PEOPLE AND PLACE

ACHIEVING POPULATION TARGETS FOR AUSTRALIA: AN ANALYSIS OF THE OPTIONS

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The authors argue that, if Australia is to achieve a stationary population (zero population growth) within one generation, there is only one feasible path: net migration should be between sixty and a hundred thousand a year while the total fertility rate should be between 1.65 and 1.8. If fertility is at the lower end of this range migration should be higher, and vice versa.

This path would take the population to between 24 and 26 million by around 2037 and maintain it at this level.

Their analysis shows that a lower stationary population of around 21 million could only be achieved by higher fertility (2.06) and zero migration. In contrast, if fertility were to fall to 1.1, very high migration (around 400,000 p.a.) would be required to achieve a stationary population, and the size of that population would be much larger (around 50 million). They also argue that low fertility (around 1.65) and zero migration would provoke a trend towards a dramatic population decline which would be difficult to check or reverse.

INTRODUCTION

Fertility rates in Australia are falling. In the most recent issue of *People and Place*, McDonald[1] estimates that women aged around 30 at present will have a completed family size close to the present cross-sectional fertility rate of 1.80 births per woman. This level is below the level required for the long-term replacement of the population (about 2.06 births per woman). McDonald also refers to a European study[2] which argues that migration cannot be used as an effective substitute for a deficit of births. The criteria this study uses to define the term 'effective', that the total population size remain constant, or, alternatively, that the age structure of the population remain constant, are stringent conditions that lead the authors to conclude that immigrants are not good (numerical) substitutes for births.

Ryder,[3] dealing with the case of Canada, has addressed the same issue using different criteria. Ryder is not concerned about the ultimate size of the population. He aims, instead, to achieve a population which eventually is stationary (constant population size and age structure over a long period of time), whatever its size, but which also has more favourable age distribution characteristics (lower proportions in the ages of dependency). According to Ryder:

> The reason for this choice is that it is difficult to arrive at an objective judgement of an optimal future size for the population – other than that it should eventually become stationary – whereas it is relatively easy to make judgements about the comparative desirability of different age distributions.

In Australia, Cocks[4] aims 'to convince as many Australians as possible that we have enough and possibly too many people living in this country' and that 'the case for stabilising Australia's population within a generation or so is strong enough to withstand the strongest possible presentation of the case for population growth'. He argues that Australia should adopt an explicit population policy and reduce immigration. While Cocks would clearly prefer to see Australia's population stabilise at its present level (18.53 million) or lower, following Young and Day,[5] he is cognisant of the fact that the present, relatively young, age structure of the Australian population implies a small momentum of population growth and, hence, that it is inevitable that the population will continue to grow during the next 30 years. Young and Day indicated in 1995 that, if fertility were to remain constant at 1.865 births per woman (10 per cent below replacement level), and mortality also remained constant, an annual net migration of 50,000 persons per year would yield a stationary population for Australia of around 23 million people well within the next century. The analysis by Young and Day has had a significant impact on the population debate within Australia. Their scenario has been supported by Cocks as producing the smallest feasible stationary population for Australia and it was also adopted in the recommendations of the Australian

Academy of Science's 1995 report, *Population 2040: Australia's Choice*, in which the paper by Young and Day appeared. The goal of 23 million seems also to have received a nod of approval from the current Minister for Immigration and Multicultural Affairs[6] and, indeed, appears to be Australia's implicit population policy at present.

In terms of Australia's total population size, other targets have been specified. Flannery[7] in *The Future Eaters* argues that the golden rule of population (never exceed 20-30 per cent of carrying capacity) implies an optimum population for Australia of between six and 12 million. On the other hand, there are others who favour a much larger population for Australia. Optimums of this sort are usually based on scale economics; proponents feel that a bigger domestic market is more likely to be a sustainable market. For example, former Prime Minister Malcolm Fraser[8] believes that Australia should aim for a population of 40 to 50 million. The Premier of Victoria, Jeff Kennett,[9] has also called recently for a larger Australian population, while the New South Wales Premier, Bob Carr,[10] has taken the opposite stance.

Those who call for an Australian population policy almost always wish to express this policy in terms of the total numbers that occupy the country, or an optimum population size. However they generally fail to address the specifics of how the target size should be reached and, perhaps more importantly, maintained once it is reached. In demographic terminology, a population which maintains a constant population size is called a stationary population. A stationary population has a zero rate of growth, and, in order that this condition is fulfilled, a stationary population has constant levels of fertility and mortality and, consequently, a constant age structure. The classic case of a stationary population is one in which the fertility rate is at replacement level, that is, at the level which ensures that the number of births each year is equal to the number of deaths. Replacement level fertility is around 2.06 birth per woman, given Australia's present levels of mortality. However, as we demonstrate in the paper, it is also possible to obtain a stationary population through a combination of positive migration and below replacement fertility. These are the only ways in which a stationary population can be maintained. Thus, inherent in the notion of an optimum population are the demographic conditions of a stationary population (here termed "stationarity"). That is, an optimum population necessarily will either have replacement level fertility and zero migration or it will have below replacement fertility and a positive level of migration.

In general, the history of immigration to the three main migrant-receiving countries, the United States, Canada and Australia, has been one of surges during periods of economic prosperity and falls during periods of economic recession. As the economic cycles of the three countries have tended to coincide, so has the ebb and flow of immigration levels. The present period is different. During the 1990s the United States and Canada have continued with large scale immigration while Australia has reduced its intake. It seems that the idea of curtailing population growth has gained greater currency in Australia than in the other two countries.

While Young and Day were careful to point out that their projection was based upon an assumption of constant fertility and constant mortality, there has been a tendency to ignore the extent to which these assumptions may not be fulfilled.[11] Since 1994 when they prepared their paper, both fertility and mortality rates have fallen. It is necessary, therefore, to examine different scenarios in which fertility and mortality are allowed to vary. It is also important to draw attention to the dynamics of the ways in which populations change in total number and in their age structures. We shall show that short-term paths (less than 100 years) to most stationary populations are not smooth. Indeed, most paths to a stationary population in the short term involve impossible or, at least, unsustainable assumptions about future trends of fertility and immigration. We demonstrate that population dynamics make it very hard to hit a target without greatly over-shooting the mark. In general, a growing (or declining) population will continue to grow (or decline) for several decades after fertility rates and migration have reached replacement level.

Harry Recher, in an address to the Western Australian branch of Australians for an Ecologically Sustainable Population, is reported to have called for an immediate one-child policy for the current generation so as to avoid asking the next three generations to have no children.[12] Beyond the highly doubtful social assumption that the numbers of children that people have can be manipulated up or down at will, from the standpoint of population dynamics, this is not a sensible approach. If Australian women were to shift immediately to having an average of one child per woman and if net international migration were to be set at zero, then Australia's total population would begin falling almost immediately, reaching 4.7 million in 100 years time. Within 150 years, the Australian population would have fallen to just over one million and would have such a massive inbuilt momentum of decline (a very old age structure) that it would be beyond the point of no return. Under Recher's policy guidelines, as early as 2047, seven per cent of the population would be aged less than 15 and 37 per cent would be aged 65 years and over. In 100 years, 47 per cent would be aged 65 and over. This is an absurd approach.

However, it is equally absurd, as we shall show, to suggest that we should aim at a stationary target of 50 million people, to be achieved within the next century. Indeed, we show that, if the aim is to achieve a stationary population within 100 years, there is only a narrow range of feasible options. This range essentially limits us to doing what we are doing now. That is, the option proposed by Young and Day (or one close to it) is not just a scenario that works, it is the only scenario that works.

THE MATHEMATICAL PERSPECTIVE

The persistence of below replacement fertility has led to an interest among mathematical demographers in the conditions under which a stationary population can be achieved when fertility is below replacement.[13] For example, Espenshade et al. show that a population with below replacement fertility will eventually become stationary if it has a constant annual number of immigrants, and if the age structure of the immigrants is constant, and if the immigrants eventually have constant below replacement fertility and constant mortality. An interesting aspect of their work is that the population existing at the beginning of the period, and their descendants, play no part in the proof because they simply disappear. The proof then needs only to focus upon the migrants who arrive after the starting point because it is these people who will form the basis of the future stationary population. The easy mathematical dismissal of the existing population and their descendants contrasts with the overwhelming social implications of such a circumstance. Consider, for example, a future Japan with no Japanese. Of course, in reality, the disappearing original population would interbreed with the immigrants producing a new and constantly changing people, but this also would have major social implications depending upon the country concerned and the rapidity with which the original population was replaced by immigrants.

We are fascinated by the mathematics of the subject. But, despite this, we do not use mathematical proofs in this paper. Instead we rely upon demonstrations of scenarios using a flexible population projection program developed by Rebecca Kippen in the Demography Program, Australian National University from an earlier version created by Don Rowland, also of the Australian National University.

ASSUMPTIONS AND TARGETS

In the demonstrations which follow, we make use of the following assumptions:

- The projections all commence with the 1997 Australian estimated resident population and age distribution.[14] We use a simple two-sex model with the assumption that there are 105 male births per 100 female births.
- The assumed age structure of migrants is the average age structure of net migrants to Australia in the years 1994-95 to 1996-97. Migrants are also assumed to have the same fertility and mortality rates as the local population from the time that they arrive in the country.
- Expressed in terms of the Total Fertility Rate (TFR), the five fertility assumptions used are:

    a. the TFR rises from 1.796 births per woman in 1997 to 2.05 (slightly below replacement) in 2022, and thereafter remains constant.
    b. the TFR remains constant at 1.796.
    c. the TFR falls from 1.796 to 1.65 by 2007 and thereafter remains constant
    d. the TFR falls from 1.796 to 1.50 by 2017 and thereafter remains constant, and
    e. the TFR falls from 1.796 to 1.30 by 2027 and thereafter remains constant.

- Two mortality assumptions are used:

a. Expectation of life remain constant at current levels of 75.94 years for men and 81.55 years for women.
b. Expectation of life for men rises from 75.94 years in 1997 to 80.94 years over 50 years and thereafter remains constant. The equivalent rise for women is from 81.55 years to 86.14 years.

- The target (or optimum) population sizes considered are those described in the introduction, that is, 12 million, 18.53 million, 23 million and 50 million.

OUTCOME MEASURES

In addition to the total size of the population, we calculate four measures of the age distribution of the population:

- the proportion of the population aged less than 15 years;
- the proportion of the population aged 65 years and over;
- the proportion of older people who are very old (85 years+ as a proportion of 65 years+);
- a simple measure of dependency (defined below).

The dependency ratio

We employ the same measure of dependency used for Canada by Ryder.[15] It defines the dependent ages as 0-19 years and 60 years and over and the independent ages as 20-59 years.[16] A ratio of one indicates that there is one worker for every dependent. A ratio of less than one indicates that there are more workers than dependents while a ratio greater than one means that there are fewer workers than dependents. Obviously, in economic terms, a lower dependency ratio is preferable.

Population turnover

We also wish to indicate the level of population turnover that is implied by each projection. The measure we use is the proportion of the projected population who are immigrants after 1997 or the descendants of those immigrants.

TYPES OF ANALYSIS

We conduct four types of analysis reflected in the following four questions:

1. Using the assumptions about fertility and mortality, what constant levels of migration would eventually yield the four target populations as stationary populations when there is no time constraint? That is, we are seeking a smooth transition to the target stationary populations and are not concerned with the time taken to achieve the target figure. Obviously, an additional outcome measure here is the length of the process.
2. Using the assumptions about fertility and mortality, which constant levels of migration would be required to reach a stationary population within 100 years when we are not concerned about the final total population size? The obvious additional outcome measure is the population size that results.
3. Using the assumptions about mortality, which combinations of fertility (varying for 30 years and then constant) and constant migration are required to achieve the four target populations as stationary populations within 100 years?
4. Using the assumptions about fertility and mortality, what constant level of migration would be required to reach the four population targets in fifty years and how would migration need to vary in the subsequent 50 years in order to maintain each target population size? In the case of the target which is the same as the present population (18.53 million), migration would have to vary in the *first* 50 years as well in order to keep the population at this target.

SCENARIO 1: REACHING THE TARGET POPULATION WITH NO TIME CONSTRAINT

When there is no time constraint involved in reaching the four specified stationary population targets, the required levels of constant annual net migration range from 1,400 to 367,000 (Table 1). With one exception, all of the scenarios take more than two centuries to achieve. Two centuries is a ludicrously long time to expect that all demographic parameters will remain constant while we attempt to reach an optimum population target. The exception is the example which best approximates that specified by Young and Day. This is the scenario in which fertility and mortality remain constant at the 1996 level and net migration is 62,000 persons per annum. In this case the population reaches the target of 23 million within a mere 40 years and would remain at that level thereafter.

Table 1: Annual net migration required to reach specified population targets at stationarity. No time constraint.

Mortality (e^o)	Fertility (TFR)	Annual net migration (ANM) ('000s)				Time taken to reach target* (centuries)			
		12m	18.5m	23m	50m	12m	18.5m	23m	50m
75.9/81.6	2.05	3.0	4.6	5.7	12.3	99.2	51.4	59.1	96.4
75.9/81.6	1.796	33	50	62	134	9.2	6.6	0.4	8.1
75.9/81.6	1.65	49	75	94	204	6.0	4.6	2.7	5.1
75.9/81.6	1.50	66	101	126	274	4.5	3.6	2.8	3.5
75.9/81.6	1.30	88	136	169	367	3.4	2.9	2.6	2.3
80.9/86.1	2.05	1.4	2.1	2.6	5.7	207.1	134.9	94.8	194.0
80.9/86.1	1.796	29	45	56	122	10.0	7.5	4.0	8.5
80.9/86.1	1.65	45	69	86	187	6.4	5.1	3.6	5.2
80.9/86.1	1.50	61	94	117	254	4.7	3.9	3.2	3.6
80.9/86.1	1.30	82	126	157	341	3.6	3.1	2.8	2.3

*Within one percent of specified population target

Aside from this one exception, it is evident also that targets are reached more quickly by reducing fertility to very low levels while at the same time increasing net migration. Thus, the fastest route to a stationary population of 50 million (230 years from now) is to reduce fertility to 1.3 births per woman (over 30 years) and to increase annual net migration (immediately) to around 350,000. The fastest route to a stationary population of 12 million (350 years from now) is to increase net migration to about 85,000 per annum immediately and to reduce fertility to 1.3 births per woman. From the point of view of political and practical feasibility, all of this is a little absurd, not least of all because of the time frames involved.

Table 2: Outcome measures for projections given in Table 1 and Table 3

Mortality (e^o)	Fertility (TFR)	<15% [a]	>65% [b]	(85+/65+)% [c]	Dependency Ratio [d]
Constant lifeexpectancy	2.05	18.7	20.1	14.8	1.04
	1.796	16.6	21.5	14.9	1.02
Males =75.9 yrs	1.65	15.5	22.3	14.9	1.02
Females = 81.6 yrs	1.50	14.3	23.0	14.9	1.01
	1.30	12.7	24.1	15.0	1.00
Increasing life expectancy	2.05	17.8	23.5	19.2	1.15
	1.796	15.8	25.0	19.2	1.14
Male -> 80.9 yrs	1.65	14.6	25.8	19.3	1.14
Female -> 86.1 yrs	1.50	13.5	26.7	19.3	1.13
	1.30	11.9	27.8	19.3	1.13

Note: The different migration levels are not shown in Table 2 because, under the assumptions used here, they do not affect the age structure

a Percentage of the population aged under 15 years.

b Percentage of the population aged 65 years and over.

c Percentage of the population aged 65 and over who are aged 85 and over.

d See text above and endnote 16.

The final stationary age structures matching the projections in Table 1 are shown in Table 2. Note that the age structure of any stationary population is wholly determined by its age-specific fertility and mortality rates and the age pattern of the net migrant intake; neither the size of the final population nor the level of net migration have any impact on the age structure. This is why these variables are not shown in Table 2. Therefore the 12 million population and the 50 million population described in the previous paragraph would have exactly the same age structure. Not unexpectedly, a population with higher fertility will have a somewhat younger age distribution than one with lower fertility, and a population with a higher expectation of life will have an older age structure than one with a lower expectation of life.

More importantly, however, the resultant age structures are not all that different from each other. The proportion of people aged under 15 years ranges only from 11.9 per cent to 18.7 per cent while the proportion of people aged 65 years and over spans values from 20.1 per cent to 27.8 per cent. Not unexpectedly, the proportion of aged persons who are very old is dependent only on the expectation of life. Similarly, the dependency ratio is hardly affected at all by the differing levels of fertility and only marginally by the differing levels of mortality.

Overall, the conclusion is that, in policy terms, the differences between the final age structures resulting from the different assumptions used would pale into insignificance compared to the policy impacts of the different sizes of the final populations. Nevertheless, the younger age structure associated with near replacement fertility could be seen as an added advantage.

SCENARIO 2: POPULATION STATIONARITY WITHIN 100 YEARS WITH NO CONSTRAINT ON THE POPULATION SIZE

A problem with Scenario 1 is that the target populations are set rigidly. We may not be concerned if our final total population is a few million removed from the target so long as we are able to achieve the result quickly. Thus, in Scenario 2, we set the constraint that the final population size must be reached within 100 years with the same set of fertility and mortality assumptions, but with no fixed target population. We show the annual constant level of net migration that would be required, the ultimate total population sizes and the percentage of the final population who would be immigrants and their descendants during the 100 years of the projection (Table 2).

Note that the range of achievable stationary populations within the next 100 years is from 20 million to 36 million. Thus stationary populations of 12 million or 50 million are unattainable under these assumptions (more on this below). Also, in all cases, there is little change in the population size after 50 years. That is, the populations are near-to-stationary within 50 years, coming close to Cocks' call for stabilising Australia's population size within a generation.

The striking finding of Table 2, however, is that, if we were aiming at a low stationary target population, we would increase fertility to replacement level and decrease net migration to zero. On the other hand, if we were aiming at a high target then the reverse is true; we would reach it by a combination of very high net migration and very low fertility. Annual net migration of 250,000 per year for the next 100 years is very likely to be off the political agenda; with this level of migration and a TFR of 1.3, assuming no interbreeding, only 25 per cent of the Australian population in 100 years would be the descendants of current Australian residents.

On the basis that a rise in expectation of life is both likely and desirable, and that fertility is unlikely to rise much above its present level of 1.80 and that, based on the experience of the late 1980s, net migration in excess of a constant 120,000 per annum would not be sustainable over a long period of time, the following conclusion emerges. The only feasible stationary populations with constant net migration levels would be those lying between the second and third rows of the second block of figures in Table 3. That is, the only feasible stationary population size that can be achieved in the next 100 years is one of around 24 to 26 million. This would be achieved with a constant net migration of between 60,000 and 100,000 per annum. If fertility is lower, migration must be higher, and *vice versa*. The age structures relating to these outcomes are the same as those in Table 1. Thus, around 25 per cent of the population would be aged 65 years and over and the dependency ratio would be about 1.14.

Table 3: Annual net migration required for population stationarity within 100 years. Notarget population constraint.

Assumptions		ANM	Total population (millions)			Replacement by immigrants (%) [a]
Mortality	Fertility (TFR)	('000s)	50 yrs	100 yrs	Final	
Constant life expectancy Male = 75.9 yrs Female = 81.6 yrs	2.05	5	20.8	20.3	20.3	3.8
	1.796	62	23.2	23.2	23.1	36.0
	1.65	101	24.6	24.8	24.8	50.5
	1.50	151	26.9	27.6	27.5	62.6
	1.30	254	32.2	34.6	34.6	75.8
Increasing life expectancy Male -> 80.9 yrs Female -> 86.1 yrs	2.05	2.5	21.6	21.3	21.3	1.9
	1.796	59	24.0	24.4	24.3	34.3
	1.65	98	25.5	26.1	26.2	49.0
	1.50	147	27.8	29.0	29.0	61.1
	1.30	246	33.1	36.1	36.0	74.4

[a] Percentage of the population after 100 years who are post-1997 immigrants or the descendants of those immigrants

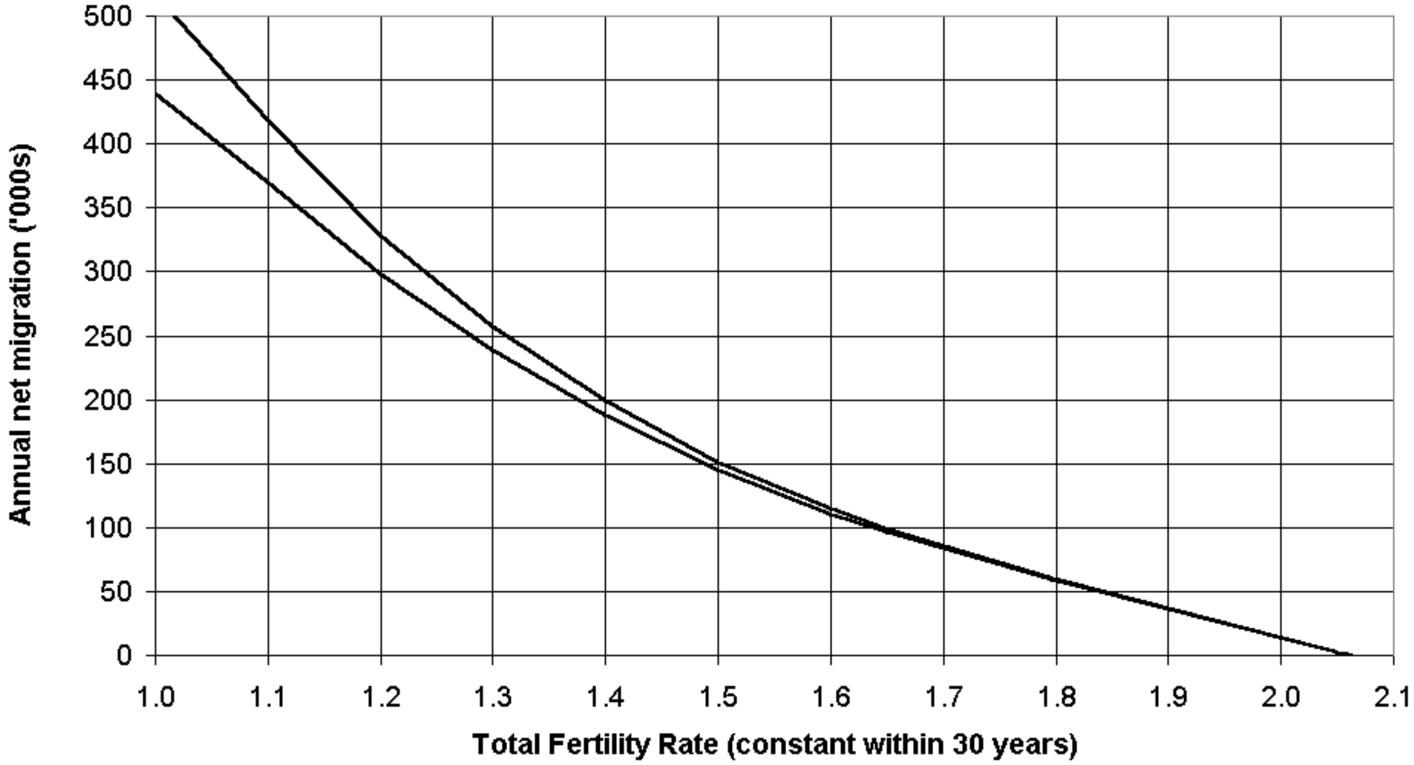
SCENARIO 3: ACHIEVING PARTICULAR TARGET STATIONARY POPULATIONS WITHIN 100 YEARS

In Scenario 2, we observed that the final population size was a function of both fertility and net migration, with higher targets being reached by a combination of high migration and low fertility and low targets being reached by a combination of replacement level fertility and zero migration. In this third scenario, we generalise this finding by allowing fertility to vary.

Thus, in this scenario we assume that the TFR changes from its present level (1.80) to another level between 1.00 and 2.06 over a period of 30 years and thereafter remains constant at that level for 70 years. Mortality follows the second mortality assumption (increasing expectations of life) and net migration is constant across the 100 years.

The results are graphed in Figures 1 and 2. The vertical axis in Figure 1 shows the range (between the lines) of levels of net migration which would yield a stationary population within 100 years, when the TFR changes to the level shown on the horizontal axis of the graph and annual net migration is constant for 100 years.

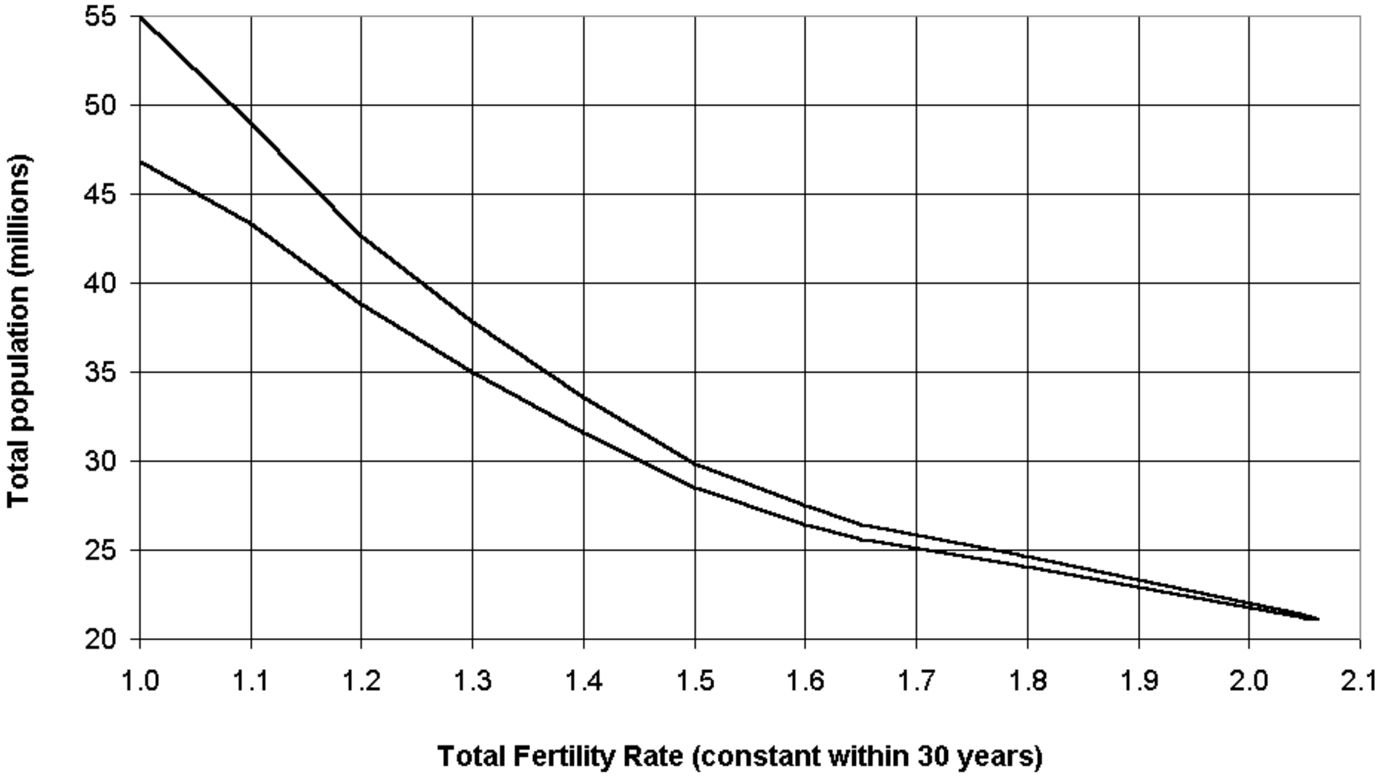
Figure 1: Range of constant annual net migration allowable for given Total Fertility Rates and increasing life expectancy (mortality assumption b) to achieve population stationarity within 100 years



For example, if fertility were to rise to replacement level, 2.06, then zero migration would yield a stationary population. However, if fertility were to fall to 1.1, then migration between 370,000 and 440,000 per annum would be required to achieve a stationary population.

Figure 2 is directly associated with Figure 1. It shows the size of the stationary populations that would result from the combinations shown in Figure 1. The relationship already observed with Scenario 2 becomes very obvious. High stationary populations are achieved with high migration and low fertility; low stationary populations are achieved with zero migration and replacement level fertility.

Figure 2 Range of stationary population numbers achievable within 100 years with given Total Fertility Rates, constant annual net migration and increasing life expectancy (mortality assumption b)



The range of the feasible is shown again to be a TFR between 1.65 and 1.80, immigration between 60,000 and 100,000 and a final population between 24 and 26 million.

SCENARIO 4: ACHIEVING THE POPULATION TARGETS WITHIN 50 YEARS AND THEN VARYING MIGRATION TO MAINTAIN THE TARGET POPULATION SIZE

In the final scenario, we drop the constraint of a constant level of annual net migration. Instead, we assume that migration is initially set at the level which will reduce or increase the population to the target level within 50 years and that thereafter migration is allowed to vary from year to year in order to keep the population at its stationary target. This is a way in which the particular targets can be met within a short time frame. Eventually, usually after not much more than 100 years, the population age structure stabilises and annual net migration becomes constant. Figures 3 to 6 show the trajectories of net annual migration and total population for the case where expectations of life increase and fertility falls to 1.65 children per woman, in our view, the most likely scenario. In fact, the pathways with other fertility and mortality assumptions to the specified population targets look very similar to those shown in Figures 3 to 6. The assumption of constant net migration in the first 50 years could also be varied so that there was not such a large discontinuity in the migration flow at the point of 50 years out but, again, the essential features of the result would be similar.

Figure 3: Annual net migration required to keep the population constant at 12 million after 50 years (fertility assumption c and mortality assumption b)

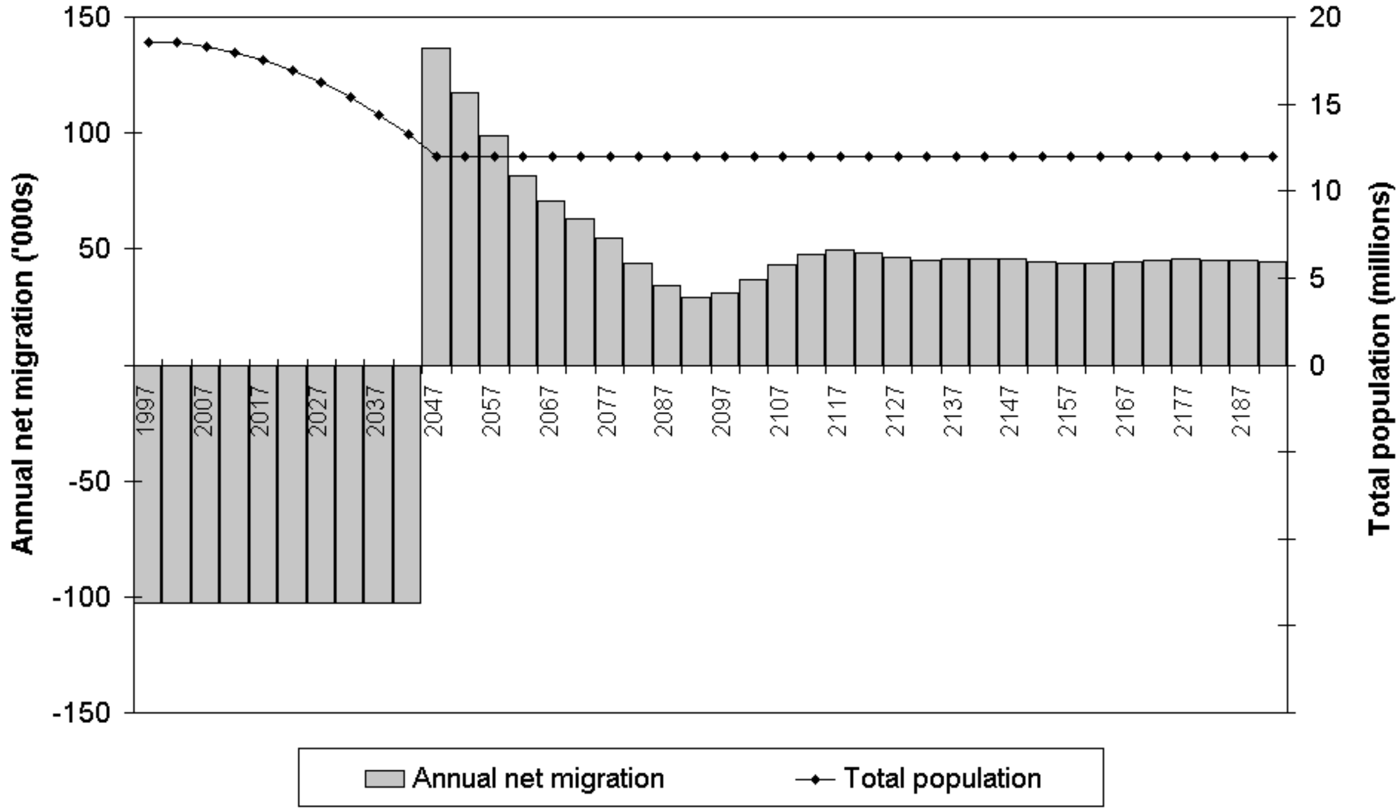


Figure 4: Annual net migration required to keep the population constant at 18.53 (fertility assumption c and mortality assumption b)

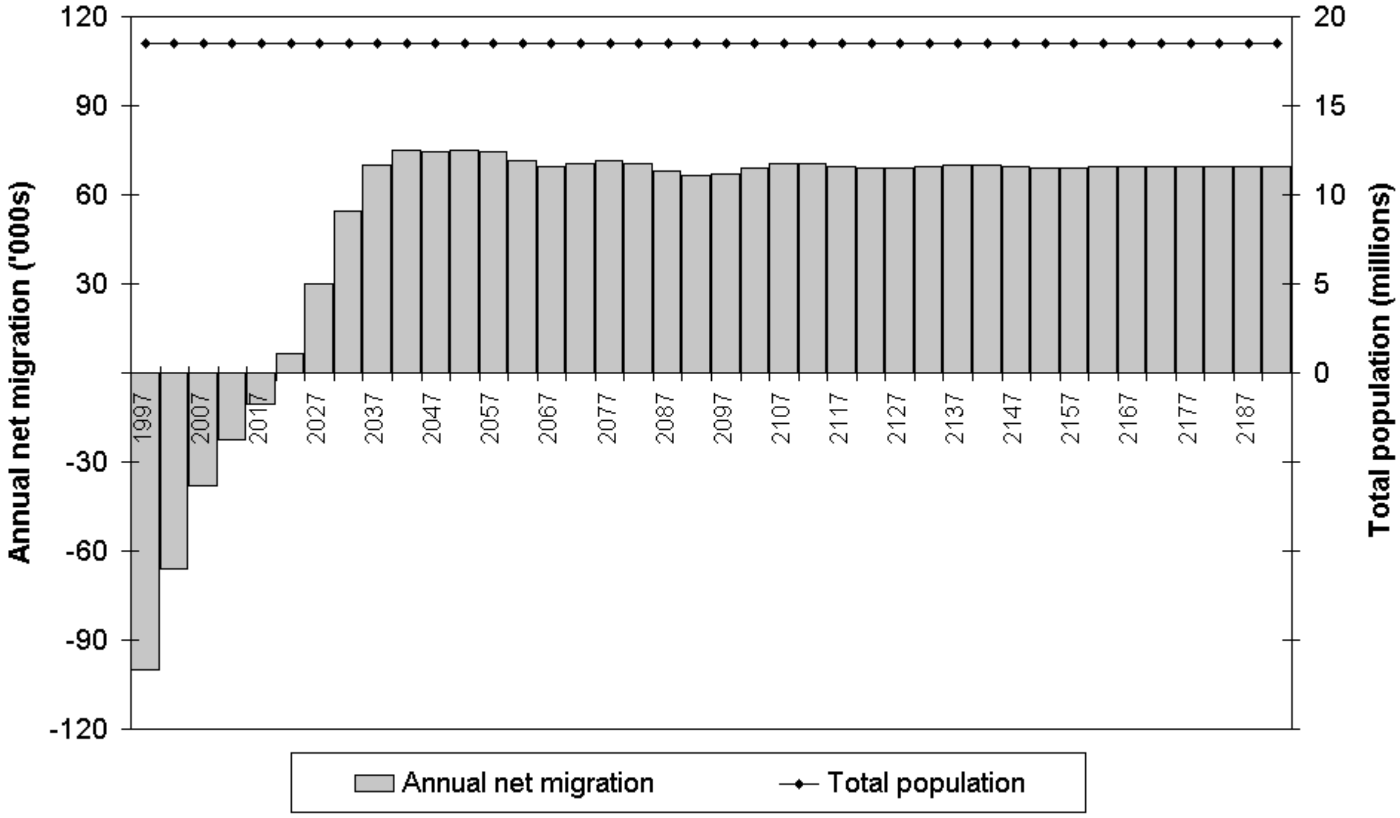


Figure 5: Annual net migration required to keep the population constant at 23 million after 50 years (fertility assumption c and mortality assumption b)

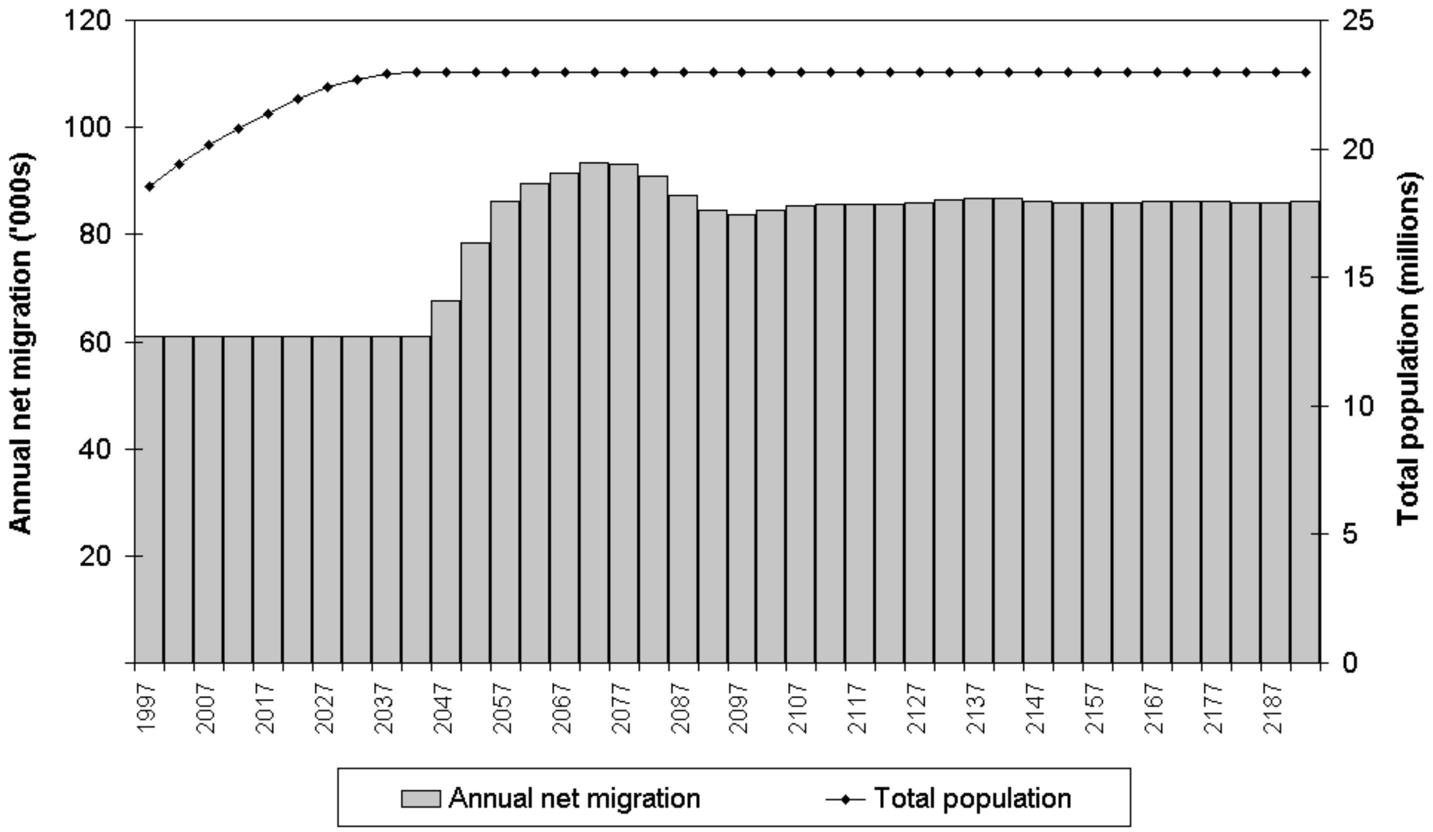
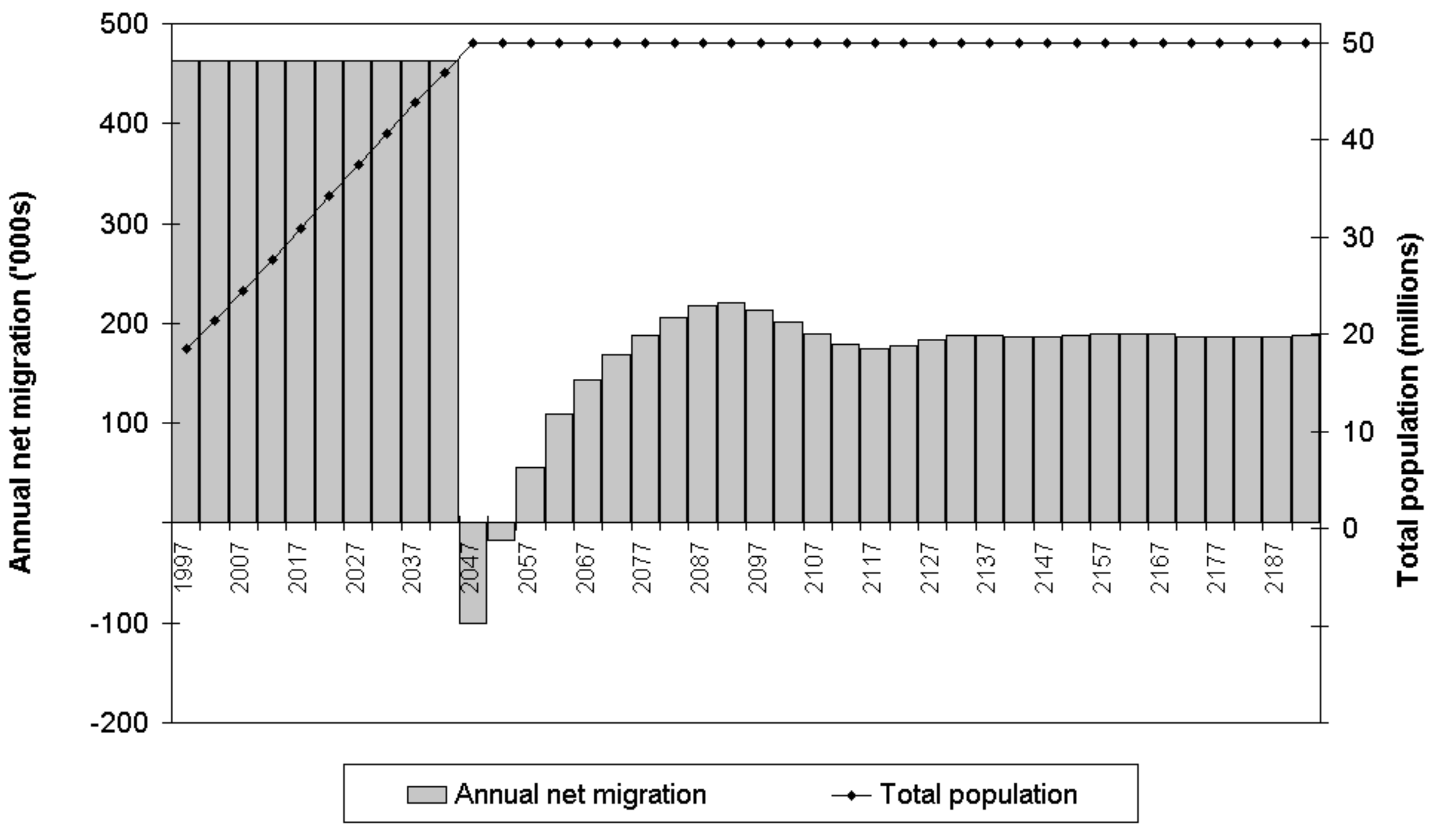


Figure 6: Annual net migration required to keep the population constant at 50 million after 50 years (fertility assumption c and mortality assumption b)



It is immediately obvious that three of the four pathways involve ludicrous assumptions. The two low targets would involve giving a very large number of Australians a one-way ticket out of Australia. The 50 million target involves enormous annual migration in the first 50 years. Again, in stark contrast, the pathway which reaches Young and Day's 23 million

(Figure 5) is smooth and easily achievable.

CONCLUSIONS

We have demonstrated that the only feasible stationary population for Australia within Cocks' one generation is one which has a final population size of around 24 to 26 million. This scenario incorporates net annual migration of between 60,000 and 100,000 people, depending upon the level of fertility. Other population targets would take centuries to achieve in any kind of reasonable way, that is, without massive immigration, without considerable emigration, without the original population being swamped by new entrants and without fertility falling to unreasonably low levels. However, to presume that fertility, mortality and net migration would be constant, or even close to constant, over centuries is also completely unreasonable.

The one feasible path to stationarity implies a total fertility rate which does not fall much below about 1.65 births per woman which, for comparative purposes, is about the level presently applying in Canada. When fertility falls, to obtain a stationary population within a reasonable period of time, the level of immigration must be increased. This leads to an ultimately larger final population and a population which is dominated numerically by the recent immigrants. Thus, a population policy for Australia needs to be directed towards providing conditions under which fertility would not fall below about 1.65 births per woman.

We should also repeat here why we have focussed on the notion of a stationary population. The reason is that, if the aim is to achieve a target or optimum population, we must reach that target in such a way that we do not overshoot the mark by a substantial amount. To illustrate the point, those who prefer the low target might argue, for example, that we could have a TFR of 1.65 and zero migration and allow the population gradually to fall. The problem with this approach is that, by the time the population fell to 12 million, there would be a large momentum (created by the age structure and the low fertility) for further decline of the population. Indeed, the population would drop by more that 50 per cent, to about 5.5 million in the following century. We could not at that point change the age structure and, to stop the fall of population, fertility would have to rise to a level well above replacement.

The study has also shown that the age distributions of likely future stationary populations do not differ greatly from each other. Indeed, the extent of ageing of the population which will inevitably occur in Australia over the next 50 years is greater than the differences between the age structures of the range of possible future stationary populations examined here (Table 2). The present percentage of the population aged 65 years and over is 12.1 per cent. Taking the projection option in Table 2 with increased expectations of life and TFR falling to 1.65 (the most likely result), the percentage aged 65 years and over will rise to 25.8 per cent. This change (from 12 per cent aged 65 plus to 26 per cent) is far greater than the range of possible outcomes shown in Table 2.

Hence, contrary to the viewpoint of Ryder quoted above, variation in the size of any future population will be a much more important policy consideration than variation in its age structure. Presuming that we do not intend to have immigrants who are all old persons or who are all children, that is presuming that the age structure of immigrants remains broadly similar to the present age structure of migration, then it is pointless to be aiming for a younger or an older age structure if at the same time we are aiming for zero population growth. However, if we allow fertility to fall to very low levels and we do not offset the fall in population with very large scale immigration (we would say, impossibly large scale), then the population will age dramatically beyond the bounds shown in Table 2. This again reiterates the need to maintain fertility at or above 1.65 births per woman.

While we have demonstrated that, in setting an optimum population level, Australia has only one option within the current planning future, even that option may well prove to be inaccessible. The 'loose cannon' is whether or not future levels of fertility will remain within close proximity of present levels. Another factor which may be difficult to control is the level of non-permanent movement to and from Australia.

References

1 P. McDonald, 'Contemporary fertility patterns in Australia: first data from the 1996 Census', *People and Place*, vol. 6, no. 1, 1998, pp. 1-13

2 R. Lesthaeghe, H. Page and J. Surkyn, 'Are immigrants substitutes for births?', IPD – Working Paper 1988-3, Interuniversity Program in Demography, Brussels, 1988

3 N. Ryder, 'Migration and population replacement', *Canadian Studies in Population*, vol. 24, no. 1, 1997, pp. 1-26

4 D. Cocks, *People Policy: Australia's Population Choices*, University of New South Wales Press, Sydney, 1995, pp. xi, xiii

5 C. Young and L. Day, 'Australia's demographic future: determinants of our population', in Australian Academy of Science, *Population 2040: Australia's Choice*, Proceedings of the Symposium of the 1994 Annual General Meeting, Australian Academy of Sciences, Canberra, 1995

6 Quoted in the Newsletter of Australians for an Ecologically Sustainable Population (AESP), no. 33, March 1997, p. 1

7 T. Flannery, *The Future Eaters*, Reed Books, Chatswood, 1994, pp. 368-9

8 M. Fraser, 'Immigration: key to Australia's relations with Asia', *News Weekly*, 16 May, 1998, p.16

9 3BA radio interview, 16 March, 1998

10 Opening address at the AESP 1997 National Conference in Sydney, 30 August, 1997

11 Young in an earlier study has indicated the impacts on growth of different fertility levels. C. Young, 'Australia's Ageing Population – Policy Options', Bureau of Immigration Research, Melbourne, 1990, pp. 8-10

12 Quoted in AESP Newsletter, no. 35, September 1997, p. 5. Obviously this is an exaggerated statement as, once the first generation has had no children, it is redundant to mention the following two generations.

13 T. Espenshade, L. Bouvier and W. Arthur, 'Immigration and the stable population model', *Demography*, vol. 19, no. 1, February 1982, pp. 1-28; G. Gesano, 'Nonsense and unfeasibility of demographically-based immigration policies', *Genus*, vol. 50, no. 3-4, 1994, pp. 47-63; Ryder, op. cit.

14 Australian Bureau of Statistics, *Australian Demographic Statistics*, September Quarter 1997, Cat. No. 3101.0

15 N. Ryder, 'Migration and population replacement', *Canadian Studies in Population*, vol. 24, no. 1, 1997, pp. 1-26. Ryder's use of this measure follows D. Ahlburg and J. Vaupel, 'Immigration and the dependency burden', *International Population Conference, Montreal*, vol. 4, International Union for the Scientific Study of Population, Liege, Belgium, pp. 61-71; T. Espenshade, 'Can immigration slow U.S. population aging?', *Journal of Policy Analysis and Management*, vol. 13, no. 4, pp. 759-68

16 Reflecting relative costs, the 0-19 age group has less weighting than the 60 and over age group. The specific measure is: [3P(0-19) + 5 P(60+)]/4P(20-59), where P(i) is the population in age group i. We describe this measure as simple because it is notional and does not consider actual flows of support from one age group to another. Development of more sophisticated measures of intergenerational transfer is an area for a future paper.

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