

PROSPECTIVE DEMOGRAPHIC CHANGE AND AUSTRALIA'S LIVING STANDARDS IN 2050

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Australia is facing a substantial ageing of its population. This paper calculates under various assumptions the future level of living standards. It shows that, notwithstanding the ageing population, there will be a substantial increase in living standards in the future, almost doubling in the next 50 years. Furthermore, future living standards are more or less independent of future rates of fertility and future rates of immigration. Lower fertility and higher immigration have positive effects on living standards but the effects are so small that we feel the best way to describe the relation is one of independence.

Australia is facing a substantial ageing of its population. By 2050, at current rates of fertility and immigration, the ratio of people aged 65 years or more to people of working age will double, from 20:100 to 40:100. Furthermore, if rates of fertility and immigration fall this measure of old dependency will increase further. This prospect of an ageing population has caused alarm in some quarters. It has led to fears that the ageing population will threaten the future living standards of Australians. To meet this apparent threat, some have called for measures that are claimed to raise fertility and others have called for a higher rate of immigration.

It seems very likely that fertility will fall in the near future. Peter McDonald¹ suggests that a fall in the total fertility rate (TFR) in Australia to 1.65 in the next decade, from its current rate of 1.75, seems likely. One would not be surprised if the fertility rate falls by more. In some countries, such as Italy and Germany, fertility rates have fallen to 1.3 or lower. Perhaps a similar low rate is in store for Australia.

The future course of immigration into Australia is more uncertain. Currently immigration is a major national issue. For over a decade the rate of immigration has been an important factor in federal and state politics. More recently the refugee issue has become an important topic, with

many in the community appearing to fear a massive influx of refugees. The outcome of these debates could be a reduction in the immigration quota. On the other hand, there are pressures for increased immigration. Influential groups, such as the Business Council of Australia, are advocating a higher rate of immigration on economic grounds. Furthermore humanitarian pressures from within Australia and the demand for access to Australia by potential immigrants may cause the rate of immigration to be increased. On balance the rate of immigration in the future could go either way.

Our research,² addresses the impact of prospective demographic change on the living standards of Australian residents in the future. The results of this research suggest that over the next 50 years living standards will almost double. Furthermore, our results challenge the view that low fertility will be a threat to future living standards. We find that lower fertility actually raises future living standards, although by a very small amount. Our research also shows that living standards are not strongly affected by the rate of immigration. Higher immigration increases future living standards, although again by a very small amount. In summary, the effect of fertility and immigration on living standards is best described as slight.

A crucial feature of our research is that to assess the implications of demographic change, we move beyond demography and demographic ratios by using economic analysis to look directly at living standards. In doing this we find that the demographic ratios are misleading. Economic analysis reveals some effects that change radically one's interpretation of the implications of low fertility and changes in the rate of immigration.

ECONOMIC MODELLING OF FUTURE DEMOGRAPHICS

For economic welfare, demographic measures are not of intrinsic interest. Their use is due to the belief that they give insight into the effect of demographic change on living standards. Obviously to look at living standards directly is a better approach, especially because it emerges that the demographic approach is misleading. To directly calculate future living standards we proceed as follows.

We define living standards as consumption per person. (As described below, 'persons' are defined to take into account the relatively high consumption demands of old people.) Consumption is the total of private and government provided consumption. To calculate how consumption per person will change in the future and to assess how different assumptions about the future demographic profile will affect consumption per person we use an economic model of the Australian economy that embodies changes in the demographic structure.

In our model, the total level of output available for Australian residents to consume, that is consumption, is determined by the total level of output produced, less any output used for investment purposes and any output used to make payments to foreigners. The level of output produced is determined by projections of the level

of employment and the capital stock. From demographic projections of the working age population and from assumptions about the future pattern of employment participation of age and gender groups, the future pattern of employment can be projected. The future capital stock is determined by investment.

By subtracting investment and payments to foreigners from output, we can calculate aggregate consumption.

In converting aggregate consumption into living standards, we take into account the fact that consumption demands vary by age. For example, our calculations suggest that people over 75 years consume 19 per cent more than younger adults. This extra consumption is due to the large amount of health services consumed by old people. To capture the impact of consumption demands varying by age, we define a consumption-unit such that, for example, a typical person 75 years or older is equal to 1.19 consumption units. Using the same methodology, we calculate the consumption unit equivalents of people in the other age groups.³ The effect of this is that as the Australian population ages, its growth in consumption units exceeds its growth in natural units. This higher growth has a negative effect on living standards because a given amount of aggregate consumption has to be spread more thinly over a larger number of consumption units.

The negative effects on living standards of increasing dependency and high expenditures on health for old people have dominated the debate on ageing. However these negative effects are offset to some extent by some subtle economic mechanisms associated with demographic change. These economic mechanisms appear to be little understood by commentators in the population debate.

They can be described as two 'consumption dividends' to be reaped from the prospective demographic change that Australia will experience. One is generated by the lower investment requirements from low employment growth. A second is generated by a decreasing proportion of children.

Lower employment growth implies reduced investment requirements. For example, fewer workers in the office implies fewer PCs, fewer desks and fewer office buildings. This means that more of the national output is available for consumption, rather than investment. More consumption implies higher living standards.

Reduced fertility implies fewer young dependents to support. The saving in this support is available to enhance the living standards of others. That is, a given aggregate amount of consumption can be spread more thickly because there are fewer people over which it is spread.

The exact size of the positive effect on living standards exerted by these two consumption dividends depends on the exact nature of the demographic scenario.⁴ The projections we report below show that, for the demographic scenarios we consider for Australia, the effect of these dividends is very strong.

In summary, our projections of future living standards take into account the future demographic structure of the economy. They recognise that some output is used to maintain and enhance the capital stock. They use production functions well established from many economic studies to convert employment and capital into output. They include the obligations of Australian residents to foreigners, that is foreign debt. They leave Australian residents at a level of wealth, defined as the capital stock minus foreign debt, in the future comparable to their levels of

wealth now. And they include the high expenditures on health for old people.

LIVING STANDARDS IN 2050

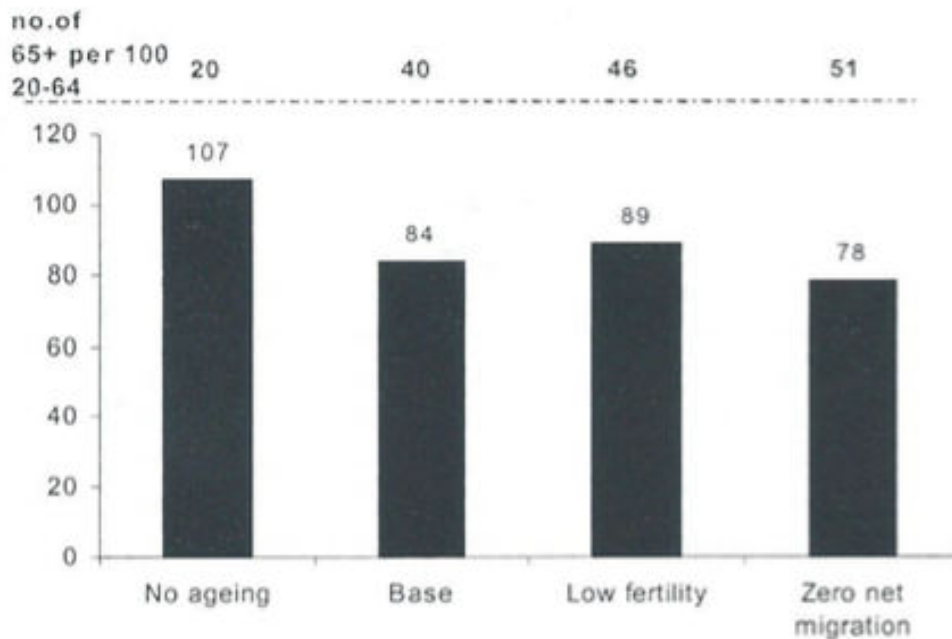
Figure 1 reports our projections of living standards for the year 2050 for Australian residents derived from our economic model briefly described above. The figure shows the increase in living standards in 2050 compared with their level in 1999.

Consider first the column labelled 'Base'. Base refers to a demographic projection that assumes the current value of the total fertility rate remains unchanged in the future at 1.75 and that the annual rate of (net) migration remains unchanged at its current rate of 0.54 per cent of population. Mortality is assumed to follow the standard Australian Bureau of Statistics (ABS) assumption, that is life expectancy increases by 0.4 years for every five years. So Base is a continuation of current demographics. Under this projection, Australia's population will increase to 28.5 million by 2050 (from 19 million in 1999).

If current demographics continue then, as Figure 1 shows, living standards will be 84 per cent higher in 2050 compared with 1999. People will be almost twice as well off as they are today.

The large projected increase in living standards is driven mainly by our assumed rate of increase of labour productivity of 1.4 per cent per year. (Below, we discuss the role of the consumption dividends.) This rate of increase of labour productivity is not an unreasonable assumption. It is equal to Australia's experience over the last 80 years. It is comparable to other high-income countries. There is no compelling reason to expect a growth slowdown.⁵

Figure 1: Projected growth in living standards from 1999 to 2050, per cent increase



As we explained above, our projections allow for the increasing proportion of old people in the future. Above the columns in Figure 1 we record the number of people 65 years or older per 100 people of working age (that is 20 to 64 years) for the year 2050. For the Base case there will be 40 old people per 100 working age people. This is double the number now.

This increase in the proportion of old people does have a negative impact on living standards. This can be seen from the column labelled 'No ageing'. For the 'No ageing' projection we assumed that the age structure is unchanged in the future. This is not a real possibility of course. We use it to measure the effect of ageing. If the age structure could be magically frozen at its 1999 composition then by 2050 living standards are projected to be 107 per cent higher. So there would be an extra 23 per cent on living standards if ageing did not occur.

Some people may be tempted to argue that foregoing an extra 23 per cent in living standards in 50 years time is a problem. However, this 'problem' will be 'suffered' by people who will be almost twice as well off as we are. This sounds a bit like people in Greece worrying about how to increase the living standards of people in the United States. In our view, it would be inequitable to reduce the consumption levels of people today in order that the consumption levels of the richer people in the future be increased even more. Such a move would increase intergenerational inequity.

The other two columns in Figure 1 show how our projections of living standards would be affected by low fertility and low immigration. The column labelled 'Low fertility' is based on a demographic projection in which the TFR falls to 1.3 by 2009, at which level it remains. This is a considerable fall

compared with the current rate of 1.75 but it is not outside the experience of high-income countries. Immigration and life expectancy are assumed to be unchanged from the Base case. The low fertility projection generates a population in 2050 of 24 million.

Using the demographic future implied by the low fertility projection we find that living standards will be 89 per cent higher than their level in 1999. Thus low fertility actually increases living standards, but the increase is very small. It would be better to conclude that living standards are independent of fertility, at least for TFRs in the range of values we consider.⁹

The fourth column, labelled 'Zero net migration', shows the projection of living standards for 2050 based on a complete cessation, in net terms, of immigration into Australia from 1999 onwards. Fertility and life expectancy are as in the Base case. The implied population for Australia for 2050 under the zero migration assumption is 19.5 million.

Using the demographic future implied by the zero migration projection we find that living standards will be 78 per cent higher than their level in 1999. Thus zero migration is bad for living standards, but not very bad. Bear in mind that a drop to zero is a massive change. Given the massive size of this change, the sensible conclusion is that living standards are independent of the rate of immigration.

We infer from our projections and the behaviour of our model that an increase in the rate of immigration above the current rate of 0.54 per cent of population would lead to slightly higher living standards in future. Again we emphasise the smallness of this effect and our interpretation that living standards are essentially independent of the rate of immigration.

THE MISLEADING GUIDANCE GIVEN BY DEMOGRAPHIC INDICATORS

Our projections of future living standards make clear that the large rise in the number of old people per people of working age from 1999 to 2050 gives poor guidance for the impact of demographic change on living standards. Many people have reacted with surprise that living standards can grow so much. Their surprise is probably a result of the alarm spread by commentators who rely on demographic indicators alone.

The unreliability of demographic indicators can be seen by comparing the projected levels of living standards with the associated projected levels of dependency. The figure above the column labelled low fertility shows that, for the low fertility case, there are projected to be 46 people aged 65 years or more for every 100 people of working age in 2050. Thus for the low fertility case, old dependency is projected to be greater than for the base case. But living standards will be higher. The relation is the opposite from the one casually assumed by many. For the zero net migration case the increase in old dependency over the base case is projected to be even greater than for the low fertility case. The zero migration case projects 51 people aged 65 years or more for every 100 people of working age for 2050. But in this case living standards are not as high as in the base case.

Clearly there is no simple relation between old dependency and living standards. Instead there can be substantial variation in the old dependency with effectively no variation in living standards. The lack of an informative relation between old age dependency and living standards suggests that the debate should focus on the latter, not the former.

THE OPTIMUM POPULATION SIZE

Within the living standards framework of our work, the optimum population size would be that which maximises living standards.⁷ Can Figure 1 give us guidance on the optimum population for 2050? Ignoring the 'No ageing' column in Figure 1, because it is based on an artificial projection that could not eventuate, the other three columns show a clear hump shape. The highest living standards for 2050 come from the low fertility case. So, amongst these three alternatives, low fertility generates the optimum population.

However this interpretation of Figure 1 is not the one we favour. Instead what is striking about these three columns in Figure 1 is how flat is the surface defined by their peaks. That is the interpretation we emphasised above. What that interpretation suggests is that, using living standards as defined by us as the criterion, for practical purposes there is no optimum population. One cannot derive a meaningful target population.

Why do fertility rates and immigration rates have a negligible effect on living standards?

The consumption dividends discussed above that result from reduced investment requirements and reduced child dependency allow Australia to allocate more of its output to consumption. This effect is illustrated in Figure 2, in which the ratios of consumption to Gross Domestic Product (GDP) generated by the three demographic cases are shown.

Compare Base with the zero net migration projection. The consumption ratio for the latter is consistently above the consumption ratio of Base. With a smaller number of immigrants, there is a smaller proportion of GDP devoted to investment. In consequence, Australia can allocate a higher proportion of its GDP to

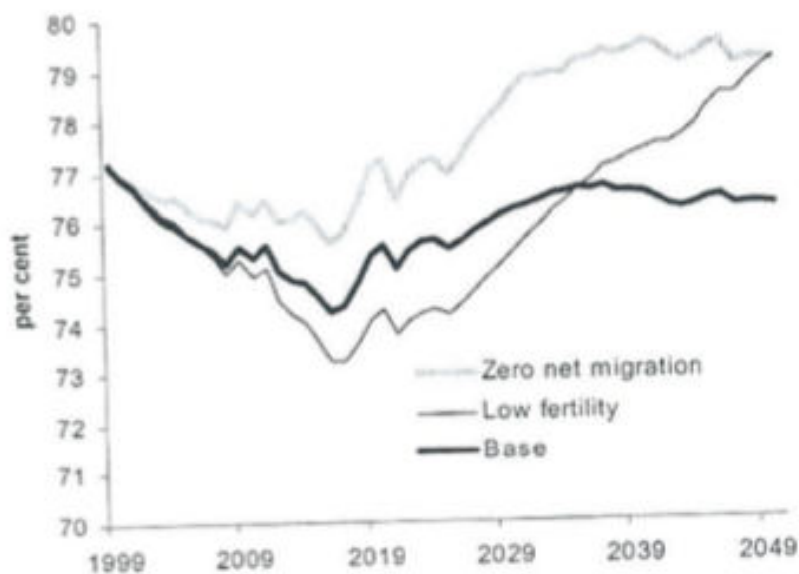
consumption. This is beneficial for living standards, offsetting the negative impact of higher old dependency.

For the low fertility projection the story is more complex. Up to the year 2035 the consumption ratio is lower for the low fertility case than for the Base case. However, living standards do not suffer during this period. Instead the consumption dividend from a decreasing proportion of children allows aggregate consumption to be lower without reducing consumption per head. The output saved because of a lower consumption ratio is lent overseas. After 2035 the consumption ratio generated by the low fertility projection moves ahead of that generated by the Base case. In these years the returns from the overseas lending can support a higher consumption ratio. Furthermore, the consumption dividend from reduced investment demands kick in. Figure 2 shows that these effects are strong. The consumption ratio for the low fertility case increases fairly smartly. By 2050 it is ahead by three percentage points of GDP.⁸

QUESTIONING OUR ASSUMPTIONS

Of course there are a range of assumptions that go into the economic model that we use to calculate the impact of fertility and immigration on living standards. Most importantly, we assume that labour productivity will increase at around 1.4 per cent per year. In our view this is easy to defend. It is the rate Australia has enjoyed over the last 80 years. It is commensurable with rates observed in other high-income countries. Furthermore, as one would expect on the basis of 80 years of experience and evidence from other countries, there are no credible forecasts that this growth is about to permanently stop or will even slow over the next 100 years.

Figure 2: Consumption/Gross Domestic Product (GDP) ratios, Australia, 1999 to 2050



We assume constant returns to scale. Some people criticise this assumption with vigour, although in different ways. Glen Withers, on one side, argues that there are increasing returns to scale. Withers⁹ cites Simon¹⁰ as showing that economies of scale exist in manufacturing. Also the study for Australia by Caves¹¹ found evidence for economies of scale in manufacturing, up to a certain level of output. However manufacturing is a small part of the economy. Furthermore, as Caves pointed out, reducing tariffs reduces the importance of economies of scale by encouraging specialisation.

Other people see diminishing returns to scale. Environmental groups are sometimes forceful proponents of this effect. They argue that increased population causes damage to the environment. The Premier of New South Wales argues that population growth causes congestion costs.

The evidence from economic studies of the aggregate economy suggests

constant returns to scale, that is the mid-point of the two groups of critics. For example, from an econometric test on the production function for the private sector, Otto and Voss¹² find that constant returns to scale for the private sector cannot be ruled out. More recently, using a different approach, Lewis and MacDonald¹³ find evidence to support constant returns to scale for the Australian economy. It appears that, for measured GDP, the economies of scale in some activities are offset by congestion costs in other activities.

Some, for example, Withers,¹⁴ argue that a higher rate of population growth will increase the rate of growth of productivity through its impact on the creation and implementation of technical progress. However, as we discuss in Guest and McDonald,¹⁵ there is no clear evidence to support a positive link between population growth and technical progress. Indeed a recent paper, Beaudry and Collard,¹⁶ find, the opposite relation

for the last two decades. That is, for advanced industrialised economies there appears to be a negative relation. The authors interpret this as a temporary phenomenon, to be superseded by a return to 'no relation'.

In the light of this evidence, we believe our assumption of a constant rate of growth of total factor productivity is the most reasonable assumption on which to make judgements about the effect of prospective demographic change on living standards.¹⁷

There is a qualification to our results, the importance of which is impossible to judge at the present time. Our measure of living standards, based on measured consumption, ignores some important influences on well-being. In particular the negative impact on economic welfare of environmental deterioration is not explicitly allowed for. Growth in population and in GDP may lead to further environmental deterioration. How much deterioration will depend in part on the measures used to regulate pollution, such as pollution taxes.

If the higher growth scenarios lead to increasing environmental deterioration, then our measure of living standards will overestimate the growth of economic welfare. If, instead, threats to the environment are controlled by effective regulation then our living standards measure would be more accurate. However, such regulation could imply a lower rate of productivity growth compared with the past. In this instance our projections of living standards would tend to overestimate their actual growth in the future and this overestimate would be greater for the faster growing population projections.

As far as we know, there is no work to give guidance on these issues. It is the case that in the past increased environmental regulation has not led to a slower

rate of productivity improvement. In the absence of evidence to the contrary we feel that this is likely to continue into the future and thus that our projections will not be upset.

We also assume an unchanged retirement age and unchanged employment participation rates of men and women. However, one cannot say that these assumptions are biased in support of our conclusions. It seems likely the retirement age and labour force participation rates, especially of women and especially if the birth rate falls further, will increase instead of decrease. This would increase output and thus living standards.

On balance we feel that our assumptions are conservative, and in that respect underestimate the future increase in living standards.

CONCLUSION

In recent years a number of commentators have argued that living standards of Australians in the future are threatened by prospective demographic change. Our research suggests that these fears are unwarranted. Under a wide range of assumptions about future demographic trends, we show that there will be a substantial increase in living standards in the future, almost doubling in the next 50 years. Australian residents will be much better off in the future than we are today. Future living standards are more or less independent of rates of fertility and rates of immigration. Lower fertility and higher immigration have slight positive effects on living standards but the effects are so small that we feel the best way to describe the relation is independence.

These results will no doubt surprise many people. It is true that demographic ratios will change. The demographic projections on which our conclusions

about living standards are based have the ratio of old people to working age people increasing by large amounts, by 150 per cent in one case. However there are economic mechanisms that offset the increase in old dependency. These are the consumption dividends arising from reduced investment requirements and reduced youth dependency. These consumption dividends will allow Australia in the future to operate with a higher aggregate consumption to GDP ratio. Through this, living standards can be protected.

Some commentators have suggested that family friendly policies be extended using the argument that these policies will raise the rate of fertility and thus improve future living standards. Our research shows that this argument is not relevant for the reason that increasing fertility will not improve future living standards.

There may be good reasons for the extension of family friendly policies. Our

work shows that raising the fertility rate to improve future living standards is not one of them. From this it follows that the success of family friendly policies should not be judged by whether they raise the fertility rate. They should be judged by their record in vindicating these other reasons put forward for them, whatever those reasons may be.

For immigration, our calculations of living standards suggest that there is little reason to choose rates of immigration on the basis of the effect on future living standards, for the reason that this effect is too small to offer guidance. Just as with fertility, immigration policy should be decided on other factors, such as humanitarian considerations.¹⁸

Note

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- ³ Guest and McDonald, 2001, op. cit., see Table 3 for exact numbers.
- ⁴ In artificial steady-state scenarios precise results can be derived. For example, with a population undifferentiated by age, the consumption-maximising, or golden rule, rate of growth of population is zero. D. H. Weil, 'Population growth, dependency and consumption', *American Economic Review*, vol. 89, no. 2, 1999, pp. 251-5, extends this well-known golden rule result to the case of a population differentiated by age.
- ⁵ 'The intergenerational report', issued in the 2002-03 *Australian Budget*, Australian Government, 2002, assumes a higher rate of growth of labour productivity of 1.75 per cent per year.
- ⁶ If the TFR falls even lower to one then we project living standards in 2050 to be 96 per cent above their 1999 level.
- ⁷ Of course, given that under most scenarios population is changing over time, the optimum population is usually changing over time.
- ⁸ The increase continues for the rest of the century. By 2100 the consumption ratio for low fertility exceeds that of the Base case by eight percentage points of GDP.
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- ☞ P. Beaudry and F. Collard, 'Why has the employment-productivity tradeoff among industrialized countries been so strong?', National Bureau for Economic Research (NBER), Cambridge, Massachusetts, Working Paper No W 8754, 2002.
- ☞ Our view concurs with the conventional wisdom. D. Bloom, D. Canning, and J. Sevilla, 'Economic growth and the demographic transition', NBER Working Paper No W 8685, 2001, p. 13, conclude that 'The neutralist theory (that is, no relation from population growth to economic growth) is the dominant view today'.
- ☞ Our measure of the improvement of living standards does not include the benefit to the migrant from moving to Australia. Instead we focus on the post-migration population. However, for many migrants their living standards in Australia are significantly higher than the standards they enjoyed in their country of origin. If this benefit is included then the gains from immigration would be greater. B. R. Parmenter, 'The Economics of Immigration', *Economic Papers*, vol. 9, no. 2, 1990, pp. 39-50, criticises two studies on the effects of immigration into Australia for focussing on the post-migration population.