Why Nations Can Afford Population Ageing.

Professor Ross Guest
Director
Graduate School of Management

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GRIFFITH UNIVERSITY

Abstract

This paper presents a range of evidence supporting a sanguine view of the impact of population ageing on a nation's average living standards, with particular reference to Australia. The evidence points to a small decrease in the growth of living standards over the next few decades, and no decline in the average level of living standards. There are essentially two reasons for this benign view, which is at odds with the dire consequences of ageing predicted by media commentators and politicians. The first is simply the power of compound growth in technical progress that is expected to be more or less unaffected by population ageing. The second is the adjustments that will occur in the behaviour of consumers, workers and firms, and in government policies, that will ameliorate the impact of ageing on living standards. Several policy implications flow from the assessment presented here. Pro-fertility policies, such as the baby bonus in Australia, cannot be justified on the basis of the need to protect living standards in the future, nor on the grounds of intergenerational equity. Similarly, the case for boosting national saving through increased compulsory superannuation, for example, is weak on the grounds of a response to population ageing. There may be good reasons to boost fertility and national saving, but population ageing is not one of them. This is not to deny that population ageing poses challenges – in particular for government budgets. However, these effects do not threaten average living standards.

1. Introduction

Tonight I will reflect on one theme of my research in recent years, which is that the doom and gloom about population ageing has been way overdone. To say that it has been a beat up might be a little strong – but only a little.

There are several groups of pessimists about population ageing, led by the media who know that bad news sells. They have been supported by the superannuation lobby who seem to want to convince everyone, including governments, that more money should be pumped into super funds. Then there are economists and others who write books like "Agequake" (Wallace, 2001) and "The Coming Generational Storm" (Kotlikoff and Burns, 2004). The popular discourse in the media is that there is an ageing crisis to which the solution is more immigrants and more babies. The respected journalist Paul Kelly, for example, argued that the "the consequences [of low fertility] will be dire" and that therefore we need more immigrants (The Australian, 17.11.04). The Australian Financial Review ran an editorial in which it argued that "there are several good reasons to encourage Australian women to have more babies…….to slow the ageing of our population and increase the rate of growth of population" (AFR, 19.7.02)"

Both sides of politics have encouraged this view. In the lock-up press conference before the 2004 Australian Federal Budget, recorded on national television, the Australian Treasurer, Mr Costello, urged the journalists to "go home and do your patriotic duty tonight". He expanded on this exhortation to procreate by saying that three children was the ideal "if you can" – "one for yourself, one for your wife, and one for the country". He went on: "If you want to fix the ageing demographic – you're just square after two – you're making no net improvement." While this was all enjoyed by the press gallery – judging by the chuckling that could be heard in the background – it does nothing to advance the understanding of the macroeconomic effects of demographic change and the appropriate public policy response.

My research shows that population ageing cannot be described as a "crisis" and that more immigration and more babies would have little impact on living standards. In this lecture I aim to get to the truth about the economic effects of population ageing, and the economic prospects facing countries with ageing populations, with particular reference to Australia.

First let us look at some facts that are beyond dispute.

Yes, we are getting older, as are almost all developed countries. This is illustrated in Table 1 which shows the population share of the over 65 age group for selected countries in 1950, 2000 and 2050 (projected). The table shows the huge gap between countries in their stage of transition towards older populations. Malaysia for example is about 50 years behind Japan and most European countries in the sense that Malaysia's population share of over 65 year olds will be the same in 2050 as those of the latter group of countries are today. Another striking feature of this table is how fast China is projected to catch up in the ageing stakes, due mainly to its official low fertility policy.

Population ageing is best thought of as a demographic transition that comes with economic development. The process comes in stages, starting with declining infant mortality and increases in adult life expectancy, and later, declining fertility rates. Table 2 illustrates the fertility rate and life expectancy for selected OECD countries in 2000. The differences in fertility rates among these developed countries

cannot be explained by differences in per capita incomes. They are explained more by immigration, cultural factors and public policies.

My research on this topic, most of which has been with Professor Ian McDonald from the University of Melbourne, has focussed on the impact of prospective demographic change on living standards. See, in particular, Guest (forthcoming), Guest, Bryant and Scobie (2004), Guest and McDonald (2004, 2003, 2002, 2001, 2000). The main conclusion from this work is that population ageing will only marginally slow down the growth of living standards, and that reductions in fertility do not threaten future living standards. Some policy implications of this are that there is not a strong case for pro-fertility policies such as the baby bonus in Australia, nor for policies to increase national saving on account of population ageing through, for example, increased compulsory superannuation. There may be good reasons to do these things, but population ageing is not one of them.

2. A framework for the effect of population ageing on living standards

Demographic measures are not of intrinsic interest for economic welfare. It is better to look at living standards directly. Living standards are commonly defined as national consumption per person, which can be represented in terms of an identity that we will find helpful as an anchor for our ideas:

$$\frac{C}{P} \equiv \frac{C}{Y}\frac{Y}{L}\frac{L}{N}\frac{N}{P} \qquad (1)$$

where C is national consumption (private plus public),Y is national output, N is population, P is population in standard consumption units, and L is aggregate employment. The notion of standard consumption units, P, warrants explanation. As we age, our consumption demands change. For example, older people spend more on health and aged care, and less on education, than younger people. These changing consumption demands imply different levels of consumption expenditures for any given level of consumer satisfaction, or utility. For example, 80 year olds may have greater total consumption expenditure than 30 year olds, simply because they spend a lot more on health and aged care which is relatively expensive, albeit less on other goods and services, but which may not leave them with any greater utility. When measuring living standards in response to population ageing, it seems sensible to adjust for these differences in consumption requirements. This adjustment occurs through the ratio N/P. In fact, we find that older populations tend to have greater consumption requirements due mainly to expensive health and aged care, which is reflected in a fall in N/P and hence a fall in C/P which is living standards measured in standard consumption units.

Equation (1) is a helpful framework in which to analyse the impact of population ageing on living standards. It identifies four ratios that combine to derive living standards. We will consider the implications of ageing on each of these four ratios.

3. The effect of ageing on the support ratio (L/N)

In assessing the impact of population ageing on living standards, C/N, the obvious first place to look is the effect on L/N, the employment to population ratio. Cutler et al. (1990) called this ratio the “support ratio”. The projected patterns of support ratios for older and younger regions of the world are illustrated in Figures 1 and 2, respectively, holding constant all age-specific LFPRs at their levels in the year 2000.

The figures show that regions of the world are at different stages of the demographic transition. The support ratio eventually falls in all regions because declining fertility and declining mortality ultimately imply a lower ratio of workers to consumers. A given percentage decline in the support ratio implies an equal percentage decline in living standards, holding the other ratios in (1) constant.

The support ratio patterns in Figures 1 and 2 are based on the United Nations' medium fertility projections. However, they are arguably pessimistic scenarios because they hold constant the LFPRs of older workers which are almost certain to rise in the future for several reasons that I will outline in this section. The assumption of constant age-specific LFPRs, as in Figures 1 and 2, is common in the empirical literature. In fact, it is part of a broader methodology which can be characterized by a mechanical extrapolation of the past into the future. This approach, for example, was adopted by the Australian Government in the Intergenerational Report (Australian Government, 2002) and more recently in Productivity Commission (2005).[1] The failure to model behavioural feedback effects based on changes in relative prices and quantities that are caused by population ageing is a major source of the pessimistic conclusions that arise from this modeling approach. A theme of this paper is to show how these behavioural responses mitigate the impact of ageing.

3.1 Human capital

Younger cohorts of the population are better educated than their predecessors, which means that when they are older their LFPRs will be higher than that of current older cohorts, because better educated people participate at higher rates in the labour market.

Day and Dowrick (2004) provide evidence for Australia that the decline in fertility since the 1960s has been associated with a substantial increase in female LFPRs. They argue that this will continue - in particular with respect to older women, as the higher educational attainments of young women today will result in much higher LFPRs of older women in the future. On the latter point, Dowrick and McDonald (2002) make the following interesting comparison for Australia. Only 25 percent of the current cohort of 50 year old women completed the final years of high school education. Whereas in coming decades nearly 80 percent of 50 year old women will have completed Year 12. They argue that the resulting boost in the LFPR of older women in the future will be enhanced by the fact that the LFPRs of the current generation of 25-34 year old women are much higher than in the past. The resulting familiarization with the paid workforce and the accumulation of human capital of this generation, will lead to a higher supply and demand for the labour of this cohort as they enter their 50s and beyond, compared with the current cohorts of women of those ages.

3.2 Government policy

In OECD countries considerable policy attention is being directed towards increasing LFPRs of older workers and ensuring that there is demand for their labour.[2] This

[1] The projections did incorporate some variations on the past based on educated guesswork, but the distinguishing feature is that there were no behavioural feedback effects in response to changes in relative prices.

[2] The OECD has published a series of country studies called *Ageing and Employment Policies*, covering about 20 countries, in which it explains the policy initiatives that have been taken, and are planned to be taken, to boost the employment of older workers. The series is unfinished at the time of

attention to both the supply-side and demand side is important. It would be wasteful if older workers seeking jobs were unable to find them due to discrimination – however subtle it may be – against older workers. Similarly ineffective would be a situation where the benefits of older workers were being increasingly recognized by employers but older workers showed no greater willingness to participate in the labour market.

On the supply-side, policies are focusing on retirement incomes and welfare reform, incentives for older workers to enter labour market training programs, and various forms of careers/employment guidance for older workers. Of these, the changes to superannuation and pension arrangements have received the greatest attention. In Australia, bodies that represent superannuation funds such as ASFA and IFSA[3] have called for changes to taxation arrangements affecting superannuation. These include: abolishing the superannuation contributions surcharge[4] that is imposed on the superannuation contributions of high income individuals, removing the limits on tax-deductible superannuation contributions, removing the work test on contributions, increasing the age up to which working members of super funds can make personal super contributions, lowering tax rates on superannuation contributions and superannuation fund earnings, and changing the tax rules on income streams by allowing variable income streams and therefore to encourage superannuation funds to invest away from interest-bearing assets to growth assets.

Policies are also being directed to the demand side of the labour market. An important determinant of labour demand is labour costs per unit of output which depend on labour productivity relative to labour costs. For given labour costs, increased investment in human capital of workers increases their productivity and therefore increases labour demand. Hence policy attention is being directed toward boosting the human capital of older workers. Measures to do this in Australia include (see Encel, 2003 for further details): career counseling, courses to upgrade skills and assistance with job applications, financial assistance with accredited training courses undertaken by job seekers, personal advisers to provide more intensive individual assistance to unemployed people with special difficulties, and training places in information technology for persons aged over 45. Other Australian policies to boost demand for older workers include the abolition in 1999 of compulsory retirement in the Australian public service and the introduction of anti-age discrimination legislation.

The simulation of delayed retirement in Guest and McDonald (2002) points to significant output gains from raising the LFPR of older workers. The simulation scenario was an increase in the retirement age (for males and females) such that the employment/population ratio for 65-69 year olds increases from 2006 would be equal to that of the 60-64 age group by 2011. The result was an increase in GDP of 8 percent and a decline in government outlays of 2.7 percent by 2051.

3.3 Feedback effects on labour supply

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writing (Feb, 2005). See
http://www.oecd.org/findDocument/0,2350,en_2649_34747_1_119699_1_1_37435,00.html

[3] ASFA is the Association of Superannuation Funds of Australia and IFSA is the Investment and Financial Services Association Limited. See for example IFSA (2002) "Retirement Incomes and Long Term Savings: Living Well in an Ageing Society".

[4] The tax is being reduced from 15% to 10% over 3 years and applies to income over $114981 in the 2003/4 year. A lower surcharge applies to income over $94691 in the 2003/4 year.

The reduction in the supply of workers relative to demand generates feedback effects that are likely to mitigate the initial reduction in supply of workers. One such effect occurs through increases in real wages in response to the shortage of workers. Higher real wages tend to increase effective labour supply through increased work effort and/or time of existing workers and the participation of new workers in the labour market. This effect is somewhat offset, however, by the negative effect of higher taxes on after-tax real wages. In addition, as we have suggested in equation (1), a falling L/N ratio implies that consumption per capita will be lower than it would otherwise have been. This would presumably apply to both consumption of goods and consumption of leisure. Lower leisure in turn implies greater work effort, thereby boosting effective labour supply.

Using the demographic projections for Australia in PC (2005), for example, these positive feedback effects boost effective labour supply by 2 percent per annum by 2050 according to simulations in Guest (2005). That is, annual labour supply is eventually 2 percent higher, permanently, than it would be without the feedback effects. This amounts to 20 percent of the 10 percent decline in L/N that the PC (2005) study projects will occur over the next 50 years.

3.4 Culture and attitudes

It stands to reason that attitudes towards older workers are likely to become more favourable when there are relatively more of them. Workplaces are likely to be re-engineered to better suit older workers, and older people are likely to enjoy better health and therefore be able to work for longer.

In summary, projecting the aggregate L/N by extrapolating age-specific LFPRs gives a highly unlikely worst case outcome. Nevertheless, under even the most optimistic scenarios, there will be some fall in aggregate L/N.

3.5 An aside: the effect of policies to boost fertility

What effect do pro-fertility policies have on L/N and therefore living standards? It is worth touching on this briefly, given the interest in such policies in Australia and other OECD countries. These policies range from cash payments to new mothers, to policies designed to make simultaneous child-raising and participation in the labour market more attractive to women. The latter include parental leave and child care subsidies. Let us assume that such policies are successful in boosting fertility, rather than simply bringing forward the timing of childbirth in the lifecycle. The initial effect is to boost the proportion of young dependents and therefore to reduce L/N and hence lower living standards. This effect lasts for about a generation, until the larger birth cohort enters the workforce at which point L/N rises. The merits of such a policy depend somewhat on one's view of intergenerational equity in the context of rising living standards over time due to technical progress, a topic to which we turn in the next section. Suffice to say at this point that living standards over a generation (say 25-30 years) can be expected to increase somewhere between 50 and 100 percent. An important question, therefore, is whether it is equitable to reduce the living standards of the current generation, in supporting a larger birth cohort, in order to increase the living standards of the next generation who will be 50 to 100 percent better off than us anyway.

4. The effect of ageing on average labour productivity (Y/L)

Of greater importance and unpredictability is the effect of population ageing on labour productivity (Y/L). This is a critical relationship because labour productivity growth

could potentially offset – indeed swamp - the economic burden implied by a falling support ratio. However, the magnitude and direction of the effect of population ageing on productivity growth remains an elusive question - unresolved in theory and empirically. For a synthesis and critique of the literature, see Chapters 4 to 7 in Birdsall, Kelley and Sinding (2001) and Chapters 1 to 8 in Mason (2001).

4.1 Technical progress

It is important to distinguish changes in Y/L that can be attributed to ageing and changes that will occur over time anyway, that is, independently of ageing. This is a simple but critical point that is often overlooked in the discourse on the implications of ageing living standards. One source of increases in labour productivity over time is improvements in technology, at least some of which will occur independently of ageing. We can describe this as exogenous technical progress. We know from very long time series – over decades and even centuries - in countries around the world that technical progress occurs relentlessly in the long run. Certainly there are fluctuations in the rate of technical progress from one decade to another, but taking several decades together the rate of technical progress is remarkably stable. It is an incredibly robust long run phenomenon. Take for example, a series for Y/L for Australia over approximately the last four decades, produced by the PC (2005) and reproduced here as Figure 3. The steady upward path of this series can be attributed to technical progress. This represents by far the most important source of sustainable improvements in living standards over time. It is well-known that similar series could be drawn for all post-industrialised countries and, indeed, over a considerably longer time span than in Figure 3.

The significance of technical progress for the debate about population ageing is that it changes the question. The question is not: will population ageing reduce living standards? We know that would be inconceivable because it would require nearly zero technical progress over a long time. Rather, the question is: to what extent will population ageing reduce the *growth* in living standards over time. The PC (2005) assumes that technical progress in Australia will increase labour productivity by 1.75 percent per annum. A pocket calculator reveals that 1.75% per annum compound growth in living standards would make us exactly twice as well off in 2045 as we are today, *ceteris paribus*. The PC estimates that population ageing will eat into these improvements in living standards such that we will be only 85 percent better off in 2045 than we are today, which implies compound growth of about 1.55 percent instead of 1.75 percent. That is, they estimate that ageing will amount to a cut in the growth rate of living standards of 0.2 percent per annum. So instead of being twice as well off in 2045, we will be almost twice as well off.

The behavioural model of Guest and McDonald, in the papers cited above, produce outcomes with respect to the effect of ageing on the growth in living standards in Australia that are within a couple of decimal points per annum of those in PC (2005). The conclusion therefore that ageing will only slightly reduce the growth of living standards over time appears to be robust.

This doesn't mean that population ageing poses no challenges or will have no important economic effects. The widely anticipated effects on government budgets, financial markets and the labour market are borne out, more or less, in all models that are capable of capturing those effects. The point being made here is that these effects are not big enough to threaten living standards, and that they will occur over such a long period of time that firms, consumers and governments will have plenty of time to adjust.

The literature tells us that some links between ageing and productivity are likely to be positive, and some negative. On the positive side, some economists have argued that firms face stronger incentives to innovate in the face of scarce labour (Habakkuk, 1962; Romer, 1990), which would lead to higher productivity. Also, to the extent that population ageing is due to falling fertility rates, it may boost human capital creation that would boost productivity. The argument here is that lower fertility is associated with a greater investment by parents in the education per child, on average, which implies greater human capital creation (Becker, Murphy and Tamura, 1990). Potential negatives of population ageing for growth could arise from a loss of economies of scale, an older and perhaps less dynamic workforce which inhibits innovation, and a reduction in the supply of new researchers as a result of slower population growth (Jones, 2002).

We now consider some effects of ageing on labour productivity that are more subtle and more ambiguous in direction, and which have not yet received much recognition in the literature.

4.2 The age distribution of a given workforce size

The age distribution of a given workforce size can affect average labour productivity. One channel through which this can occur is well known. That is, middle aged workers tend to be more productive than younger and older workers. One piece of economic evidence for this is the wages and salaries that workers are paid according to their age, although it is acknowledged that there are factors other than productivity differences that account for the wage disparities between younger and older workers, such as seniority-based pay schemes.[5] The pattern of wage rates by age is an inverted U-shape but it is not symmetrical. We observe a more gentle tailing off after middle-aged compared with the rise prior to middle-age. This implies that ageing workforces tend to imply higher average productivity. This is one well-known effect of the workforce age distribution on productivity.

There is potentially another age distribution effect, however, that has only recently been identified (Prskawetz and Fent, 2004; Guest, 2005). It is based on the idea that workers of different ages are complementary to some degree, rather than perfectly substitutable as is typically assumed in macroeconomic modeling of demographic change. Examples of complementary, or synergistic, age-dependent skills include the physical strength, higher education levels and dynamism of young workers that complement older workers' skills including more experience, maturity of judgement, reliability, and managing people, including mentoring younger workers. This would imply that even though 35 year olds may have the same marginal productivity as 65 year olds, as reflected in equal wage rates, employing either two 35 year olds or two 65 year olds would yield less output than employing one of each.

The notion of synergies or complementarities of workers by age gives rise to the possibility of an optimum age mix of a firm's workforce. It can be shown that, under standard economic assumptions, the optimum age mix of a given workforce depends on two factors: the relative marginal productivity of workers by age and the degree of substitutability (or the inverse: complementarity) between workers by age (Lam, 1989).

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[5] We must be careful not to confuse cohort effects with pure age effects here. For example, as noted above, younger cohorts of workers today, especially women, have much higher education levels than their predecessors. For this reason alone we would expect to observe higher productivity of older workers in the future than we do today. This would be a cohort effect rather than a pure age effect.

What are the implications of this principle in the face of population ageing and in particular, workforce ageing? As the workforce ages, firms will find themselves employing more older workers. The economic mechanism by which this will occur is the adjustment of relative wages of older and younger workers. That is, relative scarcity of younger workers will force up their wages relative to older workers and lead firms to choose to employ fewer younger workers relative to older workers. In other words, relative wages will adjust to ensure that the available workforce, with an older age mix, will find employment.[6] The question therefore arises as to whether an older workforce is closer to the optimum age mix of the workforce or further away from it.

If we are moving closer to the optimum, we will derive a dividend in terms of aggregate labour productivity and therefore economic well being. This would be a free lunch in the sense that it would not cost any resources. On the other hand, if we are moving further away from the optimum, we would incur a loss in terms of labour productivity and economic well being. This would be a deadweight loss to society. The magnitude of the dividend or deadweight loss can be shown to depend on two factors: the degree to which younger and older workers can be substituted in producing a given output; and the relative productivity of younger and older workers.

Evidence is emerging, based on simulations of calibrated macroeconomic models, to suggest that population ageing is likely to move the workforce age mix closer to the optimal mix, implying a dividend rather than a deadweight loss (Prskawetz and Fent, 2004; Guest, 2005). However, that the size of this dividend is very difficult to ascertain because of lack of evidence about the elasticity of substitution between younger and older workers. There is therefore more work to be done on this potentially important effect of workforce ageing.

4.3 Changes in industry composition due to changes in demand

Another potential effect of ageing on labour productivity that has received little attention is the effect of ageing on the composition of demand for goods and services produced by different industry sectors. Some industry sectors have a higher capital intensity than others. A higher capital intensity implies a higher labour productivity. Hence, if ageing shifts demand toward sectors which have a high (low) capital intensity, the average capital intensity will be higher (lower) and therefore average labour productivity will be higher (lower). The direction of the effect is an empirical question depending on several factors: the effect of ageing on the composition of demand among industry sectors, the relative capital intensity of industry sectors, and the GDP shares of the sectors.

Consider three sectoral shifts in demand that are likely outcomes of population ageing. First, the lower capital widening requirements of a more slowly growing workforce implies lower demand for manufactured goods. Second, demand for health and related services will increase disproportionately as the population ages. Third, demand for housing services is likely to decline as the rate of household formation slows and the size of households declines, resulting in smaller and fewer houses being constructed (see Mankiw and Weil, 1989, for an econometric analysis). A myriad of other changes to consumer demand for various types of goods and services can also be expected as the age distribution of consumers changes.

[6] Unemployment may still persist, although it is likely that it will be lower than today as the available labour supply falls relative to labour demand in response to population ageing.

Table 3 gives capital intensities and GDP shares by major industry classification for Australia in 2002. Output, Y_i, is the value-added of industry *i*. Capital intensity is defined here as the industry's capital output ratio, $(K/Y)_i$. The industries are ranked by their share of GDP. The far right hand column gives the total capital employed as a ratio to GDP, which is calculated by multiplying the capital intensity by the GDP share. The total of this column is the weighted average capital intensity of the economy. These data alone are not sufficient to conduct an analysis of the impact of sectoral shifts in demand on average capital intensity of the economy. That would require an input-output analysis which is not attempted here. For example, manufacturing and construction both have relatively low capital intensities but they are relatively heavy users of inputs that have high capital intensities, such as electricity, gas and water, and mining inputs. So shift in demand away from manufactured goods would, in theory, have an ambiguous effect on the average capital intensity of the economy. Similar issues with respect to inputs and outputs arise in analysing the effect of a shift in housing and health services on the net capital requirements of the economy.

In summary, the effect of ageing-induced sectoral shifts in demand on aggregate labour productivity is ambiguous. For a simulation analysis see Guest (2005).

4.4 Improvements in human capital

Improvements in human capital can be expected to increase labour productivity. For a very readable and brief summary of the literature see Day and Dowrick (2004). Section 3.3 cited the observations in Day and Dowrick (2004) of the huge improvements that occurring in the education and labour force participation of young women. This will have marked effects on the human capital of the workforce in the coming decades. The effect of investment in human capital is to increase the growth rate of labour productivity in the short run and probably in the long run.[7] This occurs in several ways. The direct effect occurs through an improvement in the quality of labour inputs used in current production. Longer term feedback benefits can occur as knowledge begets knowledge - discoveries lead to further discoveries - and also as a more educated workforce facilitates the implementation and application of new knowledge.

It is very possible – indeed likely - that these productivity gains from of a more highly educated workforce in the future have been underestimated by the ageing pessimists.

5. Effect of ageing on C/Y

Population ageing tends to increase C/Y which, from equation (1), increases living standards, *ceteris paribus*. To see this, we start with the observation that ageing implies slower growth in the workforce. A more slowly growing workforce means that firms need to buy less new capital in aggregate to equip new workers with the same capital as existing workers. For example, fewer new workers in the office means fewer new personal computers are required. This in turn means that less of the nation's output must be siphoned off for investment and therefore more is available

[7] There is a debate about whether improvements in human capital increase the long run rate of productivity growth. According to "new growth theory" they do; according to neoclassical theory productivity growth is higher only in the short run (see the discussion in Day and Dowrick, cited above).

for consumption. The result is a dividend from population ageing (see Cutler et al, 1990 for a full discussion and analysis).

Simulations suggest that this effect positive effect on living standards tends to offset about a third of the negative effect due to the decline L/N (Guest and McDonald, 2002; Guest, Bryant and Scobie, 2004).

6. Effect of ageing on N/P

Our consumption expenditures change as we age. By far the most important effect here from a macroeconomic point of view is the huge increase in health and aged care expenditure that tends to occur in the last 10 to 15 years of life. We made the case in Section 2 for allowing for these changing consumption demands in measuring living standards. We can do this through the ratio N/P, where N is the population and P is the population in consumption units. Because older people have higher consumption demands, P rises as the population ages, which implies that N/P falls, dragging down our measure of living standards.

However, there is once again a danger that we will be too pessimistic if we simply project the ratio of N/P based on people's current consumption patterns. Simply assuming that people of a given age will continue to purchase the same bundle of goods and services in the future no matter what happens to the relative prices of those goods and services ignores a fundamental principle of economics that we have already discussed in other contexts, namely substitution effects. If medical procedures and other health services become more expensive, people will tend to look for alternative therapies and preventative treatments. This will reduce their overall health expenditures. We see this principle of substitution repeated throughout economic history. Recall what happened to demand for smaller cars when oil prices shot up in the 1970s. We know that in places where land prices are high, such as Tokyo, people economise by living in smaller houses.

Having said this, Guest and McDonald have generally taken the conservative approach in modelling of N/P by assuming that consumers' bundles of consumption expenditures by age will remain constant throughout the projection period.

7. Quantifying the effects on C/P

We can now quantify the relative effects of the ratios in equation (1). These are illustrated in Figure 4 for Japan and Figure 5 for Australia, based on modelling in Guest and McDonald (2004). Japan is chosen because it is rapidly ageing and has had stagnant productivity growth over at least the past decade. It can therefore be regarded as an extreme case in the sense that if ageing is going to threaten living standards in any country it is most likely to do so in Japan. For instance, the calculations reported in the lower part of Figure 4 assume that technical progress in Japan is equivalent to only 1 percent per annum growth in labour productivity. This is low by international standards – the typical range projected for the coming decades in most international advanced countries is between 1 to 2 percent. It is also fairly low even for Japan if one considers the whole post war period. For Australia, I have assumed technical progress equivalent to growth in labour productivity of 1.5 percent per annum. This is the rate that Guest and McDonald have typically adopted but is below the rate of 1.75 percent assumed by the PC (2005).

The other important assumption underpinning Figures 4 and 5 is that ageing itself has a neutral net effect on technical progress. This is justified given the contrary evidence discussed in Section 4 about the direction of the effect of ageing on technical progress. On the other hand, one could make a good case, based on that evidence, that

the effect is more likely to be positive than negative. So the assumption of a neutral net effect on technical progress is made once again on the grounds of conservatism. Incidentally, the PC (2005) also make this assumption, as have many other modellers internationally.

It is clear from Figures 4 and 5 that if there were no technical progress, ageing would indeed reduce living standards – in Japan by about 25 percent and in Australia by about 15 percent. The effect is mainly due to a decline in L/N. However, as we have argued above, zero technical progress on average over 50 years would mean the end of the world as we know it. It would be an apocalyptic scenario and no respectable economic modelling in the world has adopted such an assumption for the long term future. Given our conservative assumptions about positive technical progress, living standards in Japan would be about one third higher in 2050 than they are today, and in Australia about 90 percent higher. This is about the same outcome for Australia as estimated by the PC (2005). Although they are more optimistic than Guest and McDonald about technical progress they are more pessimistic about the growth in health and aged care expenditure. These two differences roughly cancel each other out in terms of living standards.

8. A cushioning effect through international financial markets

International financial markets can spread the costs of ageing and therefore further diminish the impact on living standards. Ageing countries tend to have a surplus of saving relative to investment opportunities. This is because ageing countries have a relatively large proportion of middle-age workers who are highly productive relative to their consumption demands, leading to high saving; and at the same time ageing countries have lower demand for those savings for investment due to lower growth of employment. These surplus savings in ageing countries can be lent to younger countries which have better investment opportunities but relatively less savings. The result is that interest rates are lower in younger countries and higher in ageing countries, than they would be without international trade in capital. This gives rise to gains from trade for both borrowing and lending countries. For ageing countries these gains are the extra returns to savers over and above the higher cost to borrowers. For younger countries the gains from trade are the benefits to borrowers from lower interest rates over and above the losses to lenders.[8]

For simulations of these capital flows between ageing and younger regions of the world, see Guest and McDonald (2004). These simulations suggest that world interest rates could be up to three quarters of one percent (75 basis points) lower as a result of ageing.[9] This gives rise to another welfare effect of ageing. That is, lower world interest rates due to ageing transfer income from creditor to debtor countries. This income transfer could be represented in terms of equation (1) by distinguishing between gross national product and gross domestic product, which are not the same in the presence of international capital flows. However, this effect is probably less

[8] In the economic jargon, the gains from trade for lending countries are the excess of gains in producer surplus over loss of consumer surplus; and the gains for borrowing countries are the excess of gains in consumer surplus over loss of producer surplus.

[9] This assumes that the developing world does not substantially catch up to the developed world in terms of total factor productivity. If it did, then the demand for funds for investment may cause world interest rates to increase rather than decrease.

important than the other effects incorporated into equation (1) and is therefore considered an unnecessary complication for our purposes.[10]

9. Pensions, health care, taxes and intergenerational equity

Finally we turn to the fiscal implications of population ageing – in particular, the effects on pensions and health care and the associated implications for the future tax burden. It may seem odd that we leave this discussion until last given the attention that it receives in policy circles and the media. The reason is that the focus in this paper has been on the costs of ageing to the nation, rather than on who pays – private or public, the younger generation or the older generation. This important distinction between the economic costs of ageing and the distributional questions raised by ageing is often misunderstood in the public debate. The effect of ageing on living standards depends on the economic costs of ageing to the nation. The question of who bears these costs is largely a political issue, although it does have economic implications because tax rates, for example, have economic effects.

To clarify this point, take the increased health expenditures for an ageing population. This implies an increase in national consumption expenditure relative to national output and therefore a reduction in national saving. The cost to the nation is the increased consumption requirements of an older population, relative to output. This is the case whether the older generation pay for their own consumption by running down their net wealth, or whether the younger generation pay for it through higher taxes. Either way it is a cost and national saving is reduced.

The fiscal costs of ageing consist mainly of spending on public pensions, and health and aged care. There is concern among many OECD countries that these fiscal pressures will place burdens on future taxpayers that will have undesirable social, political and economic effects. As Figures 6 and 7 illustrate, these fiscal pressures vary widely among OECD countries. This is not just because their patterns of ageing differ but because they have different institutional arrangements for distributing the costs of pensions and health care. For example, Figure 6 shows that the fiscal pressure from public pensions is relatively low in Australia because we have a relatively heavy emphasis on private provision of retirement incomes through both compulsory and voluntary superannuation, and because our public pension is not as generous as some other countries, particularly European countries. However, Figure 7 shows that Australia faces a relatively high degree of fiscal pressure from health and aged care between now and 2050. Here is not the place for a detailed comparison of national health systems. Nevertheless, one might point to Australia's relatively expensive PBS scheme and lack of private insurance for long term aged care as contributing factors to the outcomes projected in Figure 7.

The question of who pays for the consumption of old people is not entirely a distributional and therefore political issue. It does have economic effects primarily through the disincentive effects of tax rates on work effort. To the extent that higher tax rates discourage work effort, the value of L in equation (1) is lower and therefore consumption possibilities are lower. This is a deadweight loss to society. Also, if L is lower then GDP is lower which implies even higher tax rates in order to finance a given level of social consumption such as health care. Guest and McDonald (2002) estimate that the tax disincentive effect on labour supply in Australia would result in

[10] The adjusted version of equation (1) is $\frac{C}{P} \equiv \frac{C}{F}\frac{F}{Y}\frac{Y}{L}\frac{L}{N}\frac{N}{P}$ where F/Y represents the ratio of gross national product to gross domestic product.

an increase in tax rates of between 0.5 and 1 percent of GDP by 2051. If instead people were to make private provision for their retirement income, and their health and aged care, the deadweight loss from higher tax rates would be eliminated. This is the economic justification for a shift to a user pays system of financing the consumption demands of old people.

Another argument that is sometimes put forward for requiring old people to finance their own consumption is that this would prevent social disharmony that might be caused by large income transfers from the young to the old generation. However, Guest and McDonald (2003) find little basis for this view, with respect to Australia at least. In that paper we explore the potential trade-off between the living standards of the younger and older generations in the future. For example, young people in 2050 could be better off if they refused to pay higher taxes to provide for the consumption of retired people. But our calculations suggest that the price of their higher living standards would by very high in terms of the reduction in living standards of old people. The main reason is that there will be many more taxpayers than retired people even though the proportion will approximately halve from about 7.0 to 3.5. (We assume taxpayers are people younger than 65 and retired people are over 65.) Hence giving an extra dollar to every person under 65 in 2050 would cost several dollars per older person.

It is worth noting, also, that the ratio of under to over-65's fell from about 10.0 to 7.0 between 1960 and 2000 while the support for the over 65's, financed by higher tax rates, rose over the same period. This was no doubt underpinned by the increased prosperity, driven by productivity growth, enjoyed by both young and old over that period. As we observed above, all economists are predicting continued productivity growth over the coming decades. Therefore our conjecture in Guest and McDonald (2003) is that history will repeat in the sense that the young will continue to support the growing living standards of old people through somewhat higher tax rates than would otherwise apply, because the young too will be enjoying higher living standards underpinned by productivity growth.

10. Conclusion

This paper has presented a sanguine view of the impact of population ageing in developing countries on living standards, with particular reference to Australia. The evidence points to a small decrease in the growth of living standards over the next few decades. In the extreme case of Japan, there will not be an absolute decline in living standards even on the most pessimistic scenarios. Such a view is at odds with much of the discourse, especially the discussion by media commentators and politicians, which tends to predict dire consequences of population ageing for society. The more benign view argued here is consistent with the reputable macroeconomic modelling done around the world, although the view taken in this paper is perhaps even more optimistic than the established view, partly on the basis of some new developments in the literature have not yet received much attention.

There are several policy implications of this assessment of the impact of ageing on living standards. Pro-fertility policies, such as the baby bonus in Australia, are not required to prevent living standards from declining. Nor can they be supported on the grounds of intergenerational equity, because they imply a reduction of the living standards of people alive today in order to boost the living standards of people alive in decades to come when these people will be better off anyway as a result of technical progress. Similarly, the case for reducing current consumption in order to boost national saving, through increased compulsory superannuation for example, is

weak on the grounds of population ageing. There may be good reasons for boosting fertility and national saving, but population ageing is not one of them.

This is not to deny that population ageing poses challenges and will have important macroeconomic effects. There will be fiscal effects, international capital flows, and changes in relative prices of labour and capital. However, these effects imply income transfers from some groups in society to others, rather than significant reductions in the growth of average living standards. It should also be remembered that governments are taking measures to boost labour force participation rates, especially of older workers. This has considerable potential to arrest the decline in employment to population ratios which are the main source of the burden arising from population ageing, modest though that burden will be.

Table 1. Population ageing. Selected countries

	Population share aged 65+		
	1950	**2000**	**2050**
	%	%	%
Italy	8.3	18.1	34.4
Sweden	10.3	17.4	27.0
Japan	4.9	17.2	36.5
Spain	7.3	16.8	35.0
Germany	9.7	16.3	28.0
France	11.4	16.0	26.4
United Kingdom	10.7	15.9	23.3
Canada	7.7	12.6	25.7
Russian Federation	6.2	12.5	27.0
Australia	**8.1**	**12.3**	**23.9**
United States	8.3	12.3	20.0
New Zealand	9.0	11.8	22.9
Ireland	10.7	11.3	24.0
Singapore	2.4	7.2	30.5
China	4.5	6.8	22.9
Malaysia	5.1	4.1	15.7

Source: Productivity Commission (2005)

Table 2. Fertility and life expectancy in 2000 for selected OECD countries

	Fertility rate	Life exp Men	Life exp women
Slovak Republic	1.15	69.8	77.8
Italy	1.21	76.2	82.6
Spain	1.22	75.5	82.7
Japan	1.36	77.6	84.6
Germany	1.40	75.0	81.0
Canada	1.48	77.2	81.2
Korea	1.56	71.0	78.0
United Kingdom	1.67	76.1	80.6
Australia	**1.72**	**77.0**	**84.2**
Sweden	1.76	77.9	82.4
France	1.79	75.0	82.4
Ireland	1.90	74.4	79.6
New Zealand	1.97	76.1	80.6
United States	2.05	74.1	79.8

Source: Martins et al. (2005)

Table 3. Capital-output ratios (K/Y) for Australia in 2002

	(K/Y)	GDP share	K/GDP
Sector i			
Manufacturing	1.41	0.14	0.20
Property and business services	1.27	0.10	0.13
Ownership of dwellings	12.11	0.09	1.10
Construction	0.68	0.07	0.05
Wholesale trade	1.08	0.06	0.06
Retail trade	1.24	0.06	0.07
Health and community services	1.51	0.06	0.08
Transport and storage	5.49	0.05	0.29
Agriculture, forestry and fishing	2.12	0.05	0.11
Finance and insurance	1.45	0.05	0.07
Mining	3.80	0.05	0.18
Education	2.73	0.04	0.12
Government administration and defence	2.56	0.04	0.10
Electricity, gas and water supply	7.68	0.04	0.27
Communication services	3.62	0.03	0.10
Personal and other services	1.23	0.02	0.02
Accommodation, cafes and restaurants	2.76	0.02	0.05
Cultural and recreational services	1.72	0.02	0.03
			3.03

Data sources:

ABS 5220.0 Factor Income by industry

ABS 5204.0 Capital stock by industry

Figure 1 Support ratios for ageing regions, medium fertility, 2000 to 2150,

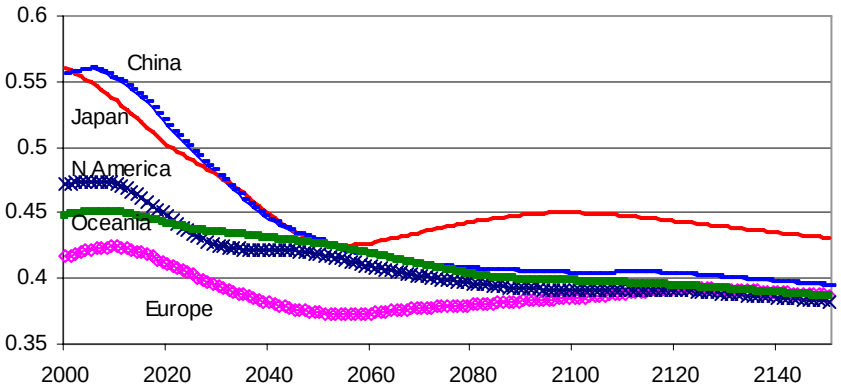


Figure 2 Support ratios for younger regions, medium fertility, 2000 to 2150

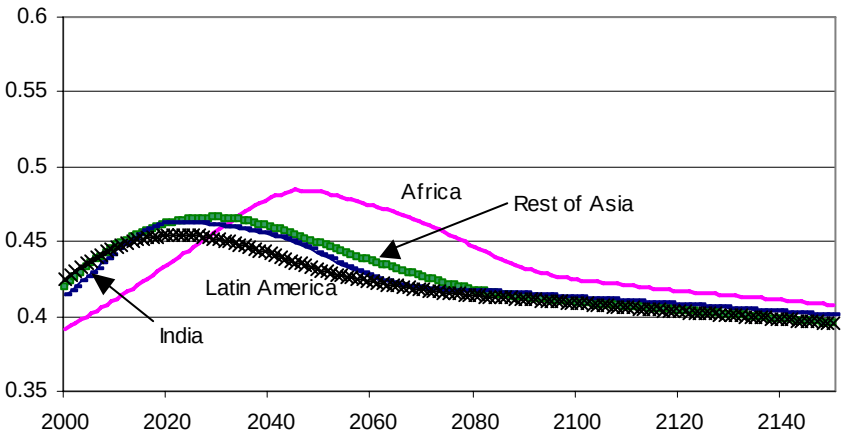
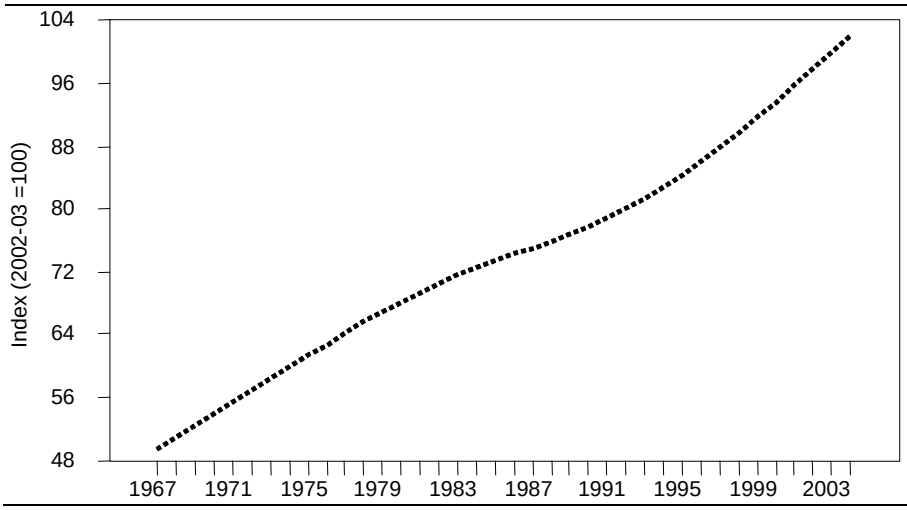
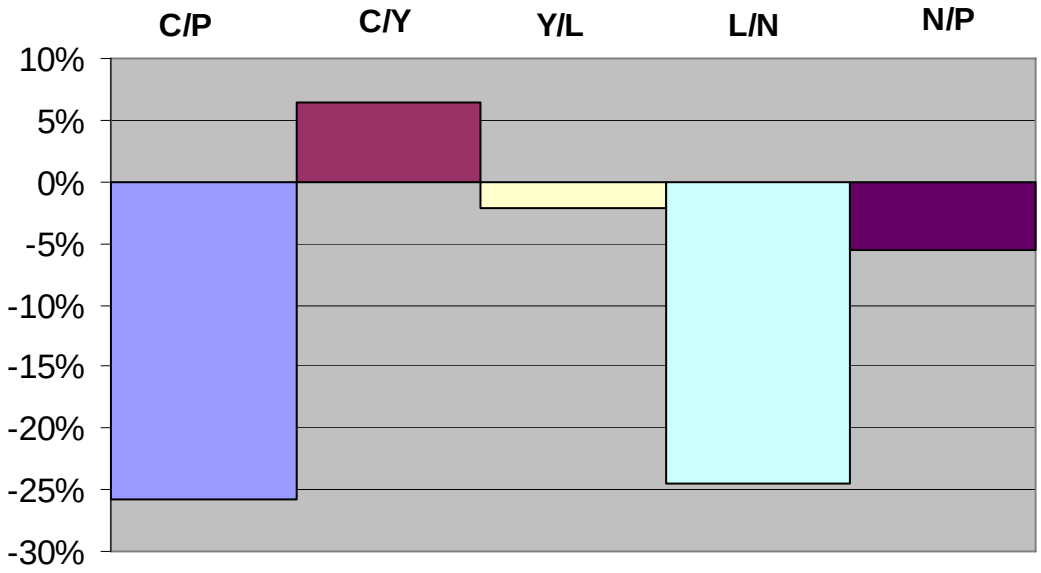


Figure 3. Index of GDP per employee hour worked for Australia[a]



a The labour productivity series has been smoothed by a Hodrick-Prescott filter, so that growth rates can be calculated for any period without being affected by cyclical variations.
Source: Productivity Commission (2005)

Figure 4. Japan: 2000 to 2050
Assuming no technical progress



Japan: 2000 to 2050
Assuming tech prog equiv to 1% p.a. Y/L growth

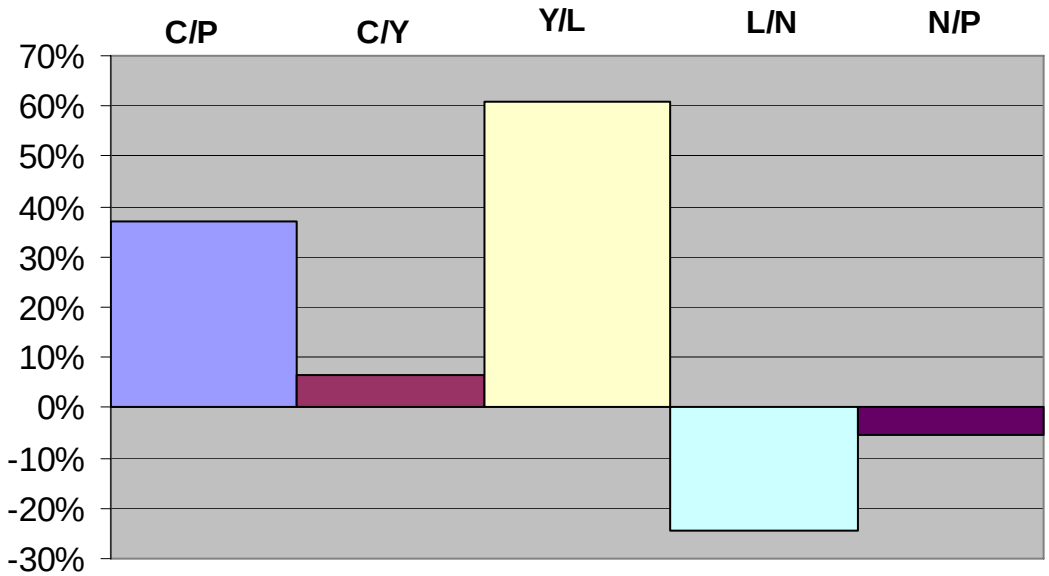
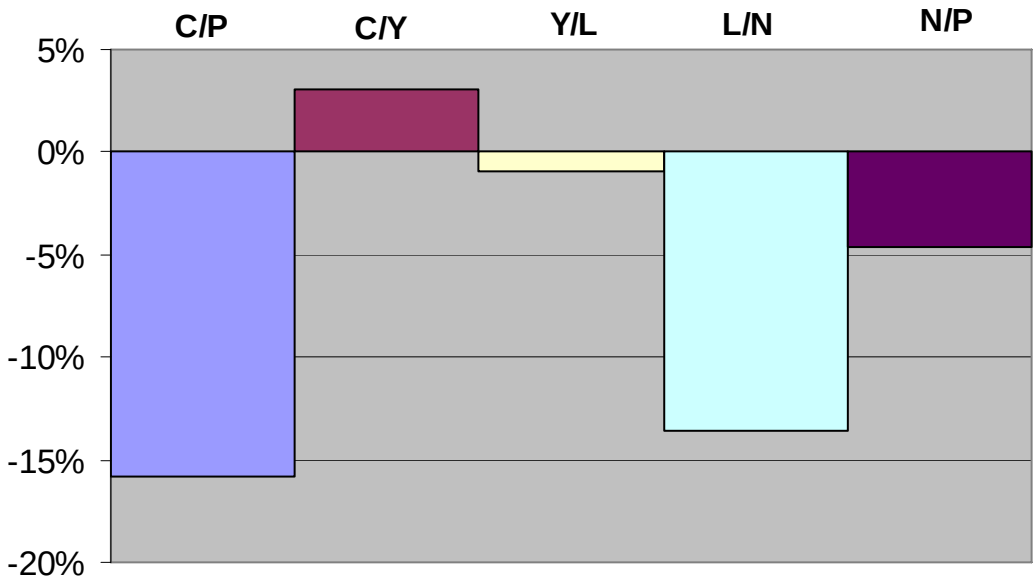


Figure 5. Australia: 2000 to 2050
Assuming no technical progress



Australia: 2000 to 2050
Assuming tech prog equiv to 1.5% p.a. Y/L growth

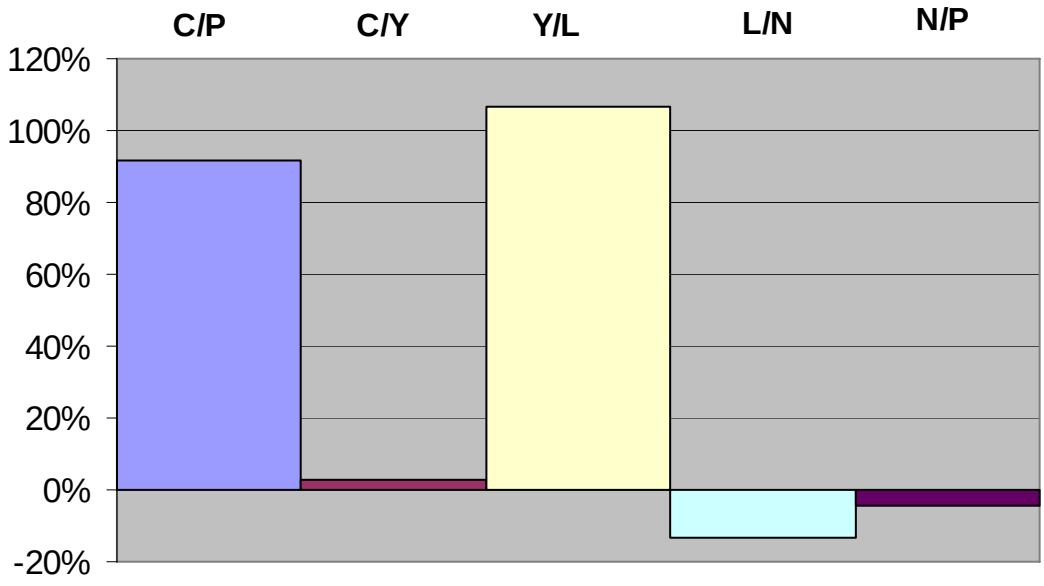


Figure 6. Projected increase in old-age pensions, 2000 to 2050, selected OECD Countries

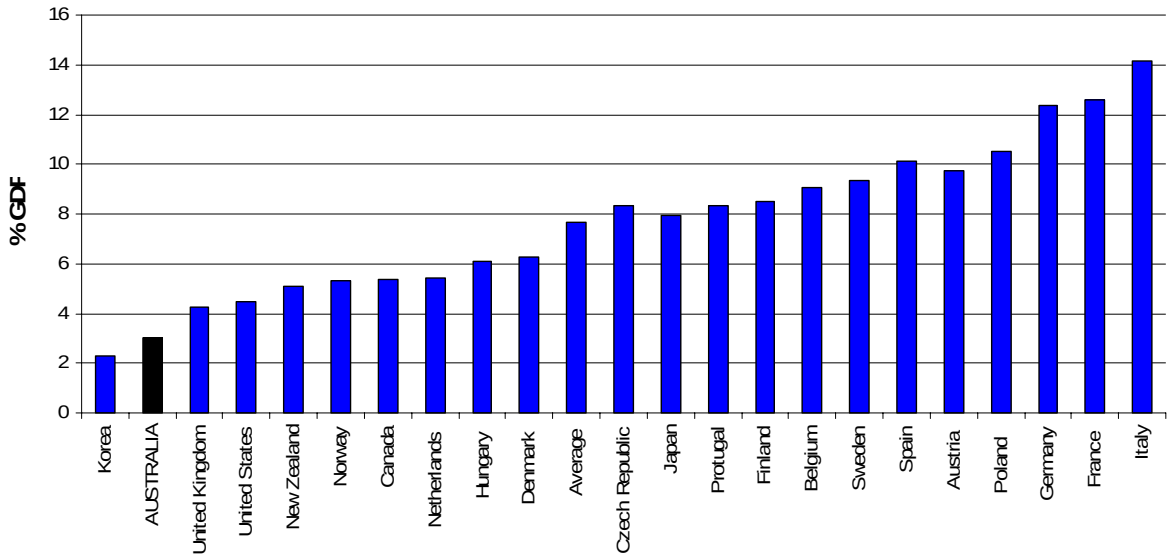
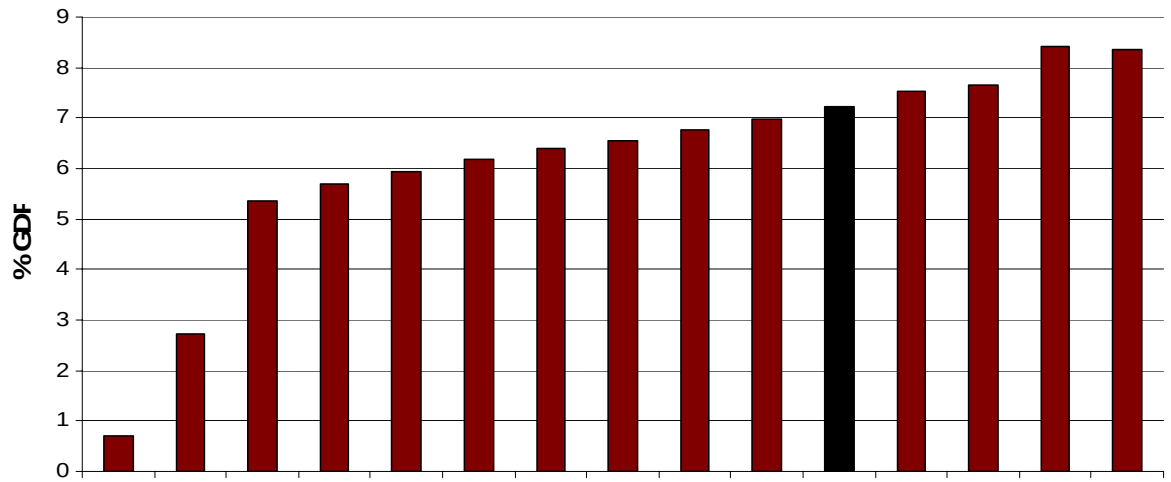


Figure 7. Projected increase in health care and long-term care, 2000-2050, selected OECD Countries



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