Growth-Friendly Demography of New Zealand

JOHN BRYANT*

Abstract

New Zealand has, by OECD standards, high birth rates. This has provided New Zealand with a relatively young population and continuing labour force growth. Both these features are, on many accounts, good for economic growth. Yet most discussions of New Zealand’s economic performance and its prospects for moving up the OECD income distribution have paid little attention to demography. This paper defines “demography” narrowly as population size, growth, and age-structure, and examines the likely effects on New Zealand’s growth rate in GDP capita, relative to the rest of the OECD. The overall conclusion is future demographic trends are likely to provide New Zealand with a small advantage, relative to the rest of the OECD.

New Zealand has slipped down many OECD league tables since the 1950s, but not the table for fertility rates. In 2000, New Zealand’s fertility rates placed it fifth in the OECD, some way behind Turkey and Mexico, but only marginally behind the United States and Iceland. Sustained higher fertility rates generally mean a younger population and continued labour force growth. Many commentators argue that a younger population and growing labour force is good for economic growth. New Zealand’s relatively high birth rates may therefore give New Zealand a slight economic advantage over other OECD countries. This needs to be taken into account when assessing New Zealand’s prospects for returning to the top half of the OECD. It also needs to be taken into account when assessing the relevance of imported policy prescriptions about maintaining growth rates in the face of an “old age crisis” (World Bank 1994; OECD 1998). Yet demographic trends have received little attention in recent debate on the New Zealand economy.

This paper surveys the likely effects of New Zealand’s slightly unusual demographic profile on its prospects for growth in GDP per capita. “Demography” is defined narrowly to mean population size, growth, and age-structure. Some topics that are occasionally included under the heading

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of demography, such as education levels or population “quality”, are deliberately excluded. The paper also abstracts away from many country-specific details. For instance, when looking at the effects of population ageing on labour force participation, the paper ignores cross-country differences in age-specific participation rates.

The decision to focus on the demographic basics was taken partly on pragmatic grounds — the paper needed to be restricted somehow — and partly in reaction to previous research. Some demographers have been conducting detailed analyses of demographic trends with likely economic significance (Pool 2000; McDonald and Kippen 2001), as have some economists (Bloom 2001). However, the international literature on the economics of population has placed relatively little emphasis on detailed exploration of underlying demographic trends. For instance, of the 30 background papers that the OECD commissioned for its 1998 report *Maintaining Prosperity in an Ageing Society*, none looked specifically at the demographic trends (OECD 1998:138-9). The result is that the pool of stylised demographic facts drawn on by most economic and policy analyses is very limited.

The first part of this paper gives a broad overview of trends in population size and age structure in the OECD, and at the underlying trends in fertility, mortality, and migration. It begins by looking at the OECD as a whole, and then moves on to comparisons between New Zealand and other countries and regions. The second part of the paper combines demography and a little economics. It describes selected demographic trends in more detail and discusses their potential economic significance, including their likely impact on New Zealand’s ability to raise its GDP per capita closer to that of wealthier OECD countries. The emphasis of the paper is generally on relative, rather than absolute, GDP levels and growth rates. The paper does not consider the relationship between changing demography and savings, a large topic that has received detailed treatment elsewhere (Hurd 1997; Weil 1997).

The paper concludes that future trends in the proportional share of the working-age population and in the balance between young and old dependants will advantage New Zealand compared to Europe and Japan, but not compared to Australia and North America. The advantage is likely to be relatively small: it would be unrealistic to expect narrowly defined determinants such as population size and structure to have a large influence on a phenomenon as complicated as economic growth. But the predictability of demographic change means that incorporating demography into discussions of future economic prospects can nevertheless be valuable.
The Sample and Data

The paper compares only across countries in the OECD. Most policy discussion concerns New Zealand’s position in the OECD income distribution rather than the world income distribution. The paper’s approach of holding institutions, income levels, culture, and other determinants of long-run economic performance constant is also more sensible when comparison is limited to the OECD than it would be for a larger, more heterogeneous group.

The paper uses data for all 30 OECD countries. Results are shown for New Zealand, Australia, Japan, and the three groups defined as follows:

<table>
<thead>
<tr>
<th>Group</th>
<th>Countries included</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland, United Kingdom</td>
</tr>
<tr>
<td>Recently developed countries (RDCs)</td>
<td>Korea, Mexico, Turkey</td>
</tr>
<tr>
<td>North America</td>
<td>Canada, United States</td>
</tr>
</tbody>
</table>

Australia is treated separately because the Australian and New Zealand labour markets are closely integrated, and because Australia is the principal country with which New Zealand compares itself. Japan forms its own group, as it does not fit into any of the others. The groupings are based on the conventional criteria of geography and economic similarity. Using these conventional criteria helps relate the results back to the more general policy literature. The groups would be slightly different and the demographic contrast would be more marked if the groups had been assembled on the basis of demographic similarity. France, for instance, would be included with the United States, and Canada would be included with the European countries, on the basis of current fertility rates (France, like the United States, has significantly higher fertility than Canada).

The paper uses “the OECD” as shorthand for “countries that are currently members of the OECD”. This leads to a few anachronisms, such as references to the OECD population in 1950, although the OECD was not established until 1961. The justification is convenience.

The demographic estimates and projections are obtained from the United Nations Population Division’s online database *World Population Prospects*.
The 2002 Revision. The UN estimates and projections are the only ones available that are sufficiently detailed, consistent, and comprehensive to enable the cross-country comparisons carried out in this paper.

Uncertainty about Future Demographic Trends

The UN projections are not well suited, however, to properly representing uncertainty about future demographic trends. The UN represents uncertainty simply by calculating three different projection variants based on “high”, “median” and “low” fertility assumptions, with the median assumption being the UN’s preferred estimate. As demographers now emphasise, the traditional variant approach can give misleading results. The only internally consistent and readily interpretable way of representing uncertainty about future demographic trends is to construct fully stochastic population projections (Lutz, Vaupel, and Ahlburg 1998; Bryant 2003a).

Since stochastic population projections with the required level of detail are not available, this paper cannot represent uncertainty in a satisfactory way. The charts in this paper show only the UN’s median variant. Warnings are, however, attached to results that demographic principles suggest are particularly uncertain. The paper also avoids spuriously precise statements of the form “Country X’s population will begin to decline in year 2037”.

Trends in OECD Averages

This section averages across the entire OECD, to establish the major trends. The OECD averages shown here are weighted averages, with the weights proportional to countries’ populations. The United States, with a 2000 population of 283 million, has by far the largest weight. Cross-country differences are examined in the following section.

Movements in population size and age structure are driven by movements in fertility, mortality, and migration. Figure 1 shows fertility and mortality rates. Fertility is measured using the “total fertility rate”. This is the sum of (single-year) age-specific fertility rates; it has an intuitive interpretation as the number of births the average woman would have over her life time if prevailing age-specific fertility rates were to prevail indefinitely. Average fertility has clearly been falling since the 1960s. Fertility rates during the 1950s and 1960s, the height of the baby boom, were in fact higher than they had been for several decades, except in the recently developed countries (RDCs) and Japan. Even in the RDCs, however, the post-war declines in infant and child mortality meant that “net” fertility
was higher than previously. The UN median variant projection shown in Figure 1 assumes that average fertility will rise somewhat in coming decades.

Mortality is measured in Figure 1 by life expectancy at birth. As is apparent in the figure, the UN assumes that gains in life expectancy will be smaller in future decades than they have been in past decades. There are as yet no signs of a slow-down, however, and demographers are increasingly arguing that the UN is underestimating future life expectancies (Vaupel 1997).

Figure 1: Estimates and projections of fertility and mortality levels for the OECD

Source: Calculated from data from the UN Population Division’s World Population Prospects online database.

Unfortunately, data on total migration into and out of the OECD as a whole are scarce. The UN’s Population Prospects online database does show, however, that net migration into “developed regions” in 2000 was about 1.8 migrants per thousand population. Migration on this scale is sufficient to materially affect population growth rates, but not age structure.3

Past and projected population sizes and growth rates for the whole of the OECD are shown in the bottom row of Table 1. The OECD as a whole grew steadily over the period 1950-2000, but the UN predicts that in-migration and future improvements in mortality will only partly compensate for lower birth rates, so that population growth will slow markedly in the future.

Figure 2 shows trends in age structure. Note that the working-age population is defined here, and throughout the paper, as ages 20-64, and not 15-64, 15+, or 20+ as is often done. Most 15-19 year olds in OECD
countries are now in education rather than work, so an increase in the size of this age group is more accurately represented as an increase in the “dependent” population than the “working age” population. An analogous argument applies to people aged 65 and over.

**Figure 2: Estimates and projections for the age structure of the OECD**

![Figure 2: Estimates and projections for the age structure of the OECD](image)

Source: Calculated from data from the UN Population Division’s *World Population Prospects* online database.

**Table 1: Estimates and projections of population size and growth rates**

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>8.2</td>
<td>19.1</td>
<td>1.7</td>
<td>25.4</td>
<td>0.6</td>
</tr>
<tr>
<td>Europe</td>
<td>350.8</td>
<td>452.7</td>
<td>0.5</td>
<td>379.1</td>
<td>-0.3</td>
</tr>
<tr>
<td>Japan</td>
<td>83.6</td>
<td>127.1</td>
<td>0.8</td>
<td>98.7</td>
<td>-0.5</td>
</tr>
<tr>
<td><strong>New Zealand</strong></td>
<td><strong>1.9</strong></td>
<td><strong>3.8</strong></td>
<td><strong>1.4</strong></td>
<td><strong>4.2</strong></td>
<td><strong>0.3</strong></td>
</tr>
<tr>
<td>RDCs</td>
<td>68.9</td>
<td>212.3</td>
<td>2.3</td>
<td>289.9</td>
<td>0.6</td>
</tr>
<tr>
<td>N America</td>
<td>171.6</td>
<td>314</td>
<td>1.2</td>
<td>417.9</td>
<td>0.6</td>
</tr>
<tr>
<td>OECD Total</td>
<td>685.0</td>
<td>1128.9</td>
<td>1.0</td>
<td>1215.2</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Source: Calculated from data from the UN Population Division’s *World Population Prospects* online database.
The age groups used here and in most other charts in this paper are very broad, to simplify comparisons. This means, however, that only the most pronounced structural changes are visible.

The proportional shares of the three age groups in Figure 2 show the imprint of the baby boom and subsequent baby bust. The proportional share of the 0-19 age group increased, mainly at the expense of age group 20-64, during the baby boom decades of the 1950s and 1960s. From the 1970s, however, the proportional share of the age group 20-64 increased again as the baby boom cohorts began to turn 20. As long as the baby boom cohorts remain in the working ages, the proportional share of 20-64 age group will remain high. From about 2020, however, when the baby boom cohorts start to reach age 65, the proportional share of the 20-64 age group is projected to fall, and the share of the 65+ age group is projected to rise. The low fertility rates experienced since the 1980s have kept the proportional share of the 0-19 group small.

The population waves induced by the baby boom and bust have been occurring simultaneously with a rise in the proportional share of older people, resulting from continuing life expectancy gains. Given that the UN may have underestimated the potential for continued increases in life expectancy, the proportional share of the aged may well turn out to be higher than Figure 2 suggests.

Geographical Differences in Demographic Trends

As Figure 3 shows, the recently developed countries (RDCs) have experienced the highest fertility levels in the OECD. New Zealand has, however, had the highest baby boom fertility rates of the non-RDCs shown, though in the decades since the baby boom New Zealand has had similar rates to North America, and only slightly higher rates than Australia. The UN’s median projection implies substantial convergence over coming decades, except that New Zealand, Australia, the RDCs, and North America are assumed to maintain slightly higher fertility than Europe and Japan. Whether New Zealand does maintain higher fertility rates than other OECD countries is, of course, uncertain. It is worth noting, however, that New Zealand has been demographically distinctive for a long time now. And in any case, the effect of any future fertility decline would not be visible in the age structure for years or decades.
Figure 3: Estimates and median variant projections of total fertility rates, OECD countries and regions

![Figure 3: Estimates and median variant projections of total fertility rates, OECD countries and regions](image)

Source: Calculated from data from the UN Population Division’s *World Population Prospects* online database.

Figure 4 presents estimates and projections for life expectancy. With the exception of Japan and the RDCs, the expectancies are tightly bunched. One demographer even suggests that the group of the 21 biggest and most industrialized countries “is behaving increasingly as if it had a single mortality pattern” (White 2002:74). The UN assumes that life expectancy will continue to grow faster in Japan than in other wealthy countries. Some demographers have, however, questioned this assumption (Wilmoth 1998; White 2002). The UN estimates that in recent years, New Zealand has had net inward migration levels of one to two per thousand. The corresponding figures are three to five per thousand in Australia and North America, one to two per thousand in Europe, zero to one per thousand in Japan, and –2 to –1 per thousand in the RDCs. The UN assumes that migration will continue at approximately these levels.

Geographical differences in population sizes and growth rates are shown in Table 1. The RDCs have grown fastest, followed by Australia, New Zealand, and North America, followed by Japan and Europe. The high growth rates of the RDCs reflect their history of high fertility; the relatively high growth rates of Australia, New Zealand, and North America reflect a combination of relatively high fertility and, in the case of Australia and
North America, high migration. Over the period 2000-2050, the populations of the RDCs, Australia, New Zealand, and North America are projected to continue growing, while the populations of Japan and Europe are projected to shrink. New Zealand’s projected growth rate is smaller than that of Australia and North America because New Zealand is assumed to attract less migration. Growth rates differ sufficiently over the period 1950-2050 for the ranking of countries and regions by total population to change: North America overtakes Europe, and the RDCs overtake Japan.

**Figure 4**: Estimates and projections of life expectancy, OECD countries and regions

Source: Calculated from data from the UN Population Division’s *World Population Prospects* online database.

Geographical differences in trends in age structure are summarised in Figure 5. Panel (i) indicates that the countries with the highest fertility rates have the highest proportions in the youngest age group. As Panel (iii) shows, the reverse is true for the oldest age group. Panel (ii) portrays a more complicated situation. Roughly speaking, the countries with the highest fertility initially have the lowest proportion in the working ages, until around 2010, when the order reverses and these countries have the highest proportion in the working ages. This reversal occurs because a decline in fertility initially raises but then lowers the population in the working ages. In all three panels of Figure 5, New Zealand’s trajectory is very similar to that of Australia and North America. This immediately suggests that any effects that age structure *per se* has on economic growth will not greatly help nor hinder New Zealand relative to these two places.
Figure 5: Estimates and projections for the age structure of OECD countries and regions

(i) Population aged 0-19

(ii) Population aged 20-64

(iii) Population aged 65+

Source: Calculated from data from the UN Population Division’s World Population Prospects online database.
Effects on Growth in GDP Per Capita

The Framework

The effects of demographic trends on growth in GDP per capita can be approached using the decomposition

$$\frac{Y}{P} = \frac{Y}{H} \times \frac{H}{W} \times \frac{W}{P}$$  \hspace{1cm} (1)

where $Y$ is GDP, $P$ is population, $H$ is hours worked, and $W$ is working-age population. The decomposition implies that per capita GDP is a product of labour productivity, participation (incorporating both employment levels and hours worked), and the proportion of the population in the working ages. If a demographic trend is to affect GDP per capita, it must do so by affecting one or more of these terms.

For some purposes it is useful to look at the effect of demographic trends on growth rates rather than levels. Taking logs of Equation 1 and differentiating with respect to time yields the following equation, where $r_Y$, for instance, denotes the growth rate of $\frac{Y}{P}$:

$$r_Y = r_{\frac{Y}{H}} + r_{\frac{H}{W}} + r_{\frac{W}{P}}.$$  \hspace{1cm} (2)

The growth rate of GDP per capita is equal to the sum of the growth rates of labour productivity, participation, and the proportion in the working ages. This equation can be used to decompose historical growth rates, or to project future growth rates.

The Proportion of the Population in the Working Ages and GDP Per Capita

Under the decomposition set out in Equation 1, the relationship between the proportion of the population in the working ages $W/P$ and GDP per capita is purely mechanical. If, for instance, the proportion in the working ages goes from 50 per cent to 60 per cent — an increase of 20 per cent — then GDP per capita increases by 20 per cent. An increase in the labour force might be expected to have additional indirect effects, but these must be appear as changes in the $H/W$ and $Y/H$ terms, and not the $W/P$ term. Proportions in the working ages are graphed in Panel (ii) of Figure 5; the values, plus the changes in these values, are summarised in Table 2.
Table 2: Estimates and projections for the proportion of the population in the working ages

<table>
<thead>
<tr>
<th>Percentage of population in working ages</th>
<th>Percentage increase* in the proportion in working ages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Historical</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Australia</td>
<td>58.6</td>
</tr>
<tr>
<td>Europe</td>
<td>58.2</td>
</tr>
<tr>
<td>Japan</td>
<td>49.3</td>
</tr>
<tr>
<td>New Zealand</td>
<td>55.0</td>
</tr>
<tr>
<td>RDCs</td>
<td>45.2</td>
</tr>
<tr>
<td>North America</td>
<td>57.4</td>
</tr>
<tr>
<td>OECD Total</td>
<td>55.6</td>
</tr>
</tbody>
</table>

Source: Calculated from data from the UN Population Division’s *World Population Prospects* online database.

* This is the percentage increase, not the percentage point increase. For example, the result for Australia 1950-1975 is calculated as $100 \times (54.7 \text{ per cent} / 58.6 \text{ per cent}) - 1 = -6.5 \text{ per cent}.$

As discussed earlier, for all countries and regions shown aside from Japan, the proportion in the working ages fell during the post-war baby boom, grew again afterwards, and will fall once more over coming decades. This is apparent in Table 2. Japan’s unusual dynamics advantaged it in the past, relative to the other countries and regions shown, but have begun to seriously disadvantage it. The swings in the RDCs are in the same direction as the majority of the OECD, but are more dramatic.

In 1975, the proportion of the New Zealand population in the working ages was only 51.6 per cent, which was 2.5 percentage points below the OECD average, and lower than any country or region shown, other than the RDCs. Since that time, however, the gap between New Zealand and the rest of the OECD has been closing; under current projections the gap will continue to close in the near future. These population movements imply an increase in the growth rate of New Zealand’s per capita income, relative to the rest of the OECD. This is one case where New Zealand’s demographic profile is delivering it a small advantage over Australia and North America, as well as Europe and Japan.

Growth in the Working-Age Population and Growth in Labour Productivity

The previous section discussed the working age population’s proportional share; this section discusses its absolute size. Many economists argue that
the size of the working age population can affect labour productivity, the $Y/H$ term in Equation 1.

Changes in the size of the working age population are shown in Table 3. In all countries and regions, growth slows over time. The projected values for sizes and growth rates are quite sensitive to variations in assumptions about migration, and, over the long run, assumptions about fertility. Given these uncertainties, the most sensible way to interpret the table is probably that New Zealand, Australia, the RDCs, and North America belong to one relatively fast-growing group, while Japan and Europe belong to another relatively slow-growing group.

**Table 3: Estimates and projections for the size of the population in the working ages**

<table>
<thead>
<tr>
<th></th>
<th>Percentage of population in working ages (millions)</th>
<th>Percentage increase in the proportion in working ages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Historical</td>
<td>Projected</td>
</tr>
<tr>
<td>Australia</td>
<td>4.8</td>
<td>7.6</td>
</tr>
<tr>
<td>Europe</td>
<td>204.3</td>
<td>233.8</td>
</tr>
<tr>
<td>Japan</td>
<td>41.2</td>
<td>67.6</td>
</tr>
<tr>
<td><strong>New Zealand</strong></td>
<td><strong>1.0</strong></td>
<td><strong>1.6</strong></td>
</tr>
<tr>
<td>RDCs</td>
<td>31.1</td>
<td>56.9</td>
</tr>
<tr>
<td>North America</td>
<td>98.5</td>
<td>133.1</td>
</tr>
<tr>
<td>OECD Total</td>
<td>381.0</td>
<td>500.4</td>
</tr>
</tbody>
</table>

Source: Calculated from data from the UN Population Division’s *World Population Prospects* online database.

Many models of endogenous economic growth and of agglomeration effects posit a positive relationship between population size or growth and labour productivity. “Population” is used implicitly to mean “working age population”, so these models may shed some light on the economic implications of the trends in working age population apparent in Table 3.

Some endogenous growth models assume that labour productivity is positively related to population size or growth simply because more people implies more ideas (Romer 2001). These models are sometimes cited in discussions of population ageing and countries’ relative economic prospects. But it is not clear that such models are in fact relevant. After setting up one such model, for instance, Jones (1997:21) warns that “as with many ideas-based growth models, this is a model of growth for the world economy as a
whole... The Belgian economy does not grow solely or even primarily because of ideas invented by Belgians, so the model does not predict that Belgium’s per capita growth rate should be related to its population growth rate”.

There are other, more plausible, mechanisms through which increased population size could raise a country’s productivity. An increase in the pool of workers permits increased specialization, thicker markets, and greater potential for knowledge spillovers. Such effects may be particularly salient for small, remote economies such as New Zealand (Skilling 2001).

However, not all the proposed effects of growth in the working age population are necessarily favourable. Economists have long argued that if labour becomes relatively abundant, its price falls, and employers have less incentive to provide workers with capital or new labour-saving technologies. If labour becomes relatively scarce, the converse is true. A notable formal model of this process has been developed by Romer (1990). In this model, a rise in the supply of labour draws human capital away from the production of research into the production of final goods, which lowers the rate of technical change and hence of economic growth.

There is a large literature investigating the empirical applicability of these models. The remainder of this section looks briefly at some of the macro-level studies of the relationship between growth in the working age population and growth in per capita productivity or incomes.

Several studies focussing directly on the relationship between growth in the working age population and growth in productivity have found the relationship to be negative. Romer (1990:354-7) graphs movements in the working-age population and output per hour worked in the United States over the period 1839-1979 to show that, over periods of 20-40 years, increases in the growth rate of the working-age population seem to induce a one-to-one reduction in the growth rate of labour productivity. He also points out that the incomes of US applied scientists and engineers declined relative to the incomes of doctors, lawyers, and managers during the period of rapid growth in the working-age population in the 1970s and 1980s, just as his model would predict. Little and Triest (2002:145-9) carry out a simple regression analysis on US data for the period 1904-1999, and find a similar effect from growth in the population in the working ages to growth in labour productivity and multifactor productivity. Cutler, Poterba, Sheiner, and Summers (1990:38-45) carry out a regression with fixed country effects on data for 29 high-income countries in the period 1960-85. The relationship between growth in the working-age population and growth in labour productivity varies across specifications, but under all except one
specification an increase in the growth rate of the working-age population of one per cent is associated with a decrease in the growth rate of labour productivity of between zero per cent and one per cent.

Findings such as these imply that the relationship between growth in labour productivity and growth in the working age population can be approximated by an equation of the form

$$r_p = a - br_w, \quad a, b > 0$$

(3)

where $a$ and $b$ are constants, and $b$ measures the extent to which growth in the working age population depresses growth in labour productivity. Substituting Equation 3 and the identity $r_w = r_p - r_H$ into Equation 2 gives

$$r_p = a + r_H + (1 - b) (r_w - r_P)$$

(4)

This equation implies that if the productivity-depressing effects of growth in the working age are large, then regressions of growth in per capita GDP on growth in the working age and total population should obtain coefficients for the working age population that are close to zero or negative.

This is not what happens. In their influential study of demography and economic growth in East Asia between 1965 and 1990, Bloom and Williamson (1998) regress growth rates for GDP per capita on growth rates for the working age and total population, and on other possible determinants of economic growth. Under a range of specifications, the coefficient on growth in the working age population is slightly higher than one. This suggests that growth in the working age population did nothing to depress productivity growth. The relevance to the OECD of results from developing countries could perhaps be questioned. Brander and Dowrick (1994), however, carry out a similar analysis on data for 67 middle and high income countries over the period 1960-1985. In their preferred specification, the coefficient on growth in the working age population is also slightly higher than one (Brander and Dowrick 1994:Table 7).

It seems, then, that neither the empirical nor the theoretical literature provide clear guidance on how growth in the working age population affect growth in labour productivity. The significance for New Zealand’s labour productivity of the trends shown in Table 3 is therefore uncertain.

**Fertility Rates and Female Labour Force Participation**

New Zealand and the other countries with relatively young age structures owe these age structures to relatively high fertility rates. High fertility rates might be expected to depress the participation term $H/W$ in Equation 1, on
the grounds that parenthood keeps people out of the workforce. Given the prevailing division of labour between genders, the effect on participation would presumably be most apparent for women.

**Figure 6:** Female labour force participation rates versus total fertility rates, OECD 2000

Figure 6 presents 2001 OECD data on fertility rates and female labour force participation to test these ideas. The two countries with the highest fertility do indeed have the lowest participation rates. But these two countries, Turkey and Mexico, are clear outliers. Among the remaining countries, there is in fact a mildly positive association between fertility and labour force participation. This was not always the case: in the 1970s the association was negative (Ahn and Mira 2002). Scholars generally explain the current positive association by pointing to institutional features, such as the availability of childcare, that reduce the incompatibility of childrearing and paid work, and raise both fertility and participation (Rindfuss and Brewster 1996). The reason that Mexico and Turkey fail to conform to these generalizations is probably that they are significantly poorer than any other OECD countries, and have rather different economic and social structures.

The international literature on fertility rates and labour force participation is vast and inconclusive. Given that there is no clear relationship between fertility rates and participation, and that fertility rates have in any case been converging across the OECD (Figure 3), it seems
unlikely that differences due to fertility in participation rates will be an important source of cross-country variation in per capita incomes.

**Age Structure of the Working Age Population**

Within the working age population, both employment and productivity vary by age. All else equal, a change in the age structure of the working age population implies a change in average participation and productivity levels, the $H/W$ and $Y/H$ terms in Equation 1. Some commentators imply that these charges will be significant (OECD 1998).

The relationship between the age structure of the working age population and average participation levels across the working-age population can be expressed with an equation of the form

$$\frac{H}{W} = \sum a_i \left( \frac{H}{W} \right)_i, \quad \sum a_i = 1$$

where $\left( \frac{H}{W} \right)_i$ is average hours worked by people in age group $i$, and $a_i$ is the proportion of the working age population in age group $i$. A similar equation can be used for productivity, though in this case the $a_i$ measures hours worked by people in age group $i$ as a proportion of hours worked by the whole working age population.

Figure 7 shows the proportion of age groups 20-24 to 60-64 in employment, an approximation of the $\left( \frac{H}{W} \right)_i$. Estimates are shown for New Zealand and for the OECD as a whole. Obtaining analogous estimates for productivity is more difficult, since all of the usual measures such as wages or time in employment are flawed in important ways. The standard assumption is that productivity rises and then declines with age (Stephenson and Scobie 2002:9-10).

Are ongoing age structural changes sufficiently large to produce a significant effect on participation or productivity? Table 4 presents data on the age-structural changes. The projected age structures for 2050 are noticeably different from those of 1950: for instance, the proportion of the New Zealand working age population aged 60-64 increases from 7.5 per cent in 1950 to 11.6 per cent in 2050. Changes in other age groups are, however, smaller, and the mean age of the New Zealand working age population rises by only 3.3 years over the century between 1950 and 2050.
Figure 7: Employment ratios by age, New Zealand and OECD, 2001

Source: Calculated from data from the OECD Labour force data online database
Note: Employment ratios are defined here as the number employed full time or part time divided by the population in the age group.

Table 4: Distribution of working age population by age

<table>
<thead>
<tr>
<th></th>
<th>New Zealand</th>
<th>OECD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1950 2000 2050</td>
<td>1950 2000 2050</td>
</tr>
<tr>
<td>20-24</td>
<td>13.3 11.2 10.7</td>
<td>14.6 12.1 10.7</td>
</tr>
<tr>
<td>25-29</td>
<td>13.6 11.8 10.1</td>
<td>14.0 12.6 10.8</td>
</tr>
<tr>
<td>30-34</td>
<td>13.0 12.7 9.8</td>
<td>11.4 12.7 10.9</td>
</tr>
<tr>
<td>35-39</td>
<td>13.1 14.0 10.4</td>
<td>12.5 12.9 10.8</td>
</tr>
<tr>
<td>40-44</td>
<td>12.1 13.1 11.1</td>
<td>12.1 12.2 10.9</td>
</tr>
<tr>
<td>45-49</td>
<td>10.4 11.6 11.6</td>
<td>10.7 11.2 11.1</td>
</tr>
<tr>
<td>50-54</td>
<td>9.1 10.7 12.1</td>
<td>9.6 10.4 11.6</td>
</tr>
<tr>
<td>55-59</td>
<td>7.9 8.3 12.6</td>
<td>8.1 8.5 11.9</td>
</tr>
<tr>
<td>60-64</td>
<td>7.5 6.7 11.6</td>
<td>7.0 7.5 11.4</td>
</tr>
<tr>
<td>Total</td>
<td>100 100 100</td>
<td>100 100 100</td>
</tr>
<tr>
<td>Mean age (years)</td>
<td>40.0 40.7 43.3</td>
<td>40.7 40.7 42.9</td>
</tr>
</tbody>
</table>

Source: Calculated from data from the UN Population Division’s *World Population Prospects* online database.
GROWTH-FRIENDLY DEMOGRAPHY

As Figure 8 shows, changes in the mean age of the working age population are relatively small across the OECD, and much smaller than changes in the mean age of the entire population. Similarly, cross-country differences in the mean age are far smaller for the working age population than for the total population. The reason is that most variation across time and between countries in the overall age structure of the population is due to variation at the youngest and oldest ages.

**Figure 8: Estimates and projection of the mean age of the working age and total population, OECD countries and regions**

(i) Working age population

![Graph showing the mean age of working age population](image1)

(ii) Total population

![Graph showing the mean age of total population](image2)

Source: Calculated from data from the UN Population Division’s *World Population Prospects* online database.
The expression for the mean age of the working age population is \( \sum_i q_i m_i \), where \( m_i \) is the mean age of people in age group \( i \). This has exactly the same form as Equation 5, the equation for average participation, with the \( m_i \) replacing the \( H/W \). The fact that the age structural changes do not have much effect on the mean age therefore suggests that they would not have much effect on the participation rate either. This is indeed the case. If, for instance, the OECD age specific employment ratios shown in Figure 7 are applied to the age structure of the New Zealand population in 1950, the overall ratio is 69.2 per cent. If the same age specific ratios are applied to the age structure in 2050, the overall ratio is 67.2 per cent. The peak occurs in 2000, when the overall ratio reaches 69.9 per cent. The changes are small. Performing the same calculations for other countries yields similar results. In the absence of good estimates of age-specific productivity rates, no such calculations are possible for productivity. But because the relationship between overall rates, age-specific rates, and age structure is essentially the same, there is no reason to believe that the effect of changing age structures on productivity would be any more striking.

The overall conclusion is that the effects of changes in the age structure of the working age population on participation and productivity are likely to be small. There is therefore little scope for trends in the age of the working age population to advantage or disadvantage New Zealand relative to other OECD countries.

**Young Dependents and Old Dependents**

The complements of measures of the population in the working ages are measures of the dependent population. The most frequently-cited such measure is the “dependency ratio”, generally defined as the ratio of the population outside the working ages to the population within the working ages. A fall in the proportion within the working ages implies a rise in the dependency ratio. As can be seen in Panel (ii) of Figure 5, the proportion in the working ages is projected to begin falling in New Zealand, and in all the other selected countries and regions, some time within the next 20 or 30 years. However, the projected declines are not large, and would only return most countries and regions to the levels of the 1970s.

As Panels (i) and (iii) of Figure 5 show, the reason the dependency ratio is relatively stable is that increases in old-age dependency are offset by decreases in youth dependency. This implies that the balance between young dependents and old dependents is shifting towards old dependents. Figure
9, showing old dependants as a percentage of total dependants, bears this out. In contrast to the changes in the share of dependants in the total population, the changes in the share of old dependants in total dependants are large. In 1950, young dependants predominated throughout the OECD, but by 2050 old dependants are projected to make up between 60 and 70 per cent of all dependants in Europe and Japan and around 50 per cent elsewhere, including New Zealand. If, as many demographers believe, the UN has underestimated the scope for future mortality declines, then the share of old dependants will be even higher than Figure 9 suggests.

Under current patterns of expenditure, the shift to old-age dependency is probably increasing the amount of resources transferred to dependants by the state. Across the OECD, government social expenditures per old person are much larger than expenditures per young person (Weil 1997:Table 10). Illustrative data for New Zealand are shown in Figure 10. Expenditures increase sharply between ages 60-64 and 65-69 as people become eligible for New Zealand Superannuation, and climb steadily after that, reflecting health care costs. As the share of the population in these high cost age groups increases, overall social expenditures can be expected to rise.

**Figure 9: Estimates and projections for the population aged 65+ as a percentage of population aged 0-19 and 65+, OECD countries and regions**

[Graph showing population projections]

Source: Calculated from data from the UN Population Division’s *World Population Prospects* online database.
A recent paper by Razin, Sadka, and Swagel (2002) challenges this conclusion. Razin et al. construct a political-economic model in which, under certain parameter settings, an increase in the old-age dependency leads a majority of voters to support a decrease in social expenditures per capita. Razin et al. carry out a panel regression using data for 13 OECD countries, and obtain results suggesting that rising dependency is indeed associated with falling social expenditures per capita. Razin et al.’s regression does not, however, distinguish between changes in overall dependency due to rises in old age dependency and changes due to falls in youth dependency. When Razin et al.’s regressions are adjusted to allow for this distinction, rising old age dependency is found to be associated with rising, not falling, social expenditure per capita (Bryant 2003b). The standard assumption that increases in old-age dependency imply increases in fiscal pressures appears to be vindicated.

**Figure 10: Government social expenditure per person per year. New Zealand 2001**

Sources: All data apart from health expenditure data were obtained from Creedy and Scobie (2002:Appendix Tables 4 and 5). Health expenditure data were obtained from the New Zealand Treasury’s Long-Term Fiscal Model (www.treasury.govt.nz/ltfm/default.asp). Combined male and female totals were obtained by weighting by population numbers from the 2001 Census, available from the Statistics New Zealand website www.stats.govt.nz.
Governments of countries where a shift towards old-age dependency is creating pressure for increased social expenditures face unpalatable choices: holding expenditure down regardless, cutting other areas of government expenditure, raising taxes, building up debt, or doing some combination of the above. There is, of course, extensive debate among economists about the extent to which these various measures reduce welfare or reduce participation and productivity. For instance, some critics of the World Bank (1994) report *Averting the Old Age Crisis* argue that the Bank exaggerates the harm done by higher tax rates (Beattie and McGillivray 1995). The Bank has, however, stood its ground (James 1996). Indeed, it is hard to believe that increased taxes would not have some effect on participation or investment decisions, and that increased public expenditure on pensions and health care would not partly crowd out productivity-enhancing public expenditure on infrastructure, schools, and research. To the extent that fiscal pressures do threaten participation and productivity, the somewhat lower old-age dependency rates in New Zealand, Australia, the RDCs, and North America are likely to give them a slight economic advantage over Europe and Japan.

**Conclusion**

UN estimates and projections for the OECD over the period 1950-2050 show population growth slowing, the proportion of the population in the younger age groups declining, the proportion in the older age groups rising, and intermediate age groups left relatively unchanged. For most purposes, the countries and regions considered in this paper fall into two groups, with New Zealand, Australia, the recently developed countries, and North America in one “high fertility” group, and Europe and Japan in a “low fertility” group. The slowing of population growth, reduction in the share of the young, and increase in the share of the old are more marked in the low fertility group than in the high fertility group.

Summaries of the paper’s conclusions about specific demographic trends and the effect of these trends on New Zealand’s GDP per capita, relative to the rest of the OECD, are given in Table 5. As the table shows, neither New Zealand’s comparatively high fertility, nor its relatively young working age population, are likely to have much influence on New Zealand’s relative economic performance. The fact that the proportion of the population in the working ages will decline less quickly in New Zealand than elsewhere in the OECD (other than the recently developed countries of Korea, Mexico, and Turkey) will be to New Zealand’s relative advantage, though the effect is
unlikely to be large. There is much greater uncertainty about the effects of
growth in the absolute size of the working age population, and the effect of
differences in the balance between old and young dependants. The former
may either help or hinder the high fertility countries such as New Zealand,
while the latter will almost certainly be of some help, though how much is
unclear. The combined effect of the demographic trends is likely to be
positive, though the magnitude is uncertain.

Table 5: Summary of specific demographic trends and their effect on the
growth in GDP per capita in New Zealand relative to other
OECD countries and regions

<table>
<thead>
<tr>
<th>Demographic trend</th>
<th>Effect on relative GDP per capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of population in the working ages projected to decline less in NZ than</td>
<td></td>
</tr>
</tbody>
</table>
  elsewhere in the OECD, except for the RDCs.                                      | Slight advantage over rest of OECD, other than RDCs, via “population” term \( \frac{W}{P} \). Magnitude  |
  of effect moderate but predictable.                                               | of effect moderate but predictable.                                                               |
| Working age population projected to continue increasing over next 20–30 years in  |
  New Zealand, Australia, North America, and RDCs, and to decline in Japan and     |
  Europe.                                                                          | Potentially conflicting influences on productivity \( \frac{Y}{H} \). Positive influences through  |
  agglomeration effects, and negative influences through reduced returns to      |
  investment in capital and labour-saving technologies. Net effect extremely       |
  uncertain.                                                                       | uncertain.                                                                                        |
| Fertility levels higher in New Zealand, Australia, North America and RDCs than   |
  in Europe and Japan.                                                             | Little evidence for common assumption that higher fertility implies lower participation \( \frac{H}{W} \). |
  Effect likely to be small.                                                        | Effect likely to be small.                                                                       |
| Working age population younger in New Zealand, Australia, North America and RDCs  |
  than in Europe and Japan.                                                        | Changes in the age structure of the working age population smaller than generally thought, and  |
  than generally thought, and have only a minor influence on average participation |
  \( \frac{H}{W} \) and productivity \( \frac{Y}{H} \). Effect small and predictable.              |
| Old-age dependency low and youth dependency high in New Zealand, Australia,      |
  North America and RDCs, compared to Europe and Japan.                             | Fewer fiscal pressures, and hence less likelihood of tax rises or expenditures cuts threatening |
  participation \( \frac{H}{W} \) and productivity \( \frac{Y}{H} \). Effect positive, but highly   |
  uncertain.                                                                       | uncertain.                                                                                        |
Assessing the importance of demographic change to growth in GDP per capita currently involves a large element of subjective judgement. It is reasonable, however, to hope that future progress in the economics of population will reduce some of these uncertainties. Of the potential areas for future research indicated in Table 5, the effects of growth in the working age population perhaps deserves the greatest attention. The size of working age population is one variable over which governments can exert significant control, through migration policy. But at present, the research literature gives no clear answers on whether the net effect on GDP per capita of continued labour force growth is positive or negative.

Despite all the uncertainties, however, there is an important sense in which judgements about the importance of demographic change can be less tentative than judgements about other influences on future economic performance. Demographic trends are one of the few social trends for which predictions 20 or 30 years into the future are not just speculative. It is reasonable to expect that demographic trends will help New Zealand gain some economic ground on Europe and Japan, though perhaps not Australia and North America. This serves as a reminder that, for all the disadvantages it may face, New Zealand’s economy also enjoys a few advantages.

Recognition of New Zealand’s relatively favourable demographic conditions is important when assessing the relevance of imported advice for dealing with the “old age crisis”, particularly if this advice originates from Europe or Japan. The differences between New Zealand’s demographic conditions and those of Europe and Japan are differences of degree rather than kind. But population issues that deserve urgent attention in Europe and Japan do not necessarily deserve the same attention here. Setting appropriate priorities depends, among other things, on a proper understanding of ongoing demographic change.

Notes

The paper has benefited from comments and suggestions by colleagues at the New Zealand Treasury and by Professor Ian Pool, Population Studies Centre, University of Waikato. The views expressed are the author’s, and are not necessarily those of the New Zealand Treasury.

1 This is based on estimates of the “total fertility rate” obtained from the OECD Health Indicators online database. The total fertility rate is the number of births the average woman would have over her lifetime if prevailing age-specific fertility rates were to be maintained indefinitely. The OECD estimates are as follows: Mexico, 2.62; Turkey, 2.50; United States, 1.99; Iceland 1.98; New Zealand, 1.97.

2 http://esa.un.org/unpp/
This can be illustrated using Statistics New Zealand's projections for the New Zealand population in 2051. Projection Series 3 and 6 use identical fertility and mortality assumptions, but in Series 3 net annual migration is zero, while in Series 6 it is 20,000. Higher migration levels raise population size in 2051 by 30 per cent, but raise the proportion of the population in the age group 15-64 by only three per cent (calculated from Statistics New Zealand, National Population Projections, 2001(base)-2051, Tables 2 and 3, available online at www.stats.govt.nz).


See, for instance, the studies reviewed by Disney (1996) and Hansen (2002).

References


