant mortality and behavior in the regulation of family size', *Population and Development Review*, 1978, 4, 3, pp. 383-403

[21] S. Siedlecky and D. Wyndham, *Populate and Perish: Australian Women's Fight for Birth Control,* Allen & Unwin, Sydney, 1990, p.12. See also the entry on Baby Farming at <https://www.slv.vic.gov.au/contribute-create/vicfix/baby-farming>. For the use of wet nurses and foundling homes in Britain see Edward Shorter, *The Making of the Modern Family*, Collins, London, 1976.

[22] Siedlecky and Wyndham, 1990, op. cit., pp. 11-12. K. Laster writes that 'Infanticide [in Melbourne] was rife well into the 20th century'. See eMelbourne, the online version of *Encyclopedia of Melbourne*, published in 2005 by Cambridge University Press. See <http://www.emelbourne.net.au/biogs/EM00754b.htm>. See also Caroline Ingram, '"How is this not murder?" Infanticide and the Law in Australian History', opinion piece in *Australian Policy and History*, 2/ October 2018 <http://aph.org.au/how-is-this-not-murder-infanticide-and-the-law-in-australian-history/>.

[23] See N. Hicks, '*This Sin and Scandal': Australia's Population Debate 1891-1911*, Australian National University Press, Canberra, 1978. See also Siedlecky and Wyndham, 1990, op. cit., pp. 14, 21-31.

[24] In 2017 the two countries with the lowest life expectancy were Lesotho and the Central African Republic, both with life expectancies at birth of just over 51 years.

[25] Gapminder has it as 4.94 babies per woman in 1864 <www.gapminder.org>.

[26] In 2018 Nigeria was growing at 2.6%, Zimbabwe 2.9%, Zambia 1.4% and Afghanistan at 2.4%: The World Bank Data. This also shows that their life expectancies at birth had improved markedly by 2017: Afghanistan 64, Zimbabwe 62, Zambia 62 and Nigeria 54 (data rounded to nearest whole number). <databank.worldbank.org/indicator/SP.DYN.LE00.IN/1ff4a498/Popular-Indicator>

[27] See V. Kantorová, M. C. Wheldon, P. Ueffing and A. N. Z. Dasgupta, 'Estimating progress towards meeting women's contraceptive needs in 185 countries: A Bayesian hierarchical modelling study', *PLOS Medicine*, 2020, https://doi.org/10.1371/journal.pmed.1003026; A. Ezeh and G. T. Feyissa, 'What's driving Africa's population growth. And what can change it', *The Conversation*, 17 November 2019

[28] Gapminder <www.gapminder.org> its unmet need for family planning for the percentage of married women ages 15-49 was estimated to be 23.06% in 2018. See <https://www.indexmundi.com/facts/nigeria/unmet-need-for-contraception>.

[29] World Bank data. This was a slight decrease on 1960 when 43.8% of the population of Afghanistan had been under the age of 15. World Bank <https://data.worldbank.org/indicator/SP.POP.0014.TO.ZS?end=2018&start=2016>

[30] Worldometers, Afghanistan Population (Live) <https://www.worldometers.info/world-population/afghanistan-population/>

[31] See 'Whose lost decade?', *The Economist*, 19 November 2011, p. 11; David Pilling's T*he Growth Delusion*, quoted in Michael Seccombe, 'Inside the "just add people" dogma', *The Saturday Paper*, May 5 - 11 2018; Leith van Onselen, 'Japan shows the world how to age gracefully', *MacroBusiness*, 15 January 2019.

[32] Carla Wilshire, 'Mongrel Nation, episode 4', Radio National (transcript), 4 August 2013, <www.abc.net.au/radionational/programs/mongrelnation/a-big-australia/4779942#transcript accessed>

[33] J. F. Fries, 'Aging, natural death, and the compression of morbidity', *The New England Journal of Medicine,* 1980, 303, 2, pp. 130-135; J. F. Fries, B. Bruce and E. Chakravarty, 'Compression of morbidity 1980-2011: a focused review of paradigms and progress', *Journal of Aging Research,* 2011, 83, 4, pp. 801-23

[34] See C. Dufouil, A. Beiser, G. Chêne and S. Seshadri, 'Are Trends in Dementia Incidence Associated With Compression in Morbidity? Evidence From The Framingham Heart Study', *Journals of Gerontology: Social Sciences*, 2018, 73, S1, 10.1093/geronb/gby001, pp. S65-S72; M. Chernew, D. M. Cutler, K. Ghosh and M. B. Landrum, 'Understanding the improvement in disability free life expectancy in the U.S: Working Paper 22306', National Bureau of Economic Research, Cambridge, MA, 2016; D. M. Cutler, K. Ghosh and M. B. Landrum, 'Evidence for Significant Compression of Morbidity In the Elderly U.S. Population: NBER Working Paper No. 19268, National Bureau of Economic Research', Cambridge, MA, 2013; C. Steensma, L. Loukine and B. C. K. Choi, 'Evaluating compression or expansion of morbidity in Canada: trends in life expectancy and health-adjusted life expectancy from 1994 to 2010', *Health Promotion and Chronic Disease Prevention in Canada*, 2017, 37, 3, pp. 1-8; E. M. Crimmins and H. Beltrán-Sánchez, 'Mortality and morbidity trends: Is there compression of morbidity?', *Journal of Gerontology: Social Sciences*, 2010, 66B, 1, 10.1093/geronb/gbq088, pp. 75-86

[35] Note 58 provides evidence on the continuance of age-based discrimination in the work place.

[36] See https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4430.0main+features202015

[37] Carers in the census data are 'people who, in the two weeks prior to Census night, spent time providing unpaid

care, help or assistance to family members or others because of a disability, long term illness or problems related to old age. This includes people who are in receipt of a Carer Allowance or Carer Payment but does not include work done through a voluntary organisation or group. This variable is applicable to all persons aged 15 years or older'. https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/2900.0main+features100912016

[38] The figure of 23.6 million is the census count as of 9 August 2016 as used in the Australian Bureau of Statistics (ABS) product TableBuilder. Some people are missed by the census entirely while others are counted but with data missing on some of the questions. This means that the total in for 2016 Figure 8 is rather lower than the estimate of 24.19 million made by the ABS for the population at June 2016. See *Demographic Statistics* 3101.0.

[39] The data used by the AIHW are based on mortality data taken from period life tables as well as data on the prevalence of health states, such as disability, using the Sullivan method. See Australian Institute of Health and Welfare, *Life expectancy and disability in Australia: expected years living with and without disability*, Australian Government, 2017, Appendix B: Methods and data sources.

[40] 'ABS: Australian smoking rates falling, Media Release' 31 May 2017 <https://www.abs.gov.au/ausstats/abs@.nsf/mediareleasesbyCatalogue/E6DE72422D16BBB4CA258130001536C2?OpenDocument>

[41] R. V. Luepker, 'Cardiovascular Disease: Rise, Fall, and Future Prospects', *Annual Review of Public Health*, 2011, 32, pp. 1-3

[42] See ABS 4307.0.55.001 - Apparent Consumption of Alcohol, Australia, 2016-17

[43] See S. R. Knight, R. Aujla and S. P. Biswas, 'Total Hip Arthroplasty — over100 years of operative history', *Orthopedic Reviews*, 2011, 3, e16, and P. Papas, B. Vivian, F. Cushner and G. Scuderi, 'The history of total knee arthroplasty', *Techniques in Orthopaedics*, 2018, 33, 1, pp. 2-6.

[44] See 'International research shows dementia rates falling by 15% per decade over last 30 years' <www.alzheimersresearchuk.org/international-research-shows-dementia-rates-falling-by-15-per-decade-over-last-30-years>. See also S. Gao, H. N. Burney, C. M. Callahan, C. E. Purnell and H. C. Hendrie, 'Incidence of dementia and Alzheimer disease over time: a meta-analysis', J*ournal of the American Geriatrics Society*, 2019, 67, 7, pp. 1361-1369; E. B. Larson, K. Yaffe and K. M. Langa, 'New insights into the dementia epidemic', *New England Journal of Medicine*, vol. 369, no. 24, 2013, pp. 2275-7.

[45] The projections published by the ABS in November 2018 assume that these improvements will continue. Their set of high life expectancy projections has males, by 2066, achieving 87.7 years and females 89.2 years (there is a set of medium life expectancy projections as well).[45] These assumptions do represent a step back from the high life expectancy assumptions used in the 2013 projections. Then high life expectancy had males achieving 92.1 years by 2061 and females 93.6 years. Medium life expectancy in the 2013 projections was assumed to be 85.2 years for males by 2060-61 and 88.3 for females. See ABS, *Population Projections, Australia, 2012 (Base) to 2101*, Catalogue no. 3222.0, Australian Bureau of Statistics, Canberra, 2013, p. 9.

[46] A. D. Lopez and T. Adaire, 'Slower increase in life expectancy in Australia than in other high income countries: the contributions of age and cause of death', *Medical Journal of Australia*, 2019, 210, 9, 10.5694/mja2.50144, pp. 403-409

[47] See https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/2900.0main+features100912016

[48] TableBuilder, AGEP Age by CTGP Child Type (including grandchildren) and SEXP Sex

[49] ABS 44020DO010_201706 Childhood Education and Care, Australia, June 2017

[50] ABS 41590DO019_2014 General Social Survey, Summary Results, Australia, 2014

[51] Sources and notes:
Base population data for June 2014 are from 3101.0 Australian Demographic Statistics, TABLE 59. Data on disability and carers are based on rates for 2012 applied to June 2014 population data (44300DO001_2012 Disability, Ageing and Carers, Australia: Summary of Findings, 2012, Table 2). Labour force data are for June 2014 and are from 6291.0.55.001 Labour Force, Australia, Detailed - Electronic Delivery, Table 01. (Where the data were provided for 10 year categories they have been halved and distributed them accordingly.) Employment data for people over 64 by five year age group categories are estimates. The ABS only publishes data for those aged 65 plus in the aggregated. I used Temple's data (in ten-year age group categories for 2011, recalculated as a rate for the 2014 population and then prorated it across the five-year age group categories). The figure of 65-69 involved a simple subtraction of the existing 60-64 group from Temple's 60-69 group. With his 70-79 group I gave two thirds of the data to those aged 70-74 and the other third to those aged 75-79. With the 80-89 and 90-99 groups I simply halved the data to apportion it to the five-year age-group categories used in this graph. It was interesting that employment rates for those 100 plus, though very small, were slightly higher than for people in their 80s and 90s. See J. Temple, *Past Present and Future of Mature Age Labour Force*

Participation in Australia: How Do Regions Differ? Melbourne: National Seniors Productive Ageing Centre, 2014 (April), Table A 3 in the appendices.
A person is said to have a profound or severe disability if they always or sometimes need help with one or more of three core activities: mobility, self-care and communication. Primary carers are people taking the main responsibility for someone who is profoundly or severely disabled.
Education data for 15 to 24 year olds are from 6291.0.55.001 Labour Force, Australia, Detailed - Electronic Delivery, Table 03a. Labour force status for 15-24 year olds by Educational attendance, Age and Sex. See J. Temple, *op. cit.,* Table A 3 in the appendices.
Unemployment among people aged 15 to 24 is under-estimated as they have not been shown as unemployed if they are also in full-time education.

[52] See Cameron K. Murray and Leith van Onselen, *Three Economic Myths about Ageing: Participation, Immigration and Infrastructure*, MacroBusiness Consulting, 2019, p. 8

[53] See David Ingles and David Plunkett, Effective Marginal Tax Rates: Part 2, 14 August 2016 <austaxpolicy.com/effective-marginal-tax-rates-part-2/>.

[54] This point was raised by Peter McDonald at Australia's 2020-21 Migration Program – Academic Community Round-table, Melbourne, 7 January 2020.

[55] Parliamentary Budget Office (PBO), *Australia's ageing population: Understanding the fiscal impacts over the next decade*, Commonwealth of Australia, 2019, pp. iv, 4

[56] ibid., p. 20

[57] ibid., p. 2

[58] Murray is quoted in Liam Walsh, 'Can executives over 60 still hack it in the corner office?', *The Australian Financial Review*, 3 September 2019, p. 3. See also D. Black, K.M. O'Loughlin, H. L. Kendig and R. Hussain, 'Age discrimination in Australian workplaces: experiences of older workers', *Innovation in Ageing*, 2018, 2, S1, p. 797; Claire Moodie, 'Ageism is a "rampant" form of discrimination in our workplaces, experts warn', ABC news, 2 December 2018, abc.net.au

[59] John Daley, *Budget pressures on Australian Governments*, Grattan Institute, Melbourne, 2013, p. 16

[60] Counsel assisting the Aged Care Royal Commission, Peter Rozen QC, quoted in Stephen Lunn, 'Aged-care call: we must lock in staffing levels', *The Australian*, 22 February 2020, p. 8

[61] Derived from Australian Institute of Health and Welfare, *Aged care data snapshot - 2018*

[62] See Parliamentary Budget Office, *Australia's ageing population: Understanding the fiscal impacts over the next decade*, Commonwealth of Australia, 2019, p. iv

[63] See Bob Birrell and David McCloskey, *Australia's 'jobs and growth' strategy: pathway to a low productivity economy*, The Australian Population Research Institute, November 2019.

[64] See ABS 5512.0 - *Government Finance Statistics, Australia, 2017-18*. The downloads for the states and territories are at 55120do003_201718.xls (NSW) to 55120do010.xlx (ACT). In each file Royalty income is listed in Table 1, under GFS Revenue.

[65] Calculated from Table 5 'Individuals – selected income items, 2009–10 and 2013–14 income years', Taxation Statistics 2016–17 <https://www.ato.gov.au/About-ATO/Research-and-statistics/In-detail/Taxation-statistics/Taxation-statistics-2016-17/?anchor=Individuals#Table5>

[66] See Martin Ryan, unpublished paper, 'Ageing Crisis rebuttals old and new', 2019. Copy in the author's possession.

[67] See National Research Council, Chapter 6, 'Aging, Productivity, and Innovation', *Aging and the Macroeconomy: Long-Term Implications of an Older Population,* Washington, DC, The National Academies Press, 2012 pp. 119-20

[68] Gary Burtless, 'The impact of population aging and delayed retirement on workforce productivity', Center for Retirement Research at Boston College, 2013

[69] Productivity Commission, PC Productivity Insights, February 2020, Melbourne, 2020, p. 3

[70] Treasury in its Intergenerational Reports implicitly argues that population growth promotes productivity by linking it together with both participation and productivity. See its 'three Ps': population, participation and productivity.

[71] See C. K. Murray and L. van Onselen, *Three Economic Myths about Ageing: Participation, Immigration and Infrastructure*, MacroBusiness Consulting, 2019, Figure 6, p. 10.

[72] ibid.

[73] See for example P. Sze-Yunn and Y. Arivalagan, *These countries are most ready to deal with ageing populations*, World Economic Forum, 2020; J. Schwartz, K. Monahan, S. Hatfield and S. Anderson, *No time tor retire: redesigning work for our aging workforce: Deloitte Insights,* Deloitte, 2019; Matt Flynn, 'The longevity dividend: how ageing populations could boost economic productivity', *The Conversation*, 29 August 2018; Ben Franklin, *Towards a longevity dividend: life expectancy and productivity across developed countries*, The International Longevity Centre London, 2018.

[74] ABS 3101.0 - Australian Demographic Statistics, Jun 2019
[75] This figure is taken from series 16 which assumes high life expectancy and a TFR of 1.95.
[76] Infrastructure Australia, *An Assessment of Australia's Future Infrastructure Needs: The Australian Infrastructure Audit 2019*, 2019, pp. 265, 272
[77] ibid., p. 131
[78] Infrastructure Australia, *Urban Transport Crowding and Congestion: The Australian Infrastructure Audit 2019, Supplementary report*, 2019, p. 8
[79] This is a simplified version of the argument developed in Jane O'Sullivan, 'Submission to the Productivity Commission Inquiry into Infrastructure provision and funding in Australia', 2014
[80] ibid., p. 3
[81] Adrian Makeham-Kirchner and Dr Jonathon Deans, Infrastructure expenditure, Budget Review 2018-19 Index <https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/BudgetReview201819/Infrastructure>
[82] Productivity Commission, *An Ageing Australia: Preparing for the Future — Overview,* Melbourne, 2013, p. 2
[83] See Leith van Onselen, Jane O'Sullivan and Peter Cook, *Population growth and infrastructure in Australia: the catch-up illusion — Discussion Paper, Sustainable Population Australia Inc., 2019*
[84] Current price measures, ABS 5206.0 — Australian National Accounts: National Income, Expenditure and Product, Dec 2019
[85] Productivity Commission, *PC Productivity Bulletin*, May 2019, 2019, p. 1
[86] See Bob Birrell and David McCloskey, *Australia's 'jobs and growth' strategy: pathway to a low productivity economy*, The Australian Population Research Institute, November 2019
[87] ibid.
[88] Data calculated from Demographic Statistics, ABS 3101.0, various issues.
[89] See Simon Keustenmacher, 'Can Australia afford to grow old? The struggles facing our economy as workforce matures', *The Australian*, 6 August 2019, p. 22; The Treasury and Department of Home Affairs, *Shaping a Nation: Population growth and immigration*, 2018; Liz Allen quoted in R. Morton, 'Migration "key to offset losses of an ageing workforce"', T*he Australian*, 23 February 2018, p. 4; Liz Allen, 'Migration helps balance our ageing population – we don't need a moratorium', *The Conversation*, 23 July 2018.
[90] See Katharine Betts, *Voters' attitudes to population growth in Australia: Results of a survey conducted for Sustainable Population Australia*, The Australian Population Research Institute, Melbourne, 2015 (December), p. 4
[91] Katharine Betts, 'A bigger Australia: opinions for and against', *People and Place*, 2010, vol. 18, no. 2, pp. 25-38, p. 35. See also Katharine Betts, 'The ageing of the population and attitudes to immigration', *People and Place*, 2006, 14, 2, pp. 26-38.
[92] ABS 3222.0 - Population Projections, Australia, 2017 (base) – 2066, Assumptions
[93] See Budget Papers 2019-20, Appendix A: Parameters and further information, Table A.2, p. 92 <https://www.budget.gov.au/2019-20/content/bp3/download/bp3_appendix_a.pdf>.
[94] In 2018 the TFR was 1.74. See ABS 3301.0 - Births, Australia, 2018 (released 11/12/2019). This is the most recent published figure as of March 2020.
[95] It was in fact 1.696, ABS 3101 Demographic Statistics, March 2019 p. 22. This is the most recent figure available at the time of writing (March 2020).
[96] See Bob Birrell and David McCloskey, Australia's 'jobs and growth' strategy: pathway to a low productivity economy, The Australian Population Research Institute, November 2019.
[97] Average NOM for 1989-1990 to 1998-99 calculated from ABS 3101.0 Australian Demographic Statistics TABLE 1. Population Change, Summary - Australia <www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Jun%202017?OpenDocument>
[98] Peter McDonald and Rebecca Kippen, *The Impact of Immigration on the Ageing of Australia's Population*, Department of Immigration and Ethnic Affairs, 1999, p. 13 <https://openresearch-repository.anu.edu.au/bitstream/1885/41451/4/01.pdf>
[99] Productivity Commission, *Economic Implications of an Ageing Australia: Productivity Commission Research Report, 24 March*, Melbourne, 2005, p. xviii
[100] Productivity Commission, *Migrant Intake into Australia: Productivity Commission Inquiry Report No. 77*, 13 April 2016, 2016, p. 337ff